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Cycling - What works?

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This briefing aims to identify which public sector policy and infrastructure interventions are most effective in getting commuters onto their bikes.



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Executive Summary

Increasing the proportion of everyday journeys made by bike is a policy aim of the Scottish Government, as increased cycling rates help achieve wider climate change, air quality, economic and health objectives. To help achieve this aim, the Scottish Government will double investment in walking and cycling from £40m in 2017/18 to £80m in 2018/19. This briefing aims to identify which public sector policy and infrastructure interventions are most effective in getting commuters onto their bikes.

To do this, the briefing summarises academic research into effective public sector cycling interventions and looks at the experience of Edinburgh, which has the highest proportion of journeys to work made by bike in Scotland and has seen significant growth in cycling over the last 10 years. The aim being to establish what, if any, public sector initiatives have helped drive this growth - providing Scotland specific evidence on effective measures to increase cycling rates.

Evidence indicates that cycle modal share can be increased through the implementation of an integrated package of measures, which can include:

1. Long term, strong pro-cycling political and official leadership at a national and local level
2. Cycling is seen as a legitimate transport choice and accorded appropriate physical infrastructure and policy priority
3. Plans are in place for the development and maintenance of a comprehensive cycle network focused on facilitating everyday cycling
4. Cycle networks are based on clear design standards aimed at ensuring direct, obstacle free travel
5. There is a willingness to reallocate road and parking space to cycling infrastructure
6. Driving is discouraged in city and town centres as a matter of policy
7. Increasing cycling is part of an approach to reducing the modal share of private cars, integrating cycling with rail, bus and tram – rather than abstracting passengers from public transport
8. Land use planning policies encourage compact towns and cities and mixed use developments, which allow for shorter trips that are easily made by bike
9. Cycle promotion is pursued in tandem with infrastructure development and is targeted at people from all parts of society over a sustained period of time

Introduction

The ¹ Cycling Action Plan for Scotland 2017 sets out a vision of 10% of everyday trips in Scotland being made by bike by 2020 (a figure that stood at 2% in 2016, the latest figures available) ². Achieving this target can contribute to meeting a number of local, national and international commitments and policy aspirations, as set out below:

- **Climate Change:** Cycling is a zero emission form of transport, which can play a role in helping reduce transport related greenhouse gas emissions ³. The Climate Change (Scotland) Act 2009 committed the Scottish Government to reducing Scotland's greenhouse gas emissions, compared with the figures for 1990, by 42% by 2020 and 80% by 2050. The Scottish Government's ⁴ Climate Change Plan highlights that achieving a 10% modal share for cycling by 2020 is one element in meeting these targets.
- **Local air quality:** Again, as a zero emission form of transport, cycling has a role to play in helping to reduce local air pollution. Air pollution can have serious health impacts, such as increasing the risk of stroke, heart disease and lung cancer ⁵. Air pollution on a number of streets in urban Scotland exceed maximum limits (established by UK and European legislation) at certain times of day ⁶. This briefing goes on to highlight the evidence linking the proportion of journeys made by bike in urban areas to reduction in air pollution, particularly in pollution hot spots.
- **Public Finances:** Investment in cycling infrastructure produces significant wider social and financial benefits, research conducted into UK Department for Transport cycling grants ⁷ concluded that "...for every £1 of public money spent, the funded schemes provide £5.50 worth of social benefit". A key element of these benefits is the impact on the NHS, with research conducted for British Cycling ⁸ concluding that "Danish levels of cycling in the UK would save the NHS £17billion within 20 years".
- **Physical activity:** During 2016 some 64%% of adults in Scotland met the Chief Medical Officer's 2011 guidelines for Moderate or Vigorous Physical Activity, a similar level to that seen since 2012 - when new guidelines were adopted ⁹. Physical inactivity has serious implications for the National Health Service (NHS) and quality of life for many people, with the Scottish Government estimating that inactivity contributes to around 2,500 deaths per year and an annual cost to the NHS of around £94m ¹⁰. Cycle commuting is an effective way of incorporating activity into daily life, which can have significant health benefits. Research conducted by Celis-Morales et al ¹¹ into the health benefits of active commuting found that

“ Commuting by cycling was associated with a lower risk of all cause mortality and adverse Cardio-Vascular Disease and cancer outcomes.”

Most research into cycle commuting has been carried out in countries such as The Netherlands, or cities such as Copenhagen, which already have high levels of cycling. This briefing aims to establish what, if any, public sector interventions could help increase cycle commuting in Scotland and includes a review of relevant literature and a case study of commuter cycling in Edinburghⁱ.

i Case study conducted by the author as part of a postgraduate research project.

Literature Review

The following section highlights key findings from research into efforts to increase cycle modal share conducted by academic, Government and third sector organisations. The results are grouped under four thematic headings:

- The role of public policy
- Concerns about research into cycling interventions
- Improved analysis
- What else influences decisions whether to cycle?

The role of public policy

Are there consistent policies, proposals and programmes that have been pursued by policy makers in towns and cities where cycling has flourished? Are there reasons why cycle modal share has failed to grow in similar municipalities? Research in this area has identified a number of key interventions that influence the popularity of cycling as a mode of transport, as summarised below.

Pucher and Buehler ¹² outlined how towns and cities in the Netherlands, Denmark and Germany have made cycling a safe, convenient and practical transport choice. They analysed national level statistics for cycling modal share and the average distance cycled in the EU, Australia, Canada and the USA. They then looked at cycling modal share in major cities in these countries and the incidence of cycling broken down by age and gender. Finally, they identify the key measures responsible for the popularity of cycling in the Netherlands, Denmark and Germany – the countries where cycling has the highest modal share. These key factors are:

- Segregated cycling infrastructure on arterial routes and at junctions
- Traffic calming on residential streets
- Ample bike parking
- Integration with public transport
- Comprehensive driver and cyclist training
- Ongoing cycle promotion
- Consistent pro-cycling policies and programmes from local and national government
- Driving is discouraged in city and town centres as a matter of policy
- Land use planning policies encourage compact towns and cities and mixed use developments, which allow for shorter trips that are easily made by bike

These findings were further developed in an international review of cycling best practice carried out by Urban Movement et al ¹³ for Transport for London (TfL). The study team

visited 14 cities with a high cycling modal share, or recent significant growth in cycling. Interviews were carried out with key cycling stakeholders in each city and the study team cycled between 40km and 50km in each city, so they could experience cycling conditions in each city. The interviews and cycle tours were particularly focussed on how these cities had implemented best practice identified from previous studies into the Dutch and Danish experiences of cycling. This study identified the following conditions, which were found in some or all of these cities, as a basis for growing cycling in other cities:

1. Strong political and official leadership throughout the local authority and key stakeholders
2. Cycling is considered a legitimate transport choice
3. Increasing cycling is part of an approach to reducing the modal share of private cars, the aim is not to abstract patronage from public transport
4. There is a willingness to reallocate road and parking space to cycling infrastructure
5. Dedicated cycling infrastructure, free from motorised traffic has been provided, or is under development
6. There are plans in place for the development and maintenance of a comprehensive cycle network
7. The cycling network is a single entity, with three levels – segregated infrastructure on arterial routes, on-street infrastructure on quieter roads and off-street infrastructure
8. A cohesive design guide for the network
9. Drivers are considerate of cyclists
10. A commitment to continual improvement in cycling provision

Cycling Scotland commissioned Urban Movement, which also led the TfL study, to undertake an International Comparator Study¹⁴. This looked at published statistical sources to identify trends in cycle use at region/city level in the Netherlands, Denmark, Germany, Spain and Austria. It then looked to identify the causes for identified trends in cycle use, with a particular focus on public policy and infrastructure interventions. The report considered causes under the following four headings:

- **Cycling policies and funding programmes:** A pro-cycling transport policy is a prerequisite for increasing cycle modal share. However, to be effective it must be accompanied by significant funding focussed on infrastructure development.
- **Provision of cycling infrastructure:** Although difficult to determine the quality of infrastructure provided, and its effectiveness in encouraging trips by bike, there is a positive relationship between the length of cycle network and cycle modal share.
- **Provision of cycle training:** While cycle training is almost always a part of efforts to encourage cycling, even in places with high cycle modal share, there is no causal link between the quality or quantity of training provided and cycle modal share.
- **Programmes and events:** Cycle promotion has been pursued, as part of a wider package of measures, by those cities which have seen a growth in cycling. However,

there is no evidence that promotional activities, taken in isolation, change people's travel habits.

The European Commission backed Cycling Heroes Advancing sustainable Mobility Practice (CHAMP) ¹⁵ project, which ran from 2011 to 2014, aimed to establish why cycling has a higher modal share in some European cities compared to other cities with the same characteristics. The project brought together seven cities, including Edinburgh, to share best practice and develop policies and tools that could be used by other cities wishing to increase their cycling modal share. The project resulted in the development of 12 “cycling commandments” that were grouped under three headings – data, strategy and implementation. The commandments can be summarised as follows.

Data

- Collect and analyse high quality cycling data – to provide a baseline, guide policy and monitor progress.
- Have a third party peer review work. Engage with local stakeholders to share best practice and better understand problems.
- Use data and information gathered to tailor solutions to meet local needs and address problems – do not develop “solutions” before understanding whether it will address problems.

Strategy

- Strong cross-party political support is a prerequisite for cycle development
- A senior politician and official should have responsibility for driving forward cycle development
- Cycling should be seen as more than a transport issue, links should be developed with fields such as health and environment.
- Opinions, rules and regulations that stand in the way of cycling development should be challenged and, where possible, amended

Implementation

- Do not be afraid to innovate, new measures can be effective and generate media interest and raise awareness.
- Highlight and develop existing infrastructure.
- Ensure that procurement processes and lead-in times are understood and that resources are in place to see projects through.
- Use proven marketing techniques to promote cycling to reach different target groups.
- Develop and utilise media contacts.

There is considerable cross-over between the results of these four major studies. However, one key issue divides them. Pucher and Buehler and Urban Movement et al for TfL both highlight the importance of policies and actions aimed at reducing the number

and proportion of trips made by car, while Cycling Scotland's International Comparator Study and the EU CHAMP report remain silent on this issue.

Increasing cycle modal share will require people to change mode for some trips. To maximise the emissions reduction effect of modal shift to cycling, efforts should focus on encouraging people to switch modes for trips currently made by car that could be made by bike, rather than from walking and public transport - which also support emissions reduction policy goals.

In addition, reducing the number of cars on the road can help make cycling more attractive – by reducing perceived and actual road danger and providing a more pleasant on-street environment for cyclists. Given this, pursuing policies aimed at reducing car trips in urban areas can be considered an important aspect of a suite of policies aimed at increasing cycle modal share. It is also worth noting that a reduction in these types of car trips can also benefit other road users, through a reduction in congestion and delays, which is of particular benefit to those making essential trips by car, bus users and freight operators.

Concerns about research into cycling interventions

The impact of specific infrastructure or policy interventions aimed at increasing cycling and the effectiveness of comprehensive cycling initiatives was assessed by Pucher, Dill and Handy¹⁶ in an international research review. The authors developed a list of cycling interventions, based on previous research, and then carried out a comprehensive literature review of studies into the effectiveness of these interventions. The review found that most of the studies into the effectiveness of cycling interventions were poorly designed and the results could not often prove whether increased cycling was due to any specific intervention. However, the authors did consider that some individual interventions could lead to an increase in cycling. They considered the most effective intervention to be an integrated package of complementary measures, including promotion, infrastructure, restrictions on car use and land use planning policies that create areas that are favourable to cycling.

Similar concerns about a lack of robust studies into the effectiveness of policies and proposals aimed at increasing cycle commuting were found by Stewart et al¹⁷, who conducted a review of studies that attempted to establish what interventions increase cycle commuting – concluding that:

“...there is little robust evidence of effective interventions to increase commuter cycling even at a subpopulation level. Many studies lack appropriate controls, their external validity to the wider population remains unclear, and they have high rates of loss to follow-up—all indicating a high risk of bias.”

Koglin and Rye¹⁸ argue that studies such as those mentioned in the previous section have tended to focus on the analysis of empirical evidence, rather than underlying theoretical issues. They suggest that an understanding of the theoretical forces that have created a car-centric transport system can allow for the development of a new model of transport planning that takes cycling into consideration. They identify four key factors in the development of this model:

1. Physical movement from A to B: cycling infrastructure should be free of obstacles and allow for the safe movement of cyclists.

2. Power relations in urban traffic space: transport planners should consider power relations between the different groups that share road space and create spaces where cycling is not marginalised.

3. Positive representations of bicycling: cycling is promoted to different groups of people in ways that create a shared meaning of cycling that goes beyond class, gender, ethnic, and other boundaries.

4. Everyday practice and the experience of cycling: cycling should make people's lives easier. Cycle infrastructure should focus on facilitating everyday trips and enhancing the cycling experience

Improved analysis of cycling interventions

Despite these concerns about the quality of previous research, some recent robust studies into the impact of cycle infrastructure developments in the UK have been published.

Heinen et al ¹⁹ carried out a before (2009) and after (2012) analysis of 470 residents living near the 25km long off-road Cambridgeshire Guided Busway, which opened in 2011 and featured a high quality cycleway along its length. This study examined changes in:

- commute modal share
- changes in the number of commute trips
- changes in commute distance

It concluded that:

“ Over time, commuters with a higher level of exposure to the guided busway were more likely to have increased the proportion of their commute trips involving active travel, and to have reduced the proportion made entirely by car, than those with a lower level of exposure. The intervention was not associated with a change in the number or distance of commute trips.”

A different approach to assessing the impact of new cycle infrastructure was followed by Ford et al ²⁰ . They developed a GIS based model that used generalised costs to measure transport costs (monetary and distance) across the Greater London transport network. The aim being to assess the accessibility impact of future low carbon transport interventions. An examination of the impact of the 10km long East-West cycle superhighway on cycle travel costs resulted in them concluding that:

“If other such infrastructure was provided in a wider context across London, the reductions in travel cost could be large enough to ensure that zero-carbon modes of transport are a competitive alternative for short distance journeys.” It is worth noting that the model did not allow for multi-modal trips.

Other factors that influence cycle use

Decisions on travelling by bike are not just a matter of public policy. Heinen et al ²¹ carried out an international literature review of 110 academic papers that looked into factors influencing decisions to commute by bike, concluding that the key factors included:

- **Built Environment:** This included trip distance, urban form, availability and continuity of cycle routes, cycle parking/storage at trip ends – with trip distance being the greatest determinant (the longer the trip the less likely people were to cycle). These are the factors most amenable to public policy interventions.
- **Climate:** A moderate climate with little rain tended to result in higher cycle modal share.
- **Socio-economic status:** No clear consensus.
- **Car ownership:** Car ownership had a negative impact on cycling.
- **Values:** People with a positive view of the value of cycling or negative view of driving were more likely to cycle.
- **Travel time and safety:** Views on how the travel time and perceived safety of cycling compared with those of other modes influenced decisions on whether to cycle.

Vandenbulke et al ²² (2011) attempted to explain the differences in cycle commuting levels across 589 municipalities in Belgium. This study used statistics, broken down under three broad headings; demographic and socio-economic, policy-related and environmental, to model cycling behaviours. This research identified lower traffic volumes and fewer accidents involving cyclists as key factors in higher cycling modal share. They also found that the size of an area, its topography and trip distances influenced whether people chose to make trips by bike or another mode. They found that most people would not consider making regular journeys by bike that were over 10km. They also highlight the importance of demographic factors, particularly lower levels of cycling by women and older people. The study also identifies a virtuous circle effect, with the growth of cycle commuting in one area tending to increase cycle commuting in neighbouring areas.

Similar results were reached by Rietveld and Daniel ²³, who developed a regression model aimed at explaining the difference in the proportion of trips made by bike between Dutch municipalities. Their model used geographic and social data from Dutch municipalities grouped under three broad headings – characteristics of the city, policy efforts and policy consequences. The model outputs led the researchers to conclude that “...municipal policies do have an influence on individuals' modal choice when considering short distances”, particularly if they focused on improving the competitiveness of bike trips with the car – especially travel time and convenience. They also noted that the physical effort required to travel by bike (both trip distance and the impact of hills/wind), accident risk and cultural acceptance of cycling as a modal choice were significant factors in choosing whether to cycle.

While these studies provide useful insights, it is worth remembering that cycling rates are considerably higher in the Netherlands and Belgium than in the UK. NHS Health Scotland commissioned research ²⁴ into the impact of socio-economic status and cycling in Scotland. This found that rates of cycling were lowest amongst the most deprived groups

and highest amongst the least deprived and that rates were falling amongst deprived groups while increasing amongst the least deprived. It also found that across deprivation levels, higher educational attainment is associated with more cycling and has an effect independent of employment status.

Steinbach et al²⁵ looked in more detail at whether gender, ethnic and class identities influenced the take-up of cycling in the UK. The research was based on the results of in-depth interviews held with 78 London residents, both cyclists and non-cyclists, chosen to include those in different circumstances likely to influence their transport choices. The researchers found that, where cycling is rare – as in the UK, it is disproportionately an activity of affluent white men. In part, this was due to the need to adopt an assertive style of cycling to deal with the potential dangers on urban roads, which suits the characteristics of this group but is less appealing to women and most minorities. Also, a lack of women and ethnic minority cyclists mean that such cyclists stand out – possibly attracting unwanted attention. Clearly, the relatively small sample size of this study and the fact respondents are all from London could limit its applicability to other areas.

In England and Wales, where cycle commuting has increased at a local authority level, there has not been any consequent increase in the proportion of women and older people cycling. Aldred, Woodcock and Goodman²⁶ examined English and Welsh census data from 2001 and 2011 to understand these trends and concluded that:

“ We cannot assume that growing cycling levels (characteristic of many dense urban areas) will automatically increase the gender and age diversity of cyclists... planners and policy-makers should study and respond to the infrastructural preferences of women, older people, and other under-represented groups. They should also examine how prevailing images and stereotypes of cycling may affect under-represented groups.”

Transport for London (TfL)²⁷ has also conducted research into who is making potentially cyclable trips, i.e. trips that could be reasonably cycled all the way, and compares their characteristics with current cyclists. The research is based on analysis of the results of the London Travel Demand Survey and a bespoke Cycle Market Segmentation tool developed by TfL. This research found that nearly two thirds of potentially cyclable trips are currently made by car and four in ten potentially cyclable trips are made for shopping and leisure purposes. As before, this study found that frequent cyclists are typically white, male, aged between 25 to 44 years old and on a higher than average income. However, many of the potentially cyclable trips are made by women, ethnic minorities, younger and older people, and those on a lower income. It also found that much of the growth in cycling since 2001 has been due to existing cyclists cycling more often, with considerable scope for more cycling trips to be made by infrequent cyclists and the group identified as most likely to cycle.

Gatersleben and Appleton²⁸ looked in more detail at what influences whether someone in the UK chooses to cycle. They found that the likelihood of someone starting to cycle, or cycle more, was influenced by whether they had never considered cycling, considered cycling but never took it up or cycled infrequently - with the barriers to cycling being lower for each subsequent group. Their research considered that efforts to increase cycling should focus on those who already cycle infrequently and those who have considered it, but not yet started to cycle, as their barriers to cycling were more easily overcome than those who never contemplated cycling. They considered actions such as the provision of

cycle facilities in the workplace, assistance with route planning and provision of some cycling infrastructure as effective in encouraging these groups to cycle (more).

The research highlighted above is broadly consistent in identifying the effects of factors including sex, age, trip distance, travel times, topography and car ownership on cycle modal share. Research from other northern European countries does not identify socio-economic class as a major factor in cycling rates, although it does seem to influence propensity to cycle in the UK.

Case study: A Closer look at the growth of cycle commuting in Edinburgh

More people commute by bike in Edinburgh than any other Scottish local authority area. Edinburgh has also seen a greater increase in cycle commuters than any other local authority over the last 10 years. This case study aims to establish why this is the case, with a particular focus on work undertaken by the City of Edinburgh Council (CEC) to encourage cycle commuting.

The key issues covered are:

- Has cycle commuting modal share increased in Edinburgh over the last 10 years?
- What actions have CEC taken over the last 10 years to increase the proportion of commuting trips made by bike?
- How effective have these actions been in encouraging any increase in cycle commuting?
- What other factors may have influenced any increase in cycle commuting?

Methodology

The case study assesses how the City of Edinburgh Council (CEC) has performed against eight key measures that were collectively identified by Pucher and Buehler ¹², Transport for London ¹³, CHAMP ¹⁵ and Cycling Scotland ¹⁴ as the key shared characteristics of cities with a high cycling modal share, or recent significant increase in cycling. The following methods were used to establish how effective CEC has been in developing and implementing these measures.

Desktop research: focusing on:

- The evolution of national and local cycle related transport policies
- Charting the growth of cycling through local and national statistics
- Demographic change in Edinburgh over the past 10 years
- Identifying cycle promotion schemes/events that have taken place over the last 10 years

Survey: An online survey of Edinburgh cycle commuters, focusing on:

- how the availability of different types of cycle infrastructure affect people's decision to commute by bike
- the effectiveness of cycling promotion schemes in encouraging people to cycle

Focus group: A focus group of regular Edinburgh cycle commuters will seek to establish reasons behind the key issues and trends identified in the survey results.

Interviews: Interviews with Keith Irving (Chief Executive, Cycling Scotland), John Lauder (Director, Sustrans Scotland) and Dave de Feu and David French (SPOKES – The Lothian Cycle Campaign). Interviews were conducted on an informal basis, and the results do not include any direct quotes - allowing interviewees to freely express their views.

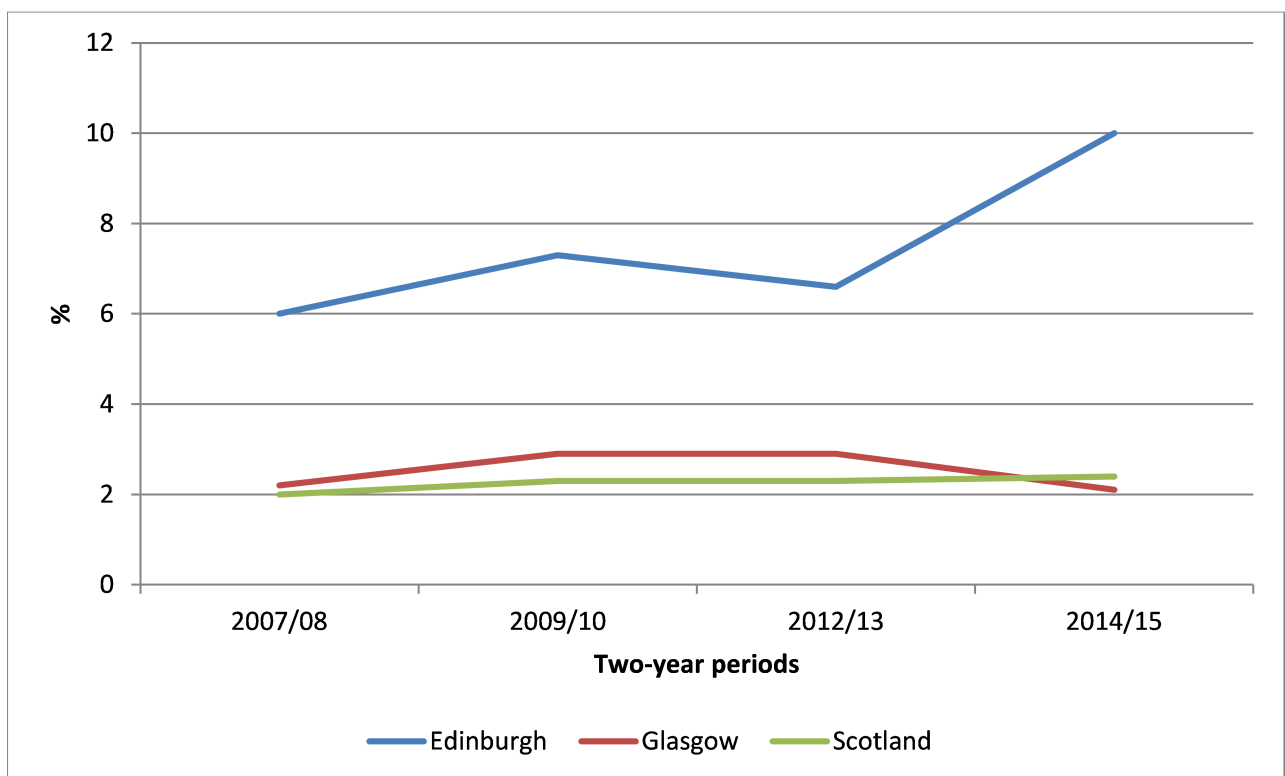
These interviews focused on:

- establishing opinions on political leadership
- the standards set out in cycle design guidance and whether such guidance is followed in the design of cycle infrastructure
- the effectiveness of local and national policies in increasing cycling
- the willingness of CEC to re-allocate road space to cyclists and discourage driving in the city centre

Case study: Edinburgh cycle modal share

How has the proportion of commuting trips made by bike in Edinburgh changed over the last 10 years and how does this compare to the experience of Glasgow (Edinburgh's nearest Scottish comparator city) and Scotland as a whole? Figure 1 below shows that cycling to work in Edinburgh has increased from 6% in 2007/08 to 10% in 2014/15. Over the same period, there has been no real change in the proportion of residents cycling to work in Glasgow, and national cycle commuting rates have only increased from 2.0% to 2.4%.

Figure 1: Proportion of commuting trips made by bike in Edinburgh, Glasgow and Scotland



Data from Transport and Travel in Scotland: Local Area Analysis and Scottish Household Survey: Household Transport (Transport Scotland) 2009-2016

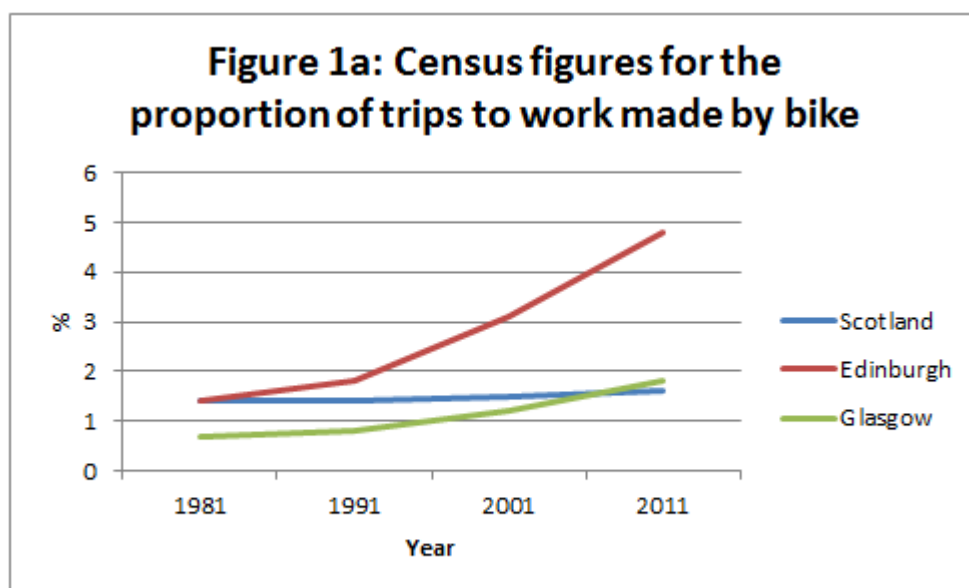
A similar pattern can be seen when looking at cycle modal share of all trips, with a clear growth in cycling rates in Edinburgh, a steady state in Glasgow and slight rise across the country, as shown in Table 1 below:

Table 1: Proportion of all trips by bike

	Year			
	2007/08	2009/10	2012/13	2014/15
Edinburgh	n/a	2.0	2.5	3.6
Glasgow	n/a	1.0	1.4	1.0
Scotland	n/a	1.0	1.1	1.3

Data from Transport and Travel in Scotland: Local Area Analysis and Scottish Household Survey: Household Transport (Transport Scotland) 2009-2016

It is worth noting that the growth in cycle commuting in Edinburgh began before the period considered by this briefing. Figure 1a below shows the proportion of trips to work made by bike in Scotland, Edinburgh and Glasgow recorded by each Census since 1981.



Data extracted from census results using the online Scotland's Census Standard Outputs tool and Nomis online data analysis tool

These figures indicate that the growth of cycle commuting, and cycling in general, in Edinburgh is not just the result of an increase in cycling across Scotland or in other Scottish cities – as shown by the experience of Glasgow.

Case study: Growth of cycle modal share in Edinburgh - controlling for other factors

While local policies, programmes and priorities are key determinants in cycle modal share, they are not the only factors. As outlined in the literature review; gender, socio-economic status and geography can all have an impact on an individual's decision to cycle.

The following section considers what, if any, influence these factors have played in the increase in cycle commuting modal share in Edinburgh – to allow the impact of local authority action to be isolated and better understood. To do this, key indicators for these factors in Edinburgh are contrasted with those of Glasgow and Scotland – to help identify if there is some Edinburgh specific reason(s) behind the growth in cycle commuting.

Statistics used in this section are principally sourced from Transport Scotland's Scottish Transport Statistics ²⁹, Transport and Travel in Scotland ³⁰, Scottish census results ³¹ and Nomis ³².

Gender

The split between men and women living in Edinburgh, Glasgow and Scotland is highly consistent, as shown in Table 2. This means that gender split is very unlikely to be a factor in the different cycling rates for these three areas.

Table 2: Gender split of Edinburgh, Glasgow and Scotland in 2011

	Edinburgh	Glasgow	Scotland
Males	48.8%	48.2%	48.5%
Females	51.2%	51.8%	51.5%

Data extracted from census results using the online Scotland's Census Standard Outputs tool

This is supported by results from the 2001 and 2011 Censuses, which show that the gender split of people aged 16+ who cycled to work in Edinburgh, Glasgow and across Scotland were broadly consistent and remained stable over that period, as indicated in Table 3.

Table 3: Proportion of people who cycle to work by sex

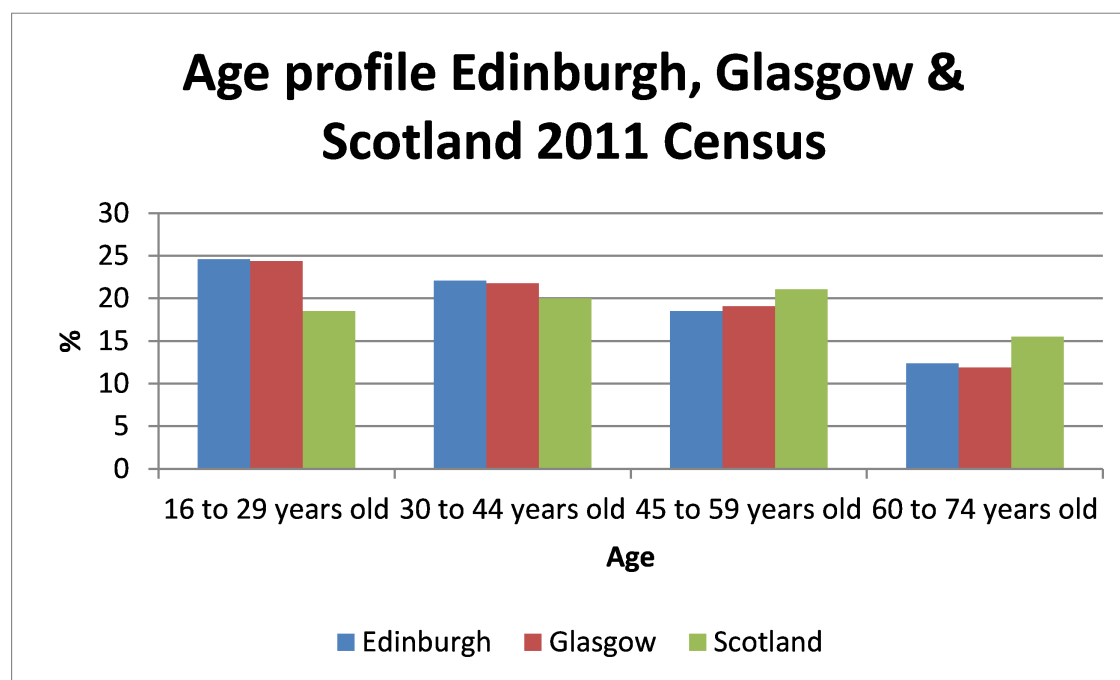
	Edinburgh		Glasgow		Scotland	
	Male	Female	Male	Female	Male	Female
2001	72.3%	27.7%	78.6%	21.4%	76.9%	23.1%
2011	71.6%	28.4%	77.2%	22.8%	77.8%	22.2%
Change	-0.7%	+0.7%	-0.8%	+0.8%	+0.9%	-0.9%

Data extracted from census results using the online Scotland's Census Standard Outputs tool

Age

The profile of the working age population in Edinburgh and Glasgow is also broadly consistent, as shown in Figure 2 below. Both cities have higher proportions of younger working-age residents than the Scottish average – particularly in the 16-29 year age range. Given the very similar age profiles of the two cities, age is unlikely to be a factor in differences in cycle modal share.

Figure 2: Age profile of Glasgow, Edinburgh and Scotland in 2011



Data extracted from census results using the online Scotland's Census Standard Outputs tool

Table 4 below shows Census 2011 data for the proportion of each age group that cycles to work in Edinburgh, Glasgow and across Scotland – comparable data for 2001 is not publicly available. The data for Glasgow closely mirrors the Scottish average, with very slightly higher proportions of younger age groups cycling to work. Cycling rates for every age group in Edinburgh are at least twice the national average, with cycling rates over three times the national average in the 35-49 and 50-64 age groups. While the two cities may share similar age profiles, cycling in Edinburgh is more popular amongst all ages, with particularly high rates amongst middle aged residents.

Table 4: Proportion of each age group that cycled to work in 2011

Age	Edinburgh	Glasgow	Scotland
16 – 24	2.1	1.0	0.9
25 – 34	4.8	2.1	1.7
35 – 49	5.4	1.9	1.7
50 – 64	3.1	1.0	1.0
65 - 74	1.2	0.4	0.6

Data extrapolated from census results obtained using the online Scotland's Census Standard Outputs tool

Socio-economic groups

As highlighted in the literature review, cycling is more prevalent amongst higher socio-economic groups in the UK. Table 5 below shows that 4.5% more Edinburgh residents are economically active than in Glasgow. However, the proportion of economically active Edinburgh residents is 1.5% below the Scottish average. Median pay in Edinburgh is above the Scottish average and in Glasgow slightly below. Edinburgh median pay is 10.2% higher than in Glasgow.

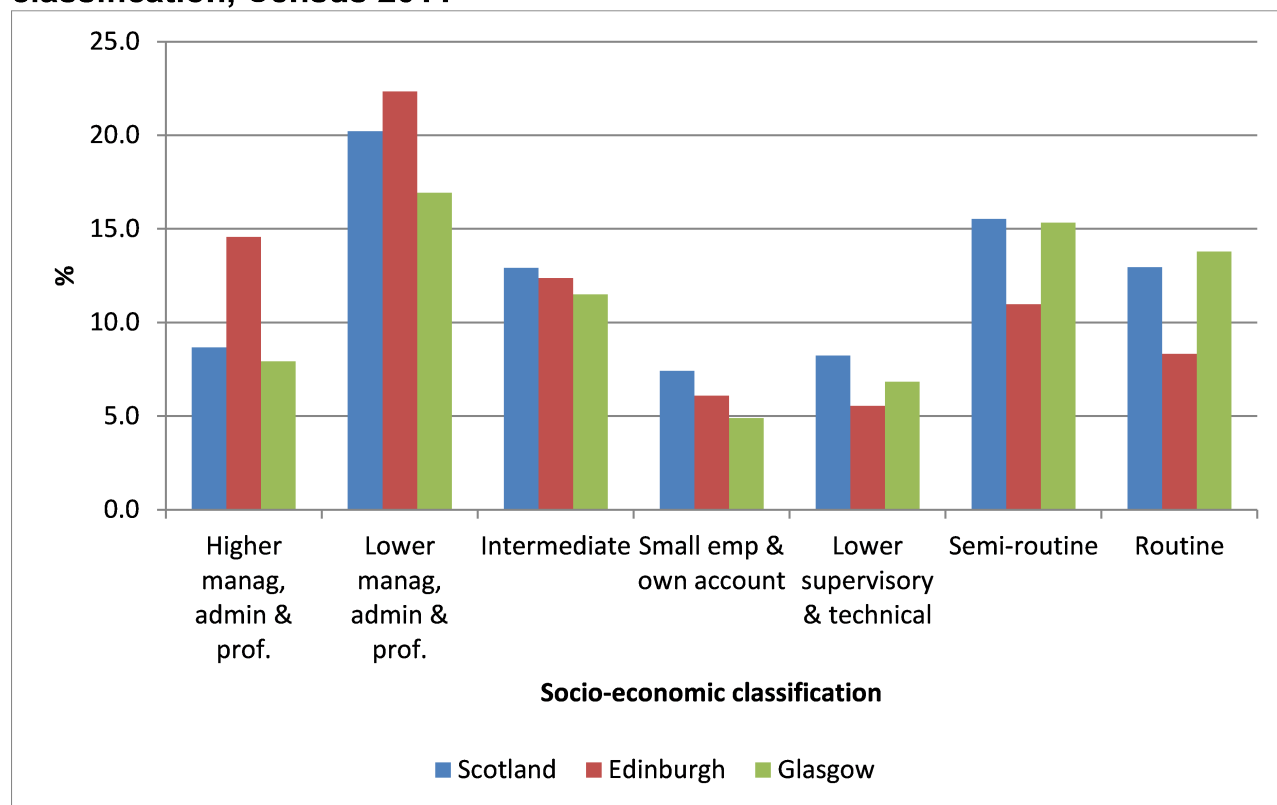
Table 5: Economic Activity (April 2016 – March 2017) and Median Full Time Pay (2016)

	Edinburgh	Glasgow	Scotland
Economically active	75.4%	70.9%	76.9%
Median pay per hour 2016	£14.76	£13.39	£13.50

Data extracted from Local Authority Profiles available on the Office for National Statistics Nomis website

While this data does not appear to point to a particularly significant difference in the employment situation of both cities, an analysis of socio-economic data from the 2011 census throws up some stark differences – as shown in Figure 3 below. The proportion of Edinburgh residents working in higher managerial and professional roles is 85% higher than in Glasgow, with 32% more Edinburgh residents working in lower managerial and professional roles. The proportion of Glasgow residents working in semi-routine jobs is 28% higher than in Edinburgh, and 40% higher for routine occupations. This pattern is broadly mirrored, although to a lesser extent, when contrasting Edinburgh with Scotland as a whole.

Figure 3: Proportion of working residents by socio-economic classification, Census 2011



Data extrapolated from census results obtained using the online Scotland's Census Standard Outputs tool

Given that research has shown that cycling is more prevalent amongst higher socio-economic groups, it is possible that the socio-economic make-up of Edinburgh's population is a factor in the city's higher cycling modal share.

Table 6 below compares cycling rates broken down by National Statistics Socio-economic Classification (NS-SEC) groupings in Edinburgh, Glasgow and across Scotland in 2001 and 2011.

Table 6: Proportion of each socio-economic class that cycles to work in Edinburgh, Glasgow and Scotland

	Edinburgh		Glasgow		Scotland	
	2011	2001	2011	2001	2011	2001
Higher managerial, administrative and professional occupations	9.5	5.2	3.2	1.7	2.7	2.1
Lower managerial, administrative and professional occupations	6.7	3.0	2.1	1.1	1.5	1.2
Intermediate occupations	5.4	2.0	1.1	0.7	1.0	0.9
Small employers and own account workers	1.8	1.5	0.8	0.5	0.4	0.4
Lower supervisory and technical occupations	3.9	2.9	1.5	1.5	1.6	2.0
Semi-routine occupations	4.5	2.2	1.1	1.0	1.2	1.6
Routine occupations	3.2	1.9	1.1	1.1	1.4	1.8

Data extrapolated from census results obtained using the online Scotland's Census Standard Outputs tool

This data confirms that cycling is most popular amongst the higher classifications. A number of other trends are also clear from the data:

- Nationally, the popularity of cycling amongst routine, semi-routine and lower supervisory and technical occupations actually fell between 2001 and 2011 and effectively remained static for small/own account workers and intermediate occupations. Nationally, the increase in cycling is concentrated amongst both lower and higher managerial, administrative and professional occupations.
- In Glasgow, cycling rates remained static between 2001 and 2011 for routine, semi-routine and lower supervisory and technical occupations. Cycling rates increased for all other classifications, with the largest increase (91%) amongst lower managerial, administrative and professional occupations and then (88%) higher managerial, administrative and professional occupations.
- In Edinburgh, cycling rates increased across all classifications, more than doubling for semi-routine occupations, intermediate occupations and lower managerial, administrative and professional occupations.

Figure 3 above shows that Edinburgh has a higher proportion of managerial, administrative and professional workers than Glasgow or Scotland. However, cycling rates across all socio-economic classifications in Edinburgh started from a higher base than Glasgow/Scotland and then increased between 2001 and 2011. The increase in rates amongst routine, semi-routine and lower supervisory and technical occupations is particularly significant, as national and Glasgow rates for these groups either fell or remained static.

Census 2011 figures show that people in professional, administrative and technical jobs account for 49.3% of Edinburgh residents in employment, 36.3% in Glasgow and 41.8% across Scotland. What impact might this difference have on cycle commuting rates in Edinburgh, given the higher incidence of cycling amongst these groups? Cycling in the top

three socio-economic classifications has a Scotland-wide average modal share of 1.73%, which is 33% above the all-classes average of 1.4%. Edinburgh's population has 13% more in these top three groups than Glasgow. This means that socio-economic factors account for an additional 4.3% incidence of cycling in Edinburgh, assuming that socio-economic factors have a similar effect on modal choice across Scotland.

Cycle modal share for trips to work was over four times higher in Edinburgh than Glasgow in 2014/15 and rates of cycling amongst all socio-economic classes are between two and four times higher in Edinburgh than Glasgow. Given this, socio-economic differences between the two cities can be considered a marginal factor in cycle modal share rates.

Geography and other factors

As discussed in the literature review, a number of other factors also have an impact on cycling uptake – including trip distance, population density and household car availability. Table 7 below shows that Edinburgh and Glasgow have similar average commute times and both have over 40% of residents living within 5km of their workplace (a distance that many people can cycle in under 30 minutes) – both are above the national average of 32.3%. Both have relatively high population densities, with Glasgow having the highest density of any local authority in Scotland – although this may be slightly skewed by the large number of residential tower blocks, which push up densities but are generally unsuitable for bike storage.

Car availability in both cities is below the national average, with approximately half of Glasgow households and approximately 40% of Edinburgh households having no access to a car.

Both cities share similar average commuting times, a high proportion of short home to work trips and high population densities – so these are unlikely to be factors in the differences in cycle modal share.

Table 7: Other factors which affect cycling rates

	Edinburgh	Glasgow	Scotland
No car or van available to household	39.9%	50.8%	30.5%
Usual home to work travel time (minutes)	31	29	n/a
% working population (16-74) living within 5km of workplace	44.2%	40.0%	32.3%
Population density (per km ²) 2014	1873	3427	69

Data from Transport and Travel in Scotland, Local Area Analysis (Transport Scotland 2016), extrapolated from census results obtained using the online Scotland's Census Standard Outputs tool, Average Home to Work Travel Time, ages 16 plus, Oct to Dec 2016 (Office for National Statistics 2017) and Edinburgh by Numbers 2016 (City of Edinburgh Council 2016),

Given the similarities between cities on these factors, it seems reasonable to conclude that they can be excluded as significant factors in the different cycle commuting modal share in the two cities.

Underlying issues

As discussed in the literature review, Koglin and Rye ¹⁸ highlighted the importance of considering underlying issues that have affected the development of transport systems and not just empirical data. Two key factors may have had an impact on the development of cycling modal share in Edinburgh and Glasgow, as briefly outlined below:

1. **Long term policy frameworks:** Edinburgh and Glasgow have pursued quite different land use and transport policies over decades. Glasgow has focussed on comprehensive redevelopment of slum housing, has seen the creation of satellite new towns and major peripheral estates, maintenance of a comprehensive suburban railway network and the development of an urban motorway system and has had to deal with the effects of rapid deindustrialisation. Edinburgh adopted a more conservative approach, based on rehabilitation of slum housing, brownfield redevelopment, accommodating new industries and (since the 1980s) improving priority for buses and beginning to invest in active travel networks.
2. **Institutional frameworks:** Since local government reorganisation in 1996, the Glasgow City Council area has principally focused on the urban heart of the city – excluding many suburban areas. The City of Edinburgh generally incorporates the great majority of the city. This means metropolitan Glasgow is subject to control by different local authorities with differing priorities, where Edinburgh is governed by a single authority, which makes it easier to pursue policy priorities. In addition, many transport functions in Glasgow and the Clyde Valley area have been managed since

the 1970's by a regional transport authority (variously the Greater Glasgow Passenger Transport Executive, Strathclyde Passenger Transport Executive/Authority and Strathclyde Partnership for Transport) – where these functions remained under Council control in Edinburgh, again simplifying policy and project development and delivery in Edinburgh.

Quantifying the impact of these factors on current cycle modal share would be very difficult and is outside the scope of this research. However, these underlying factors may have had some impact and could be worthy of further research.

Conclusion

This section aimed to answer the question “What other factors may have influenced any increase in cycle commuting in Edinburgh”. Contrasting key aspects of Edinburgh's demographic, economic and geographic make-up with Glasgow and Scotland allows for any Edinburgh specific factors to be identified – particularly as they all share a legislative, economic and social background.

There is very little evidence that demographic, economic or geographic factors specific to Edinburgh are a driver of the growth in cycle commuting. The age and sex profile of Edinburgh residents are broadly similar to those of Glasgow and Scotland as a whole and can be excluded as a factor. Population density and car ownership rates in Glasgow would appear to be more favourable to cycling than in Edinburgh while average commute times and proportion of the population living within 5km of work are broadly similar in both cities – again excluding them as a factor.

As explored above, while socio-economic factors do have a minor influence on cycling rates for certain groups, this is not a significant factor in the growth of cycle commuting in Edinburgh. However, it is worth noting that the administrative frameworks that have applied to Edinburgh and Glasgow, the long term transport and planning goals pursued by each city or some other social/demographic factor not considered above may have had some impact on each city's respective cycling levels.

Case study: Assessment of City of Edinburgh Council action to encourage cycle commuting

As outlined in the literature review, research into what encourages modal shift to cycling by Pucher and Buehler, Transport for London, CHAMP and Cycling Scotland has identified practical and policy measures that have been consistently proven to encourage modal shift to bike. These measures can be summarised under nine broad headings:

1. Long term, strong pro-cycling political and official leadership at a national and local level
2. Cycling is seen as a legitimate transport choice and accorded appropriate physical infrastructure and policy priority
3. Plans are in place for the development and maintenance of a comprehensive cycle network focused on facilitating everyday cycling
4. Cycle networks are based on clear design standards aimed at ensuring direct, obstacle free travel
5. There is a willingness to reallocate road and parking space to cycling infrastructure
6. Driving is discouraged in city and town centres as a matter of policy
7. Increasing cycling is part of an approach to reducing the modal share of private cars, integrating cycling with rail, bus and tram – rather than abstracting passengers from public transport
8. Land use planning policies encourage compact towns and cities and mixed use developments, which allow for shorter trips that are easily made by bike
9. Cycle promotion is pursued in tandem with infrastructure development and is targeted at people from all parts of society over a sustained period of time

The following sections aim to assess the progress made in Edinburgh under each of these headings. This assessment is based on views expressed by senior cycling stakeholders during interview, an assessment of policy and statistical publications and a summary of opinions expressed by Edinburgh cycle commuters who participated in a focus group.

Long term, strong pro-cycling political and official leadership at a national and local level

The literature suggests that strong pro-cycling political and official leadership is a prerequisite for increasing cycle modal share. However, little attention has been paid to why politicians or officials choose and continue to support pro-cycling policies in countries, like Scotland, with low cycling modal share. The experience of The Netherlands and cities such as Copenhagen, which have achieved substantial cycle modal shares, show that significant modal shift is a very long term ambition. Some views suggest that politicians

and officials generally work to far shorter timescales, driven by four or five year long electoral cycles. Also, a need to maintain broad public support, which can sometimes appear to be hostile to cycle infrastructure developments, can require the expenditure of political capital in supporting what can seem an unpopular cause.

The following section, based on the results of interviews with key stakeholders, looks to explore some of the key drivers behind the establishment and development of a pro-cycling culture within CEC.

Why support cycling: Generally, support for cycling amongst councillors and officials comes from two sources. The first is those who already have pro-cycling views before taking office, common amongst those that cycle already or have an existing policy interest in a related issue, particularly in environmental matters. The second are those who assume pro-cycling views after entering office. Such views are generally developed by engagement with pro-cycling colleagues and cycling stakeholders (an issue explored below) and through experience of successful policy initiatives pursued by “competitor” cities, both in the UK and internationally.

CEC is in competition with other city authorities to attract investment and jobs. Many comparable cities in northern Europe have successfully pursued pro-cycling policies with a view to improving urban environments, reducing pollution, increasing mobility of residents and as a response to a change in culture, where many young professionals now seek to live in city centres without owning a car and therefore wish to make local trips by bike or on foot. CEC has taken an active role in learning from such competitors through the EU funded CHAMP project.

Role of individuals: No major policy can be carried forward without the active and continuing support of at least one senior political figure. Several senior Councillors have played a key role in supporting cycle development in Edinburgh over the last 10 years. These Councillors, working with supportive colleagues across political parties and officials, have driven the development and implementation of the Council's Active Travel Action Plan³³ – and successfully worked with colleagues to approve cycle infrastructure schemes, sometimes in the face of vocal public opposition (e.g. Transport and Environment Committee suspended consideration of the direct on-road route for the Roseburn section of the proposed East-West segregated cycleway to establish a working group of senior councillors and stakeholders to refine the proposals, so they could be taken forward with cross-party support). In addition, these individuals have taken action to cement a pro-cycling culture within the political and official establishment, helping to ensure that support for cycling continues after any particular individual's departure.

Key amongst this work has been engaging with external stakeholders, principally through the creation of a council sponsored Cycle Forum (now the Active Travel forum) which feeds in to transport policy development and delivery, and embedding pro-cycling policies in non-transport departments of the council – such as education, where staff and school pupils are now supported in cycling to work through the provision of on-site cycle facilities.

Role of civil society: SPOKES, the Lothian Cycle Campaign, has been working for 40 years to promote the development of cycling within Edinburgh. Interviewees have all pointed to their patient, evidence based and constructive engagement with individual politicians and local, regional and national authorities over that time as a key driver in the development of the city's cycle infrastructure. The role of the core membership, relatively unchanged over this period, in networking with politicians and developing their knowledge about the benefits of cycling, providing information to officials that is not collected

elsewhere (particularly on cycling budgets) and effectively acting as a corporate memory has been an invaluable asset for cycling development in the city.

Ultimately, these actions have helped cement a pro-cycling culture within Edinburgh's political and official establishment. Support for cycling can now be found amongst all political parties (as set out in 2017 local election manifestos) and amongst officers throughout the Council. Given the long term nature of achieving substantial modal shift, the creation of this pro-cycling culture has ensured CEC has continued to support cycling development through changes in key political personnel and administrations.

Cycling is seen as a legitimate transport choice and accorded appropriate physical infrastructure and policy priority

During interviews, each senior cycling stakeholder was asked whether CEC considered cycling a serious, legitimate mode of transport. All were confident that cycling was treated as a legitimate mode of transport at both a political and official level in CEC – which is not a given, as cycling was seen as a hobby or sport by some local authorities. The priority afforded to cycle policy and infrastructure development in Edinburgh is examined in the sections below:

Policy: CEC set out its comprehensive policies, plans and proposals for the development of walking and cycling in its Active Travel Action Plan (ATAP), first published in September 2011. This 10 year plan aimed to increase cycling modal share to 15% for trips to work and 10% of all trips in the city by 2020, with progress reviewed every two years. A refreshed version of the ATAP³³ was published in January 2016, which retained the targets set in the 2011 plan.

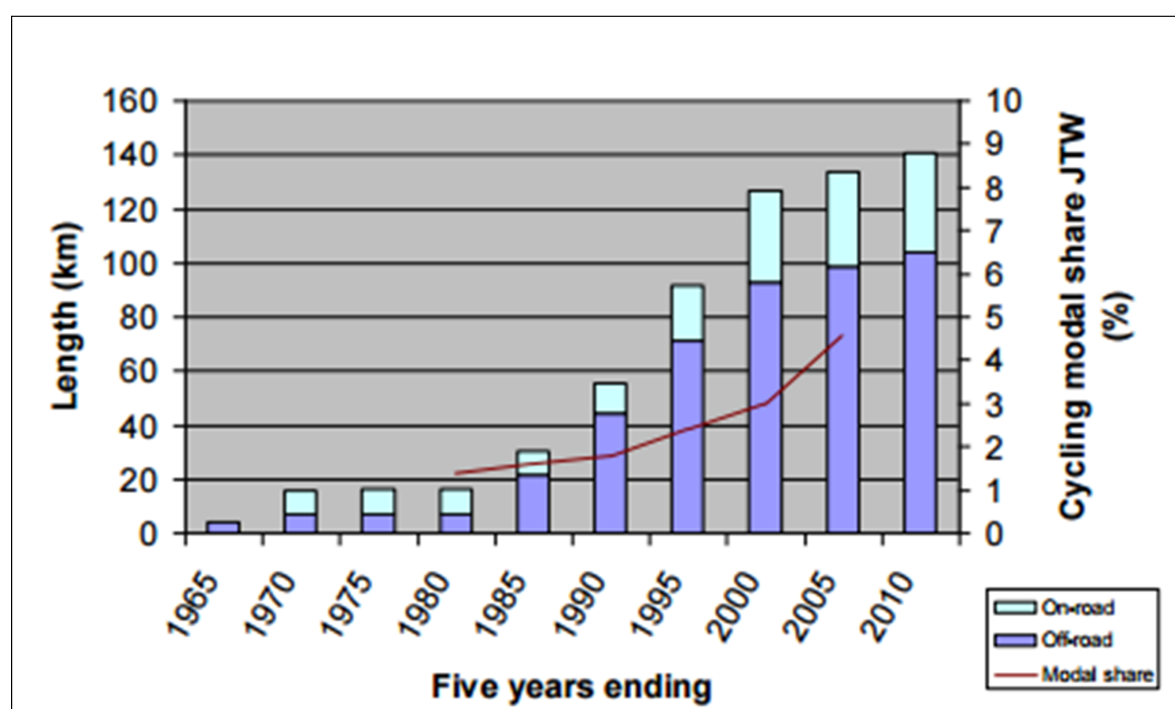
The original and refreshed ATAP was developed by CEC in partnership with NHS Lothian, Living Streets, SPOKES (the Lothian cycle campaign) and Sustrans, following extensive public consultation. The ATAP is well regarded by cycling stakeholders and it guides all cycle related policy and infrastructure development in Edinburgh and is seen as a key driver of the growth in cycle modal share. The success of the ATAP in encouraging modal shift can be attributed to several key factors:

1. Clear buy-in from senior politicians, including the leader of the Council and convener of the Transport and Environment Committee to the principles of the ATAP. This means that sometimes controversial policies, such as the roll out of a city-wide 20mph limit, have been pursued in the face of sometimes vocal opposition.
2. Setting a clear overall objective and measurable targets, identifying the actions to be taken by CEC and its partners to achieve those targets, allocating each action a timescale for completion, a lead department and/or partner organisation for action and regularly monitoring implementation at both official and political level. This process provides a clear and consistent method for delivering both infrastructure improvements and softer behaviour change measures. It also allows for progress to be measured and plans tweaked as it becomes clearer what works in encouraging cycling within the city.

3. Allocating a consistent and increasing budget to cycling. In 2012 CEC committed to spend at least 5% of its transport budget (capital and revenue) on cycling, with an annual increase of 1% per annum until cycling accounted for 10% of the budget. This policy has been implemented and 9% of the transport budget is being spent on cycling in 2016/17. Policy implementation, particularly the delivery of larger infrastructure projects, requires significant multi-year investment plans. These projects cannot be delivered using ad-hoc budget allocations, which are a significant feature of active travel spending across Scotland. It seems clear that consistent, high levels of cycle infrastructure investment produce significant increases in cycle modal share.

Infrastructure: The development of cycling infrastructure has been a priority for CEC, with the network of on and off road routes growing considerably over the last two decades, as set out in Figure 4 below:

Figure 4: Length of the Edinburgh cycle network and cycle commute modal share



Edinburgh Active Travel Action Plan – Making Edinburgh a Cycling City (Kocak and Noble 2010)

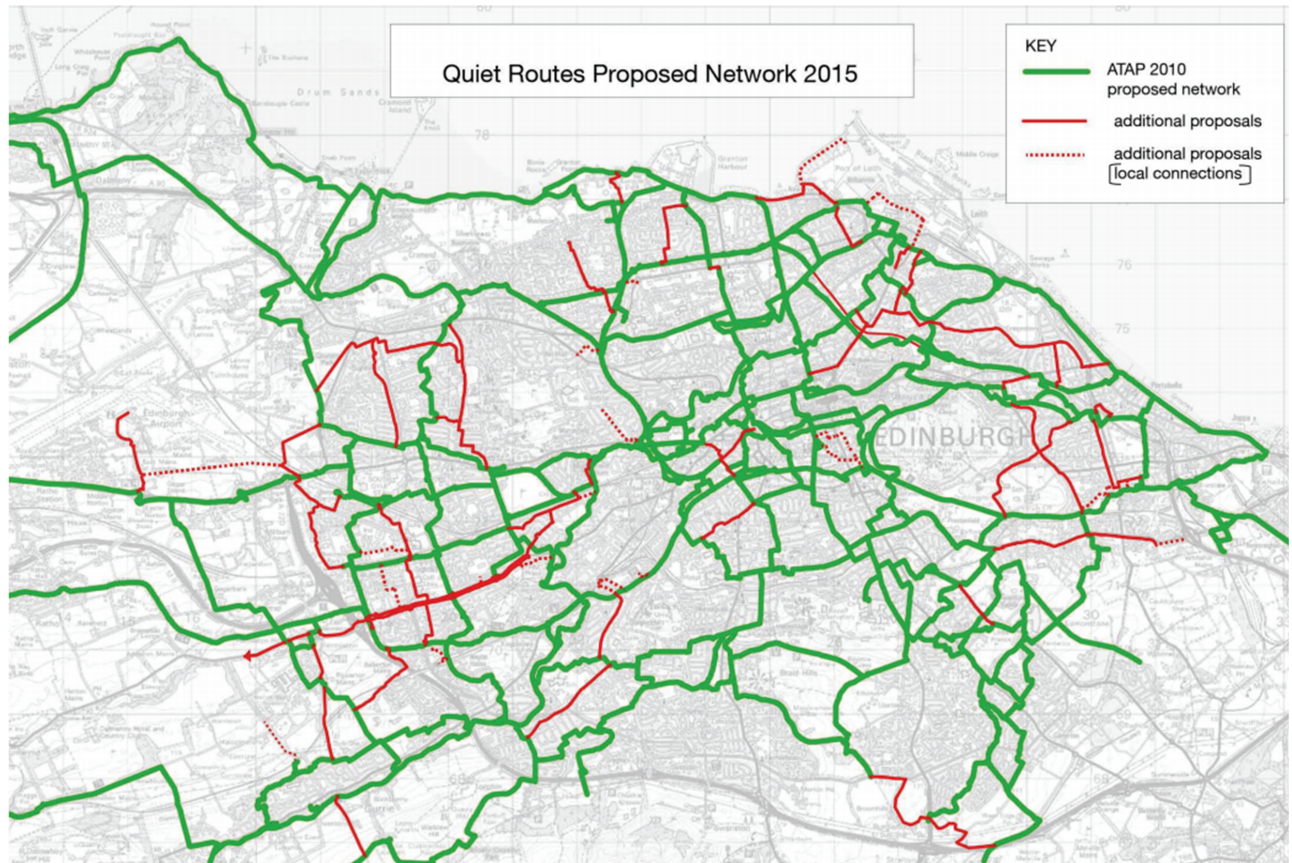
By 2016, the network had grown to 204 miles in length, of which 126 were off-road. Issues around the quality and attractiveness of the infrastructure provided are explored in sections below. In addition, other infrastructure, such as cycle parking stands and advanced stop lines, have been substantially expanded during the last 10 years.

Plans are in place for the development and maintenance of a comprehensive cycle network focused on facilitating everyday cycling

The ATAP sets out the two approaches being taken by CEC to create a comprehensive city-wide cycle network. These are briefly outlined below:

QuietRoutes: QuietRoutes are a network of clearly defined and signed routes made up of off-street cycle paths, quiet roads and segregated on-street cycle paths, with the planned network shown in Figure 5. The intention is to provide direct, convenient routes for everyday trips. Routes are designed to be suitable for use by an unaccompanied 12 year old.

Figure 5: Map of the proposed QuietRoutes network



Active Travel Action Plan 2016 (City of Edinburgh Council 2016)

Cycle Friendly City: The Cycle Friendly City programme involves the development of cycle infrastructure on main roads and the installation of cycle crossings over busy roads to allow cyclists uninterrupted use of routes on quieter side streets. The programme is designed to make cycling feel as convenient, safe and comfortable as possible and is focussed on facilitating:

- Travel from areas with high cycling potential for trips in the ideal cycling range of roughly 2 - 5km - based on recorded levels of cycling (such as from the census)
- Travel to areas with the greatest potential to generate day to day bike trips, including the city centre, major transport hubs, major employment centres, educational institutions, hospitals, shopping centres, tram stops, suburban rail stations and selected bus stops.

These are both ongoing programmes. Since the launch of the ATAP in 2010 a number of QuietRoutes have been signposted and infrastructure improved, e.g. along QuietRoute 8 between Roseburn and Edinburgh park. Cycle Friendly City projects have included the roll-out of a city-wide 20mph speed limit and the installation of hundreds of new cycle parking stands at key trip destinations.

Cyclists speaking at the focus group expressed frustrations about slow progress in the delivery of cycle infrastructure since 2010 – particularly the development of on-street segregated infrastructure in the city centre and in joining up disparate sections of cycle infrastructure. The ATAP itself notes the importance of complete routes, stating:

“ On the QuietRoutes network, coherence is of the utmost importance. A single ‘missing link’ can seriously undermine the effectiveness of a route or the entire network.”

However, the development of the QuietRoutes and Cycle Friendly City networks and the objectives of the ATAP are strongly supported by cyclists.

Cycle networks are based on clear design standards aimed at ensuring direct, obstacle free travel

The design of cycle infrastructure in Edinburgh is principally based on guidance set out in the following documents.

Designing Streets³⁴ sets out the Scottish Government's policies on the design of residential streets and lightly trafficked roads. Designing Streets is not a standards based document, rather it establishes a number of key principles to be followed by designers in reaching solutions tailored to the unique characteristics of each project.

Key to this is the street user hierarchy, which establishes the principle that street and junction design should focus on the needs of the most vulnerable road users, i.e. pedestrians and cyclists, first and private motor vehicles last. Key design principles for cyclist movement include:

- maintaining desire lines – making cycling quicker and more pleasant
- ensure direct, barrier free cycle routes
- creating small corner radii – to reduce the speed of turning vehicles
- ensuring clear visibility for cyclists

As a national policy document, the principles set out in Designing Streets can be a material consideration in a decision on an application for planning permission.

Detailed advice on cycle infrastructure design is set out in Cycling by Design³⁵ which was first published in 1999 and updated in 2010, which provides designers with advice on meeting statutory requirements and also highlights examples of best practice in cycle infrastructure delivery from across Scotland and beyond.

CEC published its Edinburgh Street Design Guidance³⁶ in January 2015. This sets out an aim to design streets that “give priority to sustainable travel (walking, cycling and public transport)” and includes a commitment that “We will always prioritise improving conditions for pedestrians...for cyclists and for public transport users”. There are also specific commitments to:

- Increasing the priority given to cyclists in street design.
- Introducing guidance covering segregated on-street cycleways, including dealing effectively with junctions and bus stops.

The document sets out three levels of design intervention; basic, standard and innovative, which can apply to street redesign schemes. Which level applies is dependent on funding available and the purpose of the intervention, ranging from basic maintenance to complete redesign of a street.

The document also sets design emphasis for different categories of street, e.g. the priorities for a retail/high street in descending order are place, pedestrians, cycling/public transport, loading, general traffic and then parking.

The Street Design Guidance superseded the following CEC policy documents; City Streets (2006), Movement and Urban Design (2003) and the Edinburgh Standards for Development (2000).

As outlined above, detailed national and local cycle infrastructure design guidance has been in place in Edinburgh during the last 10 years. However, the only cycle specific design document (Cycling by Design) has been criticised by many cycle campaigners as falling far short of international best practice, with Pedal on Parliament ³⁷ asking that “Cycling by Design, should be revised in line with best practice internationally – particularly drawing on the experience of the Netherlands where 25% of trips are by bike.”

When asked about the role of Cycling by Design and the quality of cycle infrastructure, interviewees generally agreed that standards could be improved. However, they were also keen to highlight that the guidance was not always to blame for poor quality infrastructure – with limited budgets, political will and attempts to balance the needs of different road users often the reason for design compromises, rather than the standards themselves.

There is a willingness to reallocate road and parking space to cycling infrastructure

The vast majority of Edinburgh's on-street cycling network is advisory, i.e. other vehicles can enter the lanes and park in them, unless there are additional restrictions. Cyclists can also use the 65km long network of bus lanes at all times and mandatory cycle lanes (which cannot be used by other vehicles) – although such lanes extend to a few hundred metres in length across the city.

The reallocation of road space for segregated cycle infrastructure really only started within the last four years. CEC introduced a pilot two-way segregated cycle lane along George Street in central Edinburgh, between July 2014 and August 2015. This was part of a wider programme to test plans for wider pedestrianisation, cycle provision and business use of this major city centre street. While the cycle lanes were removed following the end of the pilot, CEC intends to reintroduce segregated cycle lanes along the street (forming part of a wider east-west segregated cycle route) within the next few years.

Edinburgh's first permanent on-street segregated cycleway (filling a gap between the off-street cycleways through The Meadows and the off-street Innocent Railway cycle path) opened on 8 October 2015, although the segregated sections only extend to

approximately 175m in length. New segregated cycle lanes along part of the key arterial route of Leith Walk opened in late 2017. In addition, CEC is in the process of developing plans for the construction of several miles of on-street segregated cycleway as part of the QuietRoutes and Cycle Friendly City programmes.

Interviewees were all clear that there has been a change in attitudes to the reallocation of road space for cycling over the last few years. Councillors and officials were now more likely to consider schemes involving the reallocation of road space for segregated on-street cycle lanes. There are a number of reasons behind this change, including positive experiences from the development of segregated cycle lanes in cities such as London and the sharing of experience through initiatives such as the CHAMP project.

Interviewees did identify one major continuing barrier to the development of on-street segregated lanes – parking. During the development of proposals for segregated cycle lanes on Leith Walk and the Roseburn section of the proposed east-west cycleway, local businesses and some residents mounted a vigorous campaign against the proposals on the basis that parking and loading spaces would be lost and that this would have a negative impact on shoppers and business. Interviewees suggested that many business owners either did not understand the true role of parking in supporting their business, or sometimes relied on poor or illegal parking for either their own or customer vehicles – e.g. cafe customers parking in loading bays to pick up take-aways. Clearly, these views are not shared by those opposed to cycle route developments.

Recognising the barriers to the delivery of on-street cycling schemes, the Scottish Government established an active travel task force in November 2016, with a remit to consider and report on how barriers to the delivery of such projects could be removed. The final report of the task force, and the Scottish Government's reaction to it, is yet to be published.

Driving is discouraged in city and town centres as a matter of policy

CEC's Local Transport Strategy 2014-2019 ³⁸ includes nine outcomes, one of which is:

“ Be part of a well planned, physically accessible, sustainable city that reduces dependency on car travel, with a public transport system, walking and cycling conditions to be proud of.”

To measure progress in achieving this outcome, the Strategy includes target modal shares for journeys to work, as set out in Table 8.

Table 8: Edinburgh travel to work modal share and targets for 2015 and 2020

Mode	2009/10 modal share	2015 target	2020 target
Walk	19%	20.5%	21%
Cycle	7%	10%	15%
Public transport	30%	31%	32%
Car	42%	35.5%	29%
Other	2%	2%	2%

Local Transport Strategy 2014-2019 (City of Edinburgh Council 2014)

CEC sets out its long term vision for the city's transport system in its Transport 2030 Vision ³⁹. This outlines nine outcomes that the Council aims to achieve by 2030, including "By 2030 Edinburgh's transport system will be smart and efficient providing reliable journey times for people, goods and services." One of three indicators used to measure progress in meeting this outcome is "Peak person trips to the city centre", with an aim to "Increase pedestrians and cyclists, reduce private cars, increase public transport". The delivery of this outcome is supported by a number of measures, e.g. developing "a responsive intelligent traffic control system and traffic control centre, working to minimise congestion and pollution while prioritising public transport, walking and cycling".

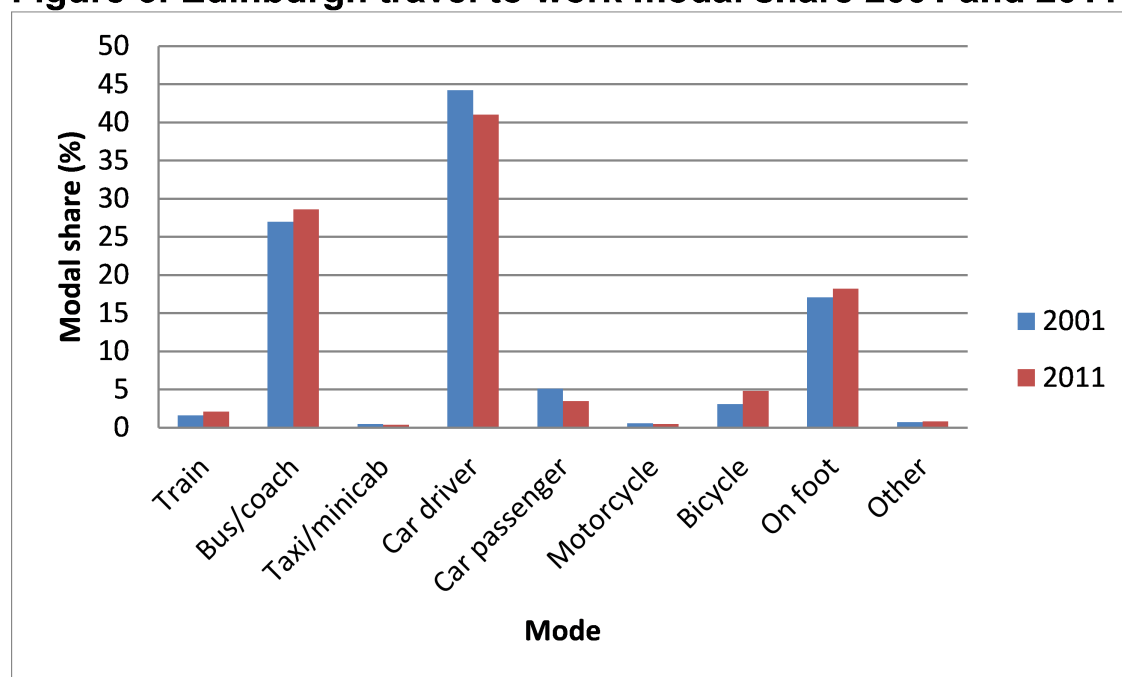
Data from the 2001 and 2011 census ⁴⁰ shows that Edinburgh has had some success in reducing the attractiveness of commuting by car, with the number of households having no access to a car increasing from 39.5% to 39.9% – the only Scottish authority where car ownership had not increased between 2001 and 2011. Over the same period, the proportion of Edinburgh residents commuting by car or van as a driver or passenger fell from 49.2% to 44.5%, one of only two Scottish local authorities where car commuting did not increase.

On a practical level, driving in the city centre has been discouraged through the creation of a ring of park-and-ride sites around the edges of the city and the imposition of on-street parking charges, time limits and extended controlled parking areas that discourage car based commuting.

Increasing cycling is part of an approach to reducing the modal share of private cars, integrating with public transport – rather than abstracting passengers

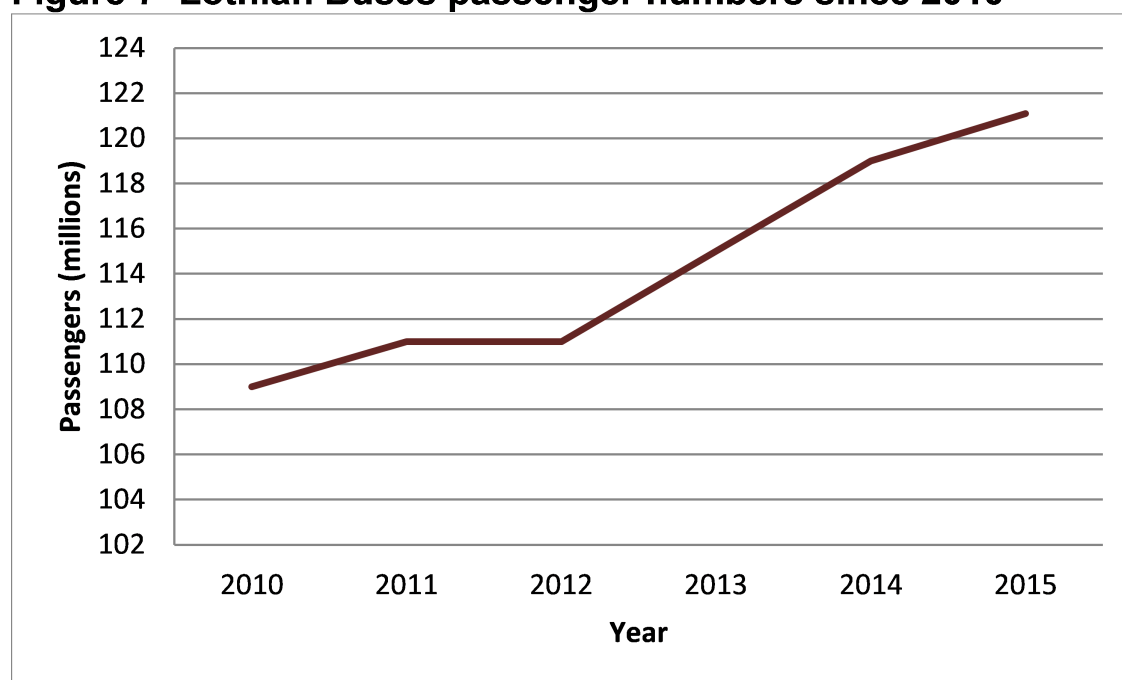
As outlined in the section above, CEC's Transport 2030 Vision aims to decrease private car traffic year on year, while increasing modal share for walking, cycling and public transport.

The city has been successful in achieving this aim over the last 15 years, as set out in Figure 6. Modal share for commuting trips made by Edinburgh residents by bike, foot and public transport all increased between 2001 and 2011, while the proportion of commuting trips made by car drivers and passengers decreased.

Figure 6: Edinburgh travel to work modal share 2001 and 2011

2011 Census Edinburgh: Transport and Travel (City of Edinburgh Council 2013)

More recent figures from the city's largest bus company, Lothian Buses, show that passenger numbers continued to increase between 2010 and 2015 – as set out in Figure 7, alongside the increase in cycle modal share.

Figure 7 Lothian Buses passenger numbers since 2010

Lothian Buses Statutory Accounts 2015, 2014 and Annual Report 2013, 2012, 2011 and 2010 (Lothian Buses 2010 to 2016)

CEC has worked to improve integration between bike and public transport over the last few years. Working with Network Rail, ScotRail and Sustrans, additional cycle parking has been installed at the key stations of Edinburgh Waverley and Haymarket. Cycle parking stands have been available at every tram stop since the service began in May 2014, and in a UK first – from July 2015 bikes can be carried on off-peak Edinburgh Tram services.

The large increase in on-street cycle parking stands and at suburban railway stations over the last 10 years has increased opportunities for travel by bike and train.

Cycle promotion is pursued in tandem with infrastructure development and is targeted at people from all parts of society over a sustained period of time

Cycle promotion in Edinburgh is principally provided by three organisations or groups of organisations, as outlined below:

- **Cycling Scotland:** Cycling Scotland is the national cycle promotion charity and runs a number of high profile national campaigns, including the Give Everyone Cycle Space campaign. It also organises the annual Pedal for Scotland mass cycle ride between Glasgow and Edinburgh and is responsible for the management of the Bikeability Scotland cycle training scheme.
- **City of Edinburgh Council:** CEC promotes cycling through its overarching “On foot, By bike” campaign, which involves promotional material, route maps, promoting guided rides and safe cycling awareness campaigns.
- **Third sector organisations:** Organisations such as the Bike Station, Cycling UK in Scotland and Spokes all promote cycling in Edinburgh through events and promotional material. In addition, many employers also promote cycling as a way to travel to work through the provision of facilities, green travel plans, buddying new cyclists and involvement in workplace cycle challenges.

The effectiveness of cycle promotion efforts is explored in the following chapter.

Land use planning policies encourage compact towns and cities and mixed use developments, which allow for shorter trips that are easily made by bike

Land use planning policies are set at a national, regional and local level in Scotland. The following section highlights key policy documents at each level and identifies those policies aimed at creating compact, mixed-use settlements that make cycling a viable and attractive modal choice.

More information on the operation of the Scottish planning system can be found in the attached [SPICe briefing](#).⁴¹

National: The Scottish Government sets out its current land use planning policies in the Scottish Planning Policy (SPP)⁴². This was preceded by the original SPP⁴³ and before that Scottish Planning Policy 1: The Planning System⁴⁴.

Policies on urban form established in these documents have remained broadly consistent over the last 10 years, with a focus on directing new development to previously used brownfield sites, maintaining green belts, minimising green field development and locating development in areas easily accessed by foot, bike and public transport. These policies are now collectively known as the “town centre first” principle, with the Scottish Government ⁴⁵ requiring public bodies, business and communities to:

“...put the health of town centres at the heart of proportionate and best value decision making, seeking to deliver the best local outcomes regarding investment and de-investment decisions, alignment of policies, targeting of available resources to priority town centre sites, and encouraging vibrancy, equality and diversity.”

Regional: Regional planning policies for south-east Scotland are set out in the Strategic Development Planning Authority for Edinburgh and South East Scotland's (SESplan) Approved Strategic Development Plan 2013 ⁴⁶. This includes policies such as Policy 8a, which requires local development plans to “Ensure that development likely to generate significant travel demand is directed to locations that support travel by public transport, foot and cycle”. It also sets out the broad boundary of the Green Belt which encircles Edinburgh's south, east and west sides (the Forth of Forth obviously constrains development to the north).

The Strategic Development Plan was preceded by the Edinburgh and Lothians Structure Plan 2015 ⁴⁷, which was approved by Scottish Ministers in June 2004. This included similar policies to the Strategic Development Plan, which aimed to “...ensure that the location and design of new development, especially major new development, reduces the need to travel by car and encourages the use of public transport, walking and cycling”.

Local: Edinburgh's city level plans have been subject to considerable change over the last 10 years. Current local planning policies are set out in the Edinburgh Local Development Plan ⁴⁸, adopted by the CEC in November 2016. This sets out a host of site specific cycle requirements for developers - such as cycle parking standards for new housing, while establishing policies requiring all major trip generating developments to contribute to increasing cycle modal share while also safeguarding potential cycle routes. The transport plan sets out an overarching aim “to promote and prioritise travel by sustainable means i.e. walking, cycling and by public transport.” It also establishes a detailed boundary for the Green Belt, with a key aim to “direct planned growth to the most appropriate locations and support regeneration.”

The Local Development Plan was preceded by two local plans:

- the Edinburgh City Local Plan (covering the authority's urban area), which was adopted in January 2010
- the Rural West Edinburgh Local Plan (covering the authority's rural area), which was adopted in June 2006 and altered in June 2011

The transport and urban form policies in these plans were very similar to those in the Local Development Plan.

Prior to the adoption of the Edinburgh Local Development Plan, CEC set out its local planning policies in five local plans adopted between 1992 and 2006, with each plan covering a distinct area of the city.

Clearly, there have been strong national, regional and local planning policies aimed at directing mixed-use developments to sites within Edinburgh's existing boundaries throughout the last 10 years. However, low-density, traffic generating out-of-town developments have been granted permission during this period, despite these policies. Reasons for this are explored below.

National: The Scottish Government defines the purpose of the planning system in the SPP as "...increasing sustainable economic growth". This generally pro-development stance has led to several planning applications for large, low density housing developments on land within the Green Belt, that were refused permission by CEC, being approved on appeal to Scottish Ministers. Examples of which include; an application for 220 houses at Lasswade Road ⁴⁹ approved on appeal in May 2016 and 120 houses by Balerno ⁵⁰ approved on appeal in December 2015.

This highlights the fact that cycling, and sustainable transport generally, is only one of a number of competing national policy priorities. National planning policies aimed at creating cycle friendly communities are often trumped by wider economic development concerns – leading to the creation of developments where travel by car is the easiest, or possibly only, transport option. This can help lock in unsustainable travel choices for many years to come.

Regional: SESplan is effectively a joint board of the City of Edinburgh, East Lothian, Midlothian, Scottish Borders and the West Lothian Councils, and the southern half of Fife Council. However, implementation of the plan is left to the individual authorities – as there are no regional authorities in Scotland.

This means that each authority is responsible for planning decisions within its area. Local authorities can be in competition to attract developments to their area with a view to creating jobs or boosting tax revenue. Given these incentives, planning authorities may be tempted to take decisions that inadvertently work against the policy priorities of the Strategic Development Plan or neighbouring authorities. One example of this is the Straiton development in Midlothian. CEC planners raised concerns ⁵¹ about the proposed expansion of this development in 2013, stating:

“ Straiton has a peripheral location relative to the future growth in population and spending, and has a high dependence on trade from outwith Midlothian. The study overlooks the fact that local authority boundaries do not determine where people shop. In addition, the study uses optimistic assumptions to quantify future spending. Excessive new provision could therefore impact adversely on the vitality and viability of existing centres in Midlothian and Edinburgh. Midlothian has limited east/west public transport services. It is likely that the majority of people using the expanded retail centre will travel by car. As a result, the proposal does not constitute a particularly sustainable option. ”

Local: A long-term strategy of the CEC has been to focus new business, retail and housing development in the west of the city, principally around South Gyle. This has led to considerable change in travel patterns within the city, creating a new centre of gravity for commuters away from the city centre and established public and active transport links. A high proportion of trips to these new developments are made by car from within the city and surrounding towns ^{52 53} .

Over the last 10 years, considerable financial and political capital has been invested in improving public transport links to this development area, especially the development of the Edinburgh Tram line. Only limited investment has been made in improving cycle links between established residential areas and these new developments. Consequently, cycling modal share is low on these routes.

Edinburgh is clearly covered by national, regional and local planning policies aimed at creating a place where cycling is an easy and attractive choice for commuting trips. While many developments approved meet these criteria, a number of decisions taken at all levels of government have resulted in the creation of major trip generating developments which lock-in unsustainable travel choices for many years – with long trip distances and poor cycle infrastructure dissuading all but the fittest and most committed cyclists from making regular trips by bike.

Case study: Survey of Edinburgh cycle commuters

The previous chapter assessed how effective CEC has been in meeting the key factors for success in increasing cycle modal share. However, this did not capture the views of regular cycle commuters on how effective these interventions have been in their decision to commute by bike. These views are important in understanding whether the most effective interventions are being pursued and whether new infrastructure is meeting the needs of cyclists – particularly those new to cycle commuting.

To capture these views, an online survey was created to gather the views. The survey was open for responses from 28 April 2017 until 24 June 2017. A total of 527 responses were received, which are summarised below. The thinking behind these results are explored in the following chapter, which reports on the results of a focus group of regular cycle commuters who considered the outcomes of the survey.

How representative are the results

To ensure the survey was seen by as many Edinburgh cycle commuters as possible, with a view to producing as representative a sample as possible, it was promoted online and through social media channels by organisations including Sustrans, Spokes, Pedal on Parliament, City Cycling Edinburgh Forum, Edinburgh Road Club, Portovelo and the Women's Cycling Forum Scotland. It was also promoted through bicycle user groups or email lists of cyclists at major Edinburgh employers, including the Royal Bank of Scotland, Scottish Parliament, City of Edinburgh Council and the Scottish Government.

Despite these efforts to produce a representative sample, the fact remains that the sample is entirely self-selecting, meaning it is unlikely to be representative of the population as a whole. To help correct for this, respondents to the survey were asked a series of questions on their sex, age and socio-economic class. This data was then used to weight the responses, using data from the 2011 census on the sex, age and socio-economic class of Edinburgh cycle commuters. This means the results should better represent the views of Edinburgh cycle commuters as a whole.

The data that has been collected is ordinal data. As such calculating confidence intervals, while possible using statistical software such as SPSS, is of very limited value as calculating an average (mean) of categorical responses is effectively meaningless.

Importance of different types of cycle infrastructure in decision to commute by bike

A key aim of new cycle infrastructure is to encourage modal shift, or to encourage existing cyclists to cycle more. However, cycle infrastructure takes several forms and it is important to understand what influence each type of infrastructure has in people's decision on whether to commute by bike. Respondents were asked to rank how important the main types of cycle infrastructure are on their decision to commute by bike, they were also given an “I do not use this as part of my commute” option – as the extent of some types of infrastructure is fairly limited and will not be used by all commuters. The results are shown in Figures 8 and 9.

Figure 8 shows that all types of cycle infrastructure are very well used by cycle commuters, with each type of infrastructure being used by over 80% of respondents – with the exception of segregated on-street infrastructure, which is currently very limited in extent.

Figure 8: Importance and use of main types of cycle infrastructure on decision to commute by bike

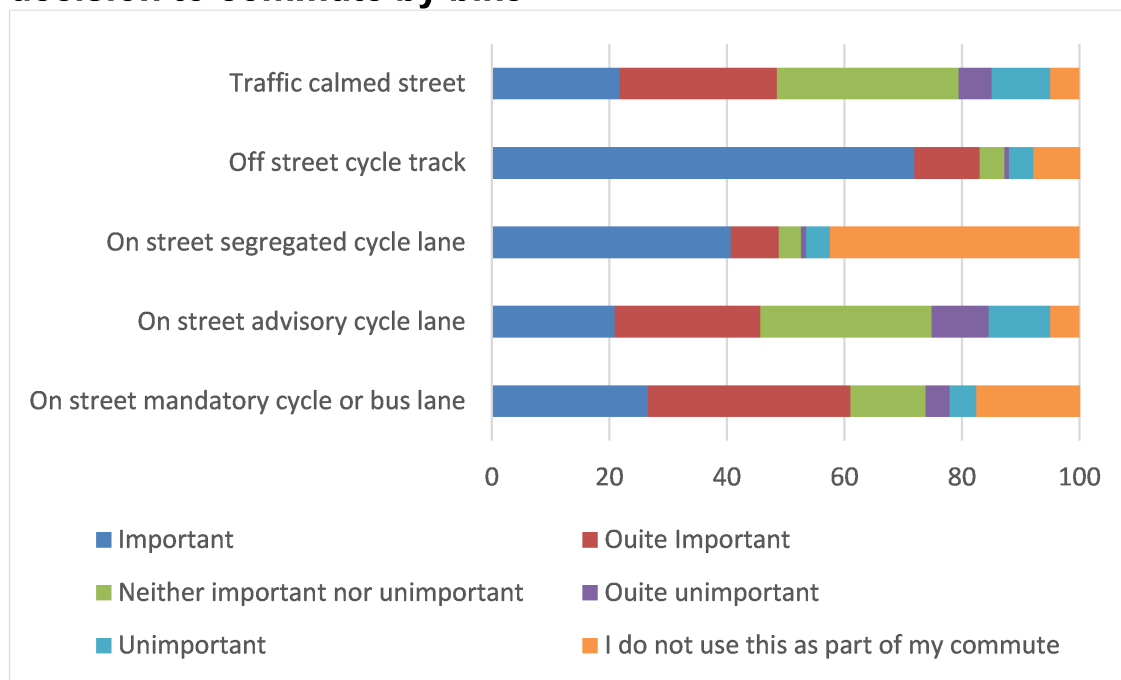
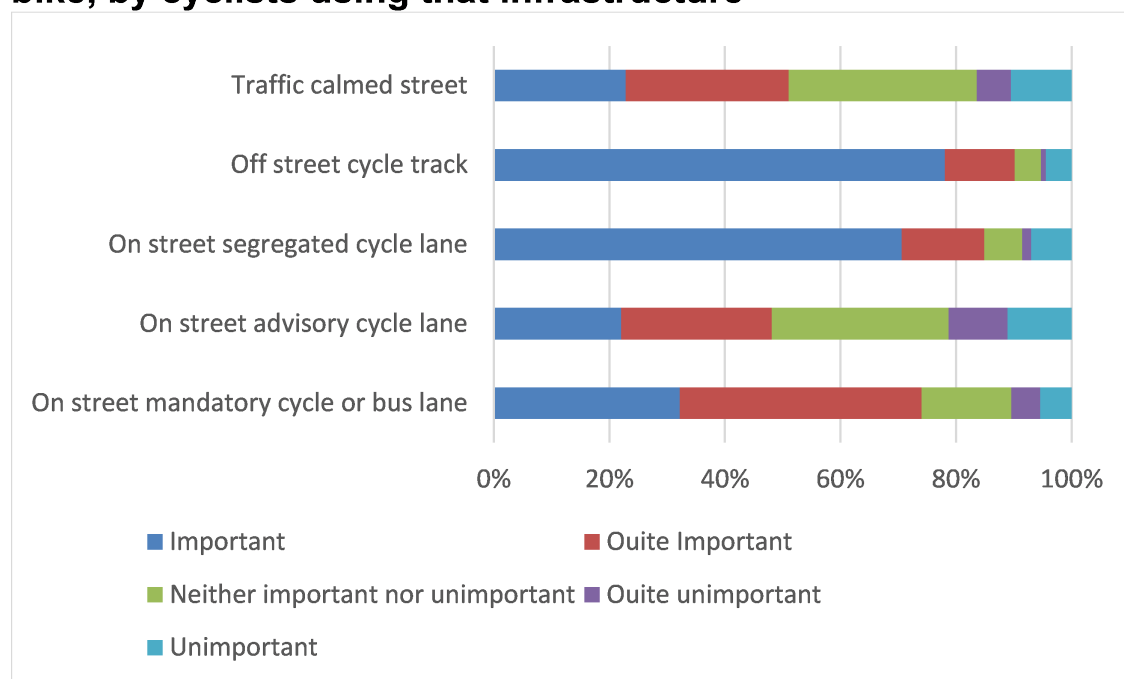


Figure 9 strips out respondents who do not use each type of infrastructure, highlighting the views of those who use each type for cycle commuting. The proportion of commuters that consider each type of infrastructure either “important” or “quite important” in their decision to commute by bike ranges between 46% for advisory cycle lanes to 83% for off-street cycle tracks.

Figure 9: Importance of infrastructure types on decision to commute by bike, by cyclists using that infrastructure

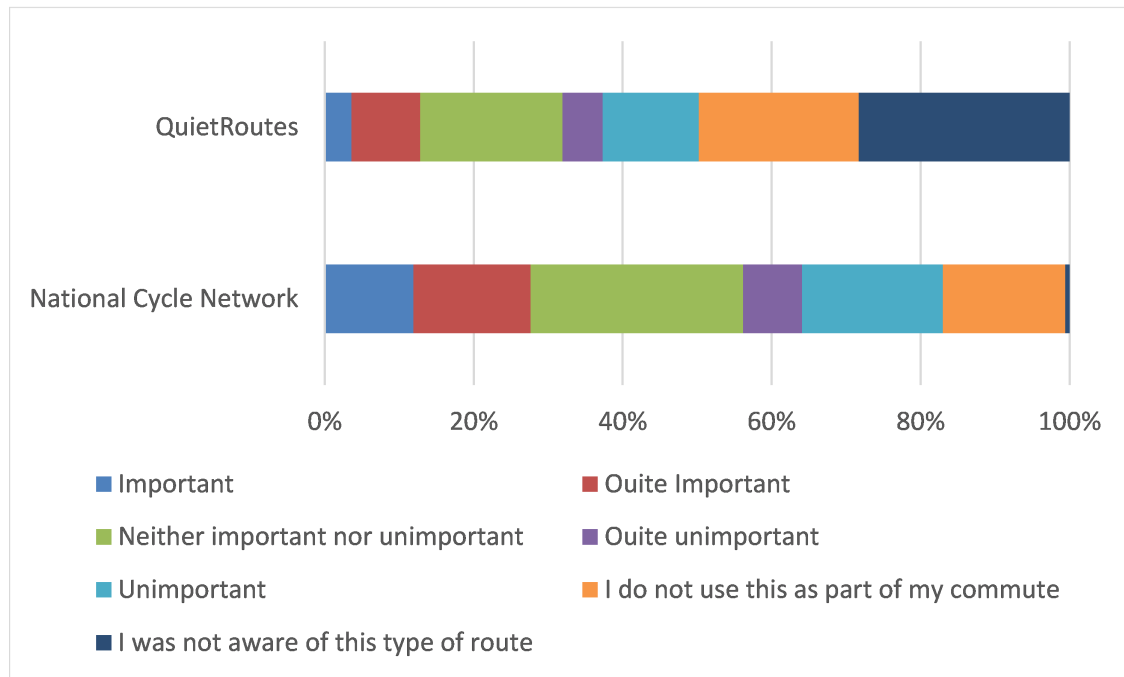


While all types of cycle infrastructure are valued by cycle commuters, the results clearly show that the greater the segregation between cyclists and motorised vehicles, the more important the infrastructure is in the decision to commute by bike. This wish to be segregated from potential danger while cycling chimes with the findings of the British Social Attitudes Survey 2016, in which 59% of respondents either strongly agreed or agreed that “It is too dangerous for me to cycle on the roads”⁵⁴. This is an important consideration for policy makers wishing to encourage modal shift to bike - segregated infrastructure is more effective at removing road danger (real and perceived) than advisory facilities. Removing the source of those fears will give more people a realistic option to travel by bike - which should produce greater modal shift.

Importance of signposted routes

How important are signposted routes for cycle commuters? The survey asked respondents to rate how important signposted routes were in their decision to commute by bike. The results are set out in Figure 10.

Figure 10: importance of signposted routes on decision to commute by bike



Clearly, the existence of signposted routes on the decision to commute by bike is a fairly minor factor for most cyclists, with only 37.6% of cyclists rating NCN routes as “important” or “quite important” and just 12.8% for QuietRoutes. This is perhaps unsurprising, as commutes are regular trips along regular routes and signposting is unlikely to be of much interest to frequent cycle commuters who are familiar with their route between home and work. However, signposting can help raise awareness of routes to those changing workplaces and assist new residents in way finding. Signposted routes have wider benefits for leisure and infrequent cyclists and in generally raising the awareness of cycling.

Importance of cycle promotion schemes

The survey asked respondents to rate how important five national and local cycle promotion campaigns were in their decision to commute by bike.

While awareness of the schemes was high, with over 80% of respondents being aware of at least one of the schemes, individually they have had a relatively limited impact on current cycle commuters, e.g. the Give Everyone Cycle Space, the most influential of those mentioned, was a factor in just 25.2% of respondent's decision to commute by bike. Why this is the case was explored by the focus group, as set out in the following section.

Case study: Edinburgh cycle commuter focus group

An informal focus group was held with 10 regular Edinburgh cycle commuters, eight men and two women, with regular commuting experience in Edinburgh ranging from a couple of

years to decades. Each participant worked for a different employer, with locations spread across the city. The group discussed the survey results and explored the thinking behind them.

The results of this discussion cannot be taken as representative of all Edinburgh cycle commuters, although there was a high degree of agreement between participants on key issues and concerns. In addition, the views on different types of infrastructure are broadly consistent with those expressed in the large scale [Bike Life Edinburgh 2015](#) survey (Sustrans 2015). Given this, it is reasonable to assume the results are broadly representative of general cycle commuter opinion.

The results of this discussion are summarised below, under three broad headings – Cycling Infrastructure, Signposted Routes and Cycle Promotion.

Cycle Infrastructure

Views on the importance of different types of cycle infrastructure on decisions to commute by bike can be summarised as follows:

Advisory cycle lanes: There was a general acknowledgement that advisory cycle lanes are a cost effective and easily implemented method of providing on-street cycle infrastructure. The lanes offer some priority to cyclists and also help raise the profile of cycling amongst other road users. However, the fact that parking is permitted in many advisory lanes severely compromises their safety benefits, as cyclists must enter the main traffic flow to pass parked vehicles. This is a particular concern for new cyclists, who can be less confident.

Bus lanes and mandatory cycle lanes: Mandatory cycle lanes were seen as more useful than advisory lanes, as parking is prohibited and other vehicles should not enter the lane – removing the main concerns raised about advisory lanes. The limited extent of such lanes at present, and experience where they do exist of vehicles regularly entering the lanes, did limit the extent of support for such lanes. Bus lanes were seen as a useful addition to cycle specific infrastructure, bus drivers were seen as better than general drivers and the lanes were generally fairly lightly used compared with general traffic lanes. Concerns were raised that lanes tended to disappear before junctions, where protection for cyclists was needed most and that new cyclists could be put off by having to share infrastructure with very large vehicles.

On-street segregated paths: While very limited in extent, the few participants who regularly used the available segregated cycle infrastructure praised it for safely separating cyclists from motorised traffic on a key route – where there had previously been a significant barrier to safe cycling. All participants strongly supported the further roll-out of high quality on-street segregated cycle paths as a means of improving cycle safety and further increasing cycle modal share.

Off-road cycle paths: All participants were highly supportive of Edinburgh's off-road cycle path network. Many respondents highlighted how using such paths allowed them to gain initial cycle commuting experience and build confidence in a safe environment, away from motorised vehicles.

More generally, participants raised a number of issues and concerns about the development of cycle infrastructure in Edinburgh, which can be summarised as follows:

- **Continuity of routes:** While praising off-street paths and segregated lanes, concerns were raised that these often ended by directing cyclists back onto major roads. While this was not an issue for some seasoned cycle commuters, others felt this prevented them from regularly using some infrastructure or routes – limiting their ability to achieve the desired modal shift.
- **Compromised routes:** Participants were concerned about compromises to the standard of cycle infrastructure made in an attempt to meet the needs of all road users. Issues such as narrow on-street lanes, infrastructure disappearing before junctions/pinch points and parking taking precedence over cycle lanes were all raised. Participants felt that too much emphasis was put on maintaining space for motorised traffic, with cycle infrastructure regularly compromised so as not to inconvenience drivers. This failed to recognise the relative vulnerability of cyclists to road danger and the need for continuous, high quality routes to achieve modal shift.
- **Easy options:** Related to compromised routes, participants also highlighted concerns that infrastructure was often developed where it was easiest to do so, often off-road routes that create minimum inconvenience to drivers, rather than where it was needed most. Although participants were keen to stress that infrastructure development was always welcome, they felt it should be focussed on city centre locations and along major transport corridors used by high numbers of commuters, rather than lightly used out-of-town leisure routes.
- **Speed of delivery:** While participants acknowledged that infrastructure development takes time, they were concerned about how long schemes took from inception to completion and slippage in project delivery, e.g. highlighting a four year delay in the delivery of a short link between the Union Canal towpath and the Meadows.

Signposted routes

Participants were supportive of the creation of signposted cycle routes as a useful tool for new cyclists, route finding to unfamiliar destinations and generally raising the profile of cycling. However, route finding was not felt to be a major commuting concern. Some participants also felt that the quality of infrastructure at some points on these routes, or the fact that sections of some routes involved major roads without any cycle infrastructure, fell well below the standard that should be expected of a marked cycle route and could be counterproductive, discouraging new cyclists.

Cycle Promotion

While generally supportive of any effort to promote cycling, no participant felt that any cycle promotion campaign had had any significant impact on their decision to choose to commute by bike and that promotion was of secondary importance to infrastructure development. However, participants highlighted the importance of peer-to-peer cycle promotion. This was described as active engagement between employers, current cycle commuters and potential cyclists and was considered more successful than general cycle promotion campaigns. Two specific approaches were singled out as particularly successful:

1. Buddying for new cycle commuters, where experienced cycle commuters assisted new cyclists in matters such as equipment choice, route finding and accompanying new cyclists to and from work to help them gain confidence and learn from a more experienced mentor.
2. Paper maps produced by Spokes or CEC. Routes across the city could be planned or possibly recommended by experienced cyclists using these maps. These were felt to be more useful than online resources, as they highlight cycle routes not shown on other maps, could be drawn on and cover far larger areas of the city, in more detail, than available on a screen and can be easily consulted on the go.

Case study conclusions

The assessment of CEC action to encourage cycle commuting highlights the actions taken by CEC aimed at increasing cycle modal share, which can be broadly categorised as creating a pro-cycling culture, developing a pro-cycling policy framework, delivering cycle infrastructure and promotion.

Creating a pro-cycling culture: A pre-requisite for increasing cycle modal share has been the development of a pro-cycling culture, driven by the personal commitment to cycling of key politicians and long term, constructive engagement between those politicians and their colleagues, CEC officials, SPOKES (the Lothian Cycle Campaign) and the wider cycling community. This pro-cycling culture has seen support for cycling maintained through three different administrations and changes in council and committee leadership. Such long-term support is essential for delivering significant modal shift, as the development of cycling infrastructure and changing people's travel habits is a very long-term process, as shown by the experience of cities in Northern Europe which now have significant cycle modal share.

Developing a pro-cycling policy framework: The development of the Active Travel Action Plan (ATAP), supported by plans for the creation of a comprehensive cycle network, has provided a clear focus for action, rather than piecemeal development of isolated sections of infrastructure - which is generally ineffective in increasing cycle modal share. Key to this has been setting objectives and measurable targets, identifying the actions to be taken by CEC and its partners, allocating each action a timescale for completion, a lead department and/or partner organisation for action and regularly monitoring implementation at both official and political level.

Delivering cycle infrastructure: A pro-cycling policy is meaningless without the means to implement it. The development, and maintenance, of cycle infrastructure requires long-term funding. The CEC decision to commit a rising share of the transport budget, now standing at the target 10% of total transport investment, is possibly the single biggest decision taken by CEC in support of its cycle mode share goals. It allows for the development of multi-year investment plans and large scale infrastructure projects, such as the East-West cycle route. It also acts as a funds multiplier – allowing additional “match funding” to be secured from Sustrans and other organisations, which would not be possible without this commitment. The impact of the decision to invest a substantial proportion of the transport budget in cycling is yet to be fully felt, as many of the major infrastructure schemes are still in development. However, data shows that as the network has been extended, the proportion of people commuting by bike has also increased (as shown in Figure 4) and this is likely to continue.

Promotion: Current cycle commuters are clear that promotional activities are secondary to infrastructure development, as people are only likely to consider cycling when they feel it is safe to do so. They also felt that promotional efforts should be focused on facilitating peer-to-peer promotion and providing practical tools to enable cycling, e.g. route maps and personalised travel planning, rather than general awareness campaigns – which do not help people overcome barriers to cycling.

How effective have these actions been in encouraging any increase in cycle commuting?

The survey results clearly show that the availability of the safest possible cycle infrastructure, offering the highest level of segregation from motorised traffic, has the biggest influence on decisions to commute by bike. Focus group participants were clear that current cycle infrastructure fell short of these requirements in many areas. While advisory on-road infrastructure was welcomed by many participants, it was felt to offer insufficient protection from road danger for less confident cyclists.

While advisory infrastructure has encouraged modal shift, it is not of the same level as would be produced by segregated infrastructure, as it does not offer the level of comfort needed to encourage less confident cyclists to commute by bike. The same is true of isolated sections of higher quality cycle infrastructure. If cyclists feel it is unsafe to get to and from a stretch of cycle infrastructure, regardless of its quality, they are unlikely to use it. This is likely to limit the use of such infrastructure to cyclists that are confident enough use the roads at either end of such facilities – limiting the potential for modal shift.

While infrastructure developed over the last 10 years has been successful in attracting more cyclists, it has not increased the diversity of cycle commuters. Cycle commuting remains dominated by middle aged, middle class men – generally a more confident group of cyclists that are more willing than other groups to use advisory or piecemeal cycle infrastructure. Efforts to increase the number of cycle commuters should consider the provision of infrastructure, and promotion efforts, that are attractive to groups from across society.

It seems clear that if cycle modal share is to continue to grow, plans should focus on the development of high quality, segregated infrastructure that will fill gaps in the current cycle network. To achieve this it may require councillors and officials to make the sometimes difficult, even potentially unpopular, decision to move/remove on-street parking or inconvenience drivers in favour of cyclists - policies which are already set out at a national and local level. Such a change in attitude would allow for the development of new continuous, segregated on-street cycle infrastructure.

Councillors and officials also have to take a wider view of policy and decision making and its impact on encouraging modal shift to bike. While land use planning policies are supportive of developments conducive to cycling, competing economic and institutional priorities have led to developments being approved that are in locations which are unfavourable for cycling, due to long distances or only being accessible from busy roads. Careful consideration of planning applications is required to ensure that they do not undermine cycling goals.

Lessons from Edinburgh

The practical and policy measures consistently found to encourage modal shift to bike identified in the literature review should be applicable to all Scottish local authorities. However, there are additional lessons to learn from the experience of CEC, including:

- **Partnership building:** A pro-cycling culture can be built within an authority by key politicians working with supportive colleagues, officers, external stakeholders and cyclists. Key aims should be to develop cross-party consensus, inform colleagues and the wider public about the benefits of cycling and engage in plan and policy making to ensure cycling is an integral consideration. Continuity planning is important to ensure that pro-cycling policies can be carried forward following changes in administration or personnel.
- **Delivery focussed plans:** Plans should include deliverable targets, assign responsible organisations/officers to each policy or proposal and include monitoring arrangements and review dates. This is essential to ensure continual progress is made.
- **Resources:** Modal shift to cycling cannot be achieved on ad hoc or minimal budgets. The creation of a comprehensive cycle network is a long term commitment which requires substantial, firm, long term funding. In addition, local authorities need sufficient, suitably qualified staff to ensure project development and delivery.

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