Reducing car use

What do people who live and drive in cities and towns think?

26 November 2019

By Tim Burns and Vicki Cracknell
For more information, please contact: Tim Burns tim.burns@sustrans.org.uk

Sustrans is the charity making it easier for people to walk and cycle.

We connect people and places, create liveable neighbourhoods, transform the school run and deliver a happier, healthier commute.

Join us on our journey.

www.sustrans.org.uk

Registered Charity No. 326550 (England and Wales) SC039263 (Scotland).

Cover photo credit: John Linton

sustrans
JOIN THE MOVEMENT

Contents

Executive Summary

Cars have changed our lives

Cars offer a convenient and flexible mode of getting around. They give us our own space, a way to carry our shopping and belongings, they take us “door to door”, and once we own one they are relatively cheap to use.

However, cars are associated with congestion, community severance, fatalities, air pollution, inequality and climate change. And all of these issues are more persistent in urban areas. Too many cars can make cities and towns less attractive to people, visitors and businesses.

More and more city and town leaders are taking steps to better manage the number of cars in their area. This includes making it easier, more attractive and safer to walk, cycle or use public transport, whilst simultaneously making it harder to drive, especially for journeys where suitable alternatives exist.

Changing how we travel in cities is not an easy challenge.

Policy decisions that help to reduce car use in cities and towns are likely to be controversial and divide public opinion. It is therefore essential that we better understand people who live and drive in cities and towns and better work with them towards solutions that are more publicly acceptable and fair.

Therefore Sustrans undertook research, funded by Transport Scotland, with people who live and drive in towns and cities in Scotland to better understand their views and behaviours.

Our research included two deliberative workshops in Glasgow and Edinburgh in May 2019 with members of the public. The workshops used a deliberative approach to better understand the attitudes and perspectives of people who live and drive in Glasgow, Edinburgh and their surrounding towns. The findings were then tested through a representative YouGov survey of 1,048 people who live and drive in cities and towns in Scotland.

What did we find out?

The following is a summary of our findings for people who live and drive in cities in towns in Scotland:

Whilst most people drive, they also use other modes to move around

National data sets show that most households own or have access to a car or van. Data from Sustrans suggests that driving is a very common form of transport in cities and towns in Scotland and across the wider UK. However people who drive also regularly walk, use public transport and occasionally cycle. People who drive and live in cities and towns are multi-modal and use a variety of travel modes to reach everyday destinations and travel for leisure.

People want to live in healthier and more attractive cities and towns

People want to live in places that have a healthy environment and think it's important that the Scottish Government takes action to achieve this. People who live and drive in cities and towns in Scotland think the Scottish Government should:

- Ensure all residents, especially children, the elderly and those with respiratory conditions, can breathe clean air (92%).
- Create a highway system in Scotland with no fatalities or serious injuries involving road traffic (85%).
- Improve mental and physical health by making it easy and attractive to travel actively (84%).
- Become 'carbon neutral' by 2030 (74%).
- Create more public 'living' space by transforming streets into pedestrianised parks and spaces (66%).

People want to live in neighbourhoods where services and amenities are nearby

Most people want to live in neighbourhoods not just housing developments. They want community, amenities and services on their doorstep within easy reach. People also view streets and roads as multi-purposed – to move people around, as well as places where people live and spend time. Of the people who live and drive in cities and towns in Scotland:

- Over four fifths of people think it's important to live near good local services, attractive public space, nearby shops, restaurants and cultural attractions and in places with a sense of community, friends and family.

- 71% think people should be able to meet most of their everyday needs within a 20-minute walk, cycle or local public transport trip from their home.
- Whilst people think roads should enable people to move around (93%), they also believe roads and streets should be high quality spaces where people want to live and spend time in (84%).

When people live nearer the everyday services and amenities they need to reach, reliance on the car can be reduced. Proximity to destinations and higher densities make walking, cycling and the use of public transport more viable. However in many places driving still prevails unless steps are taken to make walking, cycling and public transport the most attractive ways to travel for people.

People think you shouldn't need a car to have a good standard of life

Most people believe we shouldn't need a car to have a good standard of living and access day to day destinations, and that the Scottish Government should enable this.

- 70% think that it should be possible for everyone to undertake their most frequent journeys without a car.
- 80% think it's important for the Scottish government to enable people to have a good standard of living in Scotland without needing a car.

People use the most attractive and available form of transport

Our research found people are not committed to cars. Whilst driving is the most common form of transport, people who live and drive in cities and towns across Scotland are open to using other modes. People take different modes of transport for different journeys depending on what they perceive is most 'attractive' to their needs.

The most important factors, when assessing attractiveness, were arriving on time, feeling safe from harm, journey time, having flexibility[a], comfort, and journey cost. The ability to carry other people, including children, and cargo, such as shopping, during a journey is also seen as important. Talking a journey that has less impact on the environment and society is also of importance to people but less so than the factors above.

Currently travel by car is perceived to be the best option to many people for most journeys based on these factors. This is a result of many years of designing and investing in cities, towns and regions to suit the car above other modes of travel. Our research, however,

[a] Flexibility is defined as the ability to easily change your mind during a journey, for example to stop off mid journey and pick up food for dinner. This tends to be easier whilst walking, cycling or in a car than public transport where you are following a pre-determined route.

suggests if other modes become more attractive, people who live and drive in cities and towns are open to changing their travel choices.

People are receptive and support measures to reduce the number of cars in cities and towns

Cities across Scotland and beyond are increasingly trialling different approaches to reduce the number of cars and improve their city. The level of support for most of these solutions is high. Of the people who live and drive in cities and towns in Scotland:

- 61% support closing streets directly outside of schools to all traffic (excluding for local residents) at drop off and pick up times (21% oppose).
- 62% support stopping more polluting vehicles[b] from entering areas with high levels of air pollution to improve air quality (18% oppose).
- 50% support creating regular car-free days at the weekend where certain streets are closed to cars and opened for people (29% oppose).
- 47% support reallocating road space from cars to be used for people walking, cycling and socialising on our streets (28% oppose).
- 53% support restricting traffic that passes through residential streets (22% oppose).
- 38% support charging employers who offer workplace parking to invest in public transport, walking and cycling (45% oppose).

Recommendations

Our research found that people who live and drive in cities and towns in Scotland are open to walking, cycling and using public transport more and using their car less. However this is only likely to happen if we take steps to make these other modes more 'attractive' to people than getting in a car.

We suggest three things that are likely to be important for this to happen:

Develop high quality neighbourhoods as opposed to simply building more houses.

People want to live in places where everyday services and amenities are on their doorstep. Increasing proximity means more journeys can be walked, cycled, whilst increasing density helps to underpin better public transport services.

[b] e.g. older diesel, petrol cars, vans, lorries for example

To do so we need to commit to a 20-minute neighbourhood planning principle for all cities and towns. This is designed so all people living in cities and towns are within a 20-minute walk from their everyday services.

This would help facilitate new mixed-use developments with increased housing density where everyday services are on the doorstep. Ideally, these developments should be located near where people already live, work, go to school and socialise. These homes must be attractive to everyone, including affordable housing, and homes designed for families and older people. Walking, cycling and public transport provision should be integral to these developments and the most attractive means of travel for most everyday journeys.

Improve public transport provision, walking and cycling across cities and towns

Linked to Scotland's climate change targets we need to increase investment in sustainable local transport. Public transport is seen as costly and unreliable by many people in Scotland.

We need to improve public transport provision including improving local services and making it cheaper for people to use. We also need to improve the walking environment giving more priority to pedestrians, whilst creating dense networks for cycling across cities where people do not have to share road space with motor vehicles.

Take steps to reduce the number of cars within our cities and towns

We need to increase our efforts to reduce car dependency in cities both locally and at a whole-city or town level. Cities in Scotland will be implementing Low Emission Zones in the next few years and have recently been given powers to implement Workplace Parking Levies through the Transport Bill. Cities like Edinburgh and Glasgow are having public conversations around future connectivity and how to improve the liveability of their streets, city centres and neighbourhoods.

Reducing traffic in local neighbourhoods is also important. Using filtering on neighbourhood streets to discourage through-traffic in residential areas has support from people who live and drive in cities and towns in Scotland. Support also exists for increasing the number of schools where local streets around the school are closed during drop off and pick up times,

However our research also found that whilst there is pressing need to take action to reduce cars in cities and towns we must ensure solutions are fair for all people and give people a genuine choice in how they travel and where they live. Scotland's draft Transport Strategy aims to ensure transport helps to promote equality, delivers net-zero greenhouse gas emissions, and improves health and wellbeing. This must be realised, prioritising and investing in transport that delivers these goals for the benefit of people across Scotland.

1. Introduction

The benefits and drawbacks of cars in cities and towns

Cars have changed our lives. They offer a convenient and supremely flexible mode of getting around. They give us our own space, a way to carry our shopping and belongings, they can often take us “door to door” and are a relatively cheap mode of transport once we own one.

However, there is increasing awareness of a wide variety of negative impacts from high numbers of cars in our cities and towns.

Congestion

Private vehicle use is widely accepted to be the least efficient use of street space. Public transport, cycling and walking can be five times more efficient than driving in terms of moving people along a street.[1] If cities want to maximise the movement of people, they should focus on prioritising more efficient forms of transport.

Public health

Regular physical activity can reduce the risk of heart disease, stroke, or type 2 diabetes by up to 50%, and early death by up to 30%.[2] However, around 39% of UK adults do not meet Government guidelines for physical activity. This costs the UK £1.2bn in healthcare and the wider economy £1.5bn each year.[3] Walking, cycling and public transport use can help to incorporate physical activity into our lives. There are also benefits for mental health, whilst increasing productivity and reducing illness at work.[4]

Road Safety

In Scotland there were 146 fatalities and 1,580 serious injuries in 2017.[5] Reducing fatalities and injuries from road traffic is an aim for every government in the UK.

Climate change

In 2017, 31% of UK greenhouse gas emissions came from transport, of which cars make up the largest proportion.[6] Greenhouse gas emissions from the transport sector have broadly stayed the same since 1990, whilst most other sectors have reduced their emissions. If we

are to respond to the climate crisis, we must rapidly reduce greenhouse gas emissions from motor vehicle use. Electric vehicles will be important, but we also need to reduce vehicle use.

Liveability

Cities, towns, neighbourhoods and streets dominated by cars can be less attractive for residents, businesses and visitors. Cars have contributed to people shopping further afield, which can be damaging for the local economy. Coupled with this local high streets dominated by traffic can be unattractive for people, and therefore be bad for retail. Studies have found improvements to the environment on the high street for walking, cycling and the public realm can increase retail sales by up to 30%.[7]

Inequality

Spatial inequality exists in cities. Communities and neighbourhoods which are more deprived are often pushed to areas further away from services and amenities and where public transport provision is poor in comparison to richer neighbourhoods. People living in disadvantaged communities are also less likely to own or have access to a car.[8] This can exacerbate poverty and exclusion including accessibility to employment, voice and participation. People living in more deprived neighbourhoods are more likely to be inactive, be killed or seriously injured in a road accident and suffer from high levels of air pollution as a result of higher levels of cars.[9]

A growing urban population and problem

After decades of declining urban populations, many cities in Scotland and the wider UK have experienced an urban renaissance since the start of the 21st century. This is set to continue. Glasgow's population is expected to grow by 7% over the next 25 years,[10] and Edinburgh is predicated to increase by 20% by 2040.[11]

The increasing population of city dwellers as well as those commuting into cities from the urban fringe will put more pressure on city transport networks, and on air quality, climate change, public health and the local economy.

Car use, however, is still the most frequent form of transport in the majority of Scottish cities and towns. Growing populations will increase the numbers of and usage of cars. However our cities and towns are limited in space and cannot continue to increase road capacity. Therefore, it is likely that we will need to take action to reduce car use by designing transport based upon modes that use street space more efficiently.

A new approach

Cities across the world are developing approaches to make sustainable and active travel more attractive than car use. Cities exist where car use is low and walking, cycling and public transport are the most common ways people move around. These approaches are making transport more efficient in addition to making cities more attractive and liveable.

To reduce the number of cars in our cities and towns, difficult policy decisions will need to be made. It is often not enough to improve public transport, walking and cycling infrastructure alone. We also need to make these sustainable transport options more attractive to people than driving.

An approach using both incentives (improvements to public transport, cycling and walking) and deterrents (measures that reduce the attractiveness of cars for some journeys) is likely to be most effective, however reducing car use is likely to be controversial and divide public opinion. For policies of this nature to be successful it is essential that we better understand people who live and drive in cities and towns. This will help to ensure solutions are more publicly acceptable and fair.

2. Aims and approach

Aims

This research, funded by Transport Scotland, aims to:

- Understand the attitudes and behaviours of people who live and drive in cities and towns, and their wider behavioural/environmental context.
- Understand what evidence and solutions people find most compelling as an argument to reduce personal car use.
- Identify how to design and communicate measures to reduce car use in their city.

To achieve these aims we delivered three activities:

- A literature review, including a review of the Bike Life dataset from 2017 and 2018.
- Two deliberative workshops with people who live and drive in Glasgow and Edinburgh and the surrounding urban areas.
- A YouGov survey of people who live and drive in urban areas in Scotland.

Research approach

Literature review

A literature review of the existing evidence base on driving and the behaviours and attitudes of people who drive was undertaken. We reviewed global evidence but had a focus on the Scottish and UK research and statistics. The review included:

- Trends in Scotland and the wider UK on driving, including car ownership, driving frequency and journey types.
- Attitudes of people who drive.
- Influences of driving behaviour.
- Policy measures that aim to reduce car journeys in cities and towns.

We also undertook an analysis of Bike Life data in relation to driving behaviour. Bike Life is the largest assessment of cycling in cities in the UK. Bike Life also includes data on wider resident travel behaviours and the attitudes of city residents about travel in their city. We reviewed Bike Life data from the resident survey responses in eight cities in 2017 and 2018, including Glasgow and Edinburgh in relation to three groups:

- People who drive five or more days each week.
- People who drive up to four days each week.
- People that do not drive.

Analysing the Bike Life data in this way allowed Sustrans to compare and review the behaviours and views of people with different driving behaviours who live in cities.

Public workshops

Sustrans held two deliberative workshops in Glasgow and Edinburgh in May 2019. The workshops used a deliberative approach to better understand the attitudes and perspectives of people who drive in the two largest Scottish cities, both of which are currently developing plans to improve connectivity and liveability.

The workshops with people who live and drive in cities and towns aimed to:

- Better understand the attitudes and behaviours of participants and the context within which these are set, or are formed.
- Better understand what evidence participants find most compelling as an argument to reduce personal car use.
- Identify how participants react to measures designed to reduce car use, and how best to design and frame these to build their support.

There were three parts to each workshop:

1. An initial focus group to understand the views of participants.
2. Input sessions to develop the understanding of participants in relation to the benefits, issues and challenges of cars in cities. These included inviting expert stakeholders from various perspectives to address and have discussions with the group.
3. A session for participants to work together to explore and develop solutions to reduce journeys by private motor vehicles in cities, including a walking tour of their city to explore the tensions and approaches to improving streets and neighbourhoods.

Sustrans commissioned specialist independent agencies to recruit participants and facilitate the workshops. Each workshop lasted for two days and 12 participants were invited using a screening guide. Participants:

- Lived in either the city itself or bordering urban settlements. All participants travelled within or visited the city on a regular basis.
- Were a mix of both heavy car users (drive five or more days a week) and lighter car users (drive up to four days a week).
- Had another option for their main car journey into or within the city.
- Broadly matched the areas' demographics – for example geographical spread, gender, age, ethnicity and socio-economic group.

Quantitative survey

Sustrans commissioned YouGov to undertake a representative survey of 1,048 people who drive and live in towns and cities in Scotland in July 2019. The survey was used to explore and test findings of the literature review and workshops with a wider representative sample of people across Scotland.

3. Results

Driving behaviours and trends in Scotland

Driving licencing and car ownership

In Scotland, 70% of the population hold driving licences. Whilst driving is more prevalent in rural areas, in large urban areas, 61% of adults still hold a driving licence.[12]

In Scotland, there has been a significant fall in young people acquiring driving licences. Young adults aged 17-19 acquiring licences fell from 39% in 1995 to 31% in 2017.[13] Research from Edinburgh suggested some young people are finding that other ways to spend money were more important to them than owning a car.[14]

The trends are similar in England. A study in England suggested 'cost' as the main factor that puts young adults off driving.[15] Other factors for not learning to drive amongst young adults in the same study include lower full-time employment rates; greater living in highly urbanised areas; and an increase in the age at which people begin relationships and have children.

In Scotland, 72% of households have access to a car, and 29% to more than one car. Car ownership varies significantly between cities and regions, for example census data shows that only 51% of households in Glasgow own a car. This figure is 60% for Edinburgh and 86% for Aberdeenshire.[16]

Driving behaviours

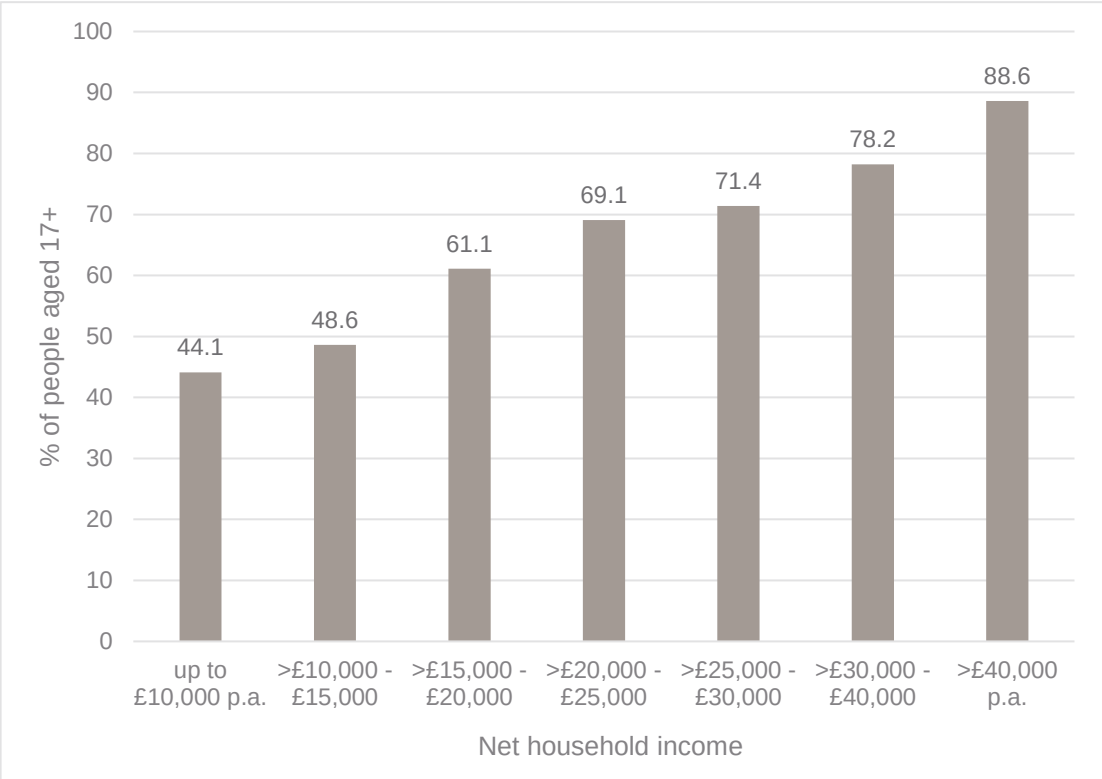
Cars have a 65% modal share in Scotland and account for 75% of all traffic. Across Scotland there was a 10% increase in traffic on the roads between 2012 and 2017 with a 7.2% increase of car traffic specifically. [17] Road traffic increased by 6.5% in Edinburgh and 4.5% in Glasgow during that time.[18]

In Scotland, the modal share for cars alters very significantly for commuting journeys when comparing urban and rural households. 80% of rural commutes use the car in comparison to 55% of urban work journeys.[19]

Inequality and driving behaviour

The likelihood of holding a full driving licence in Scotland also depends on household income.[20] The greater the net combined income for the household the greater the likelihood holding a driving licence (see Figure 2 below).

Figure 1: People in Scotland that hold a full driving license (Adapted from Transport Scotland data, 2018)



Around half (52%) of households in the 20% most deprived areas of Scotland have no access to cars compared with close to a quarter (24%) of households in the rest of Scotland.[21]

In England there is a similar correlation between driving frequency and household income. 56% of households with a total annual income of over £30,000 drove every day. This compares with only 24% per cent of adults in households with income of under £20,000.[22]

A lack of investment in alternatives to driving can create transport inequality for individuals who cannot afford to own a car. For example, a recent Sustrans study found that 20% of the neighbourhoods studied in Scotland were at high risk of transport poverty, i.e. people are at risk of social 'isolation or at risk of debt from spending on car use.[23] In total this equates to more than 1 million people at risk. The research indicated that it is not remote areas that are at the highest risk or transport poverty; it is small towns (28%) and rural locations (30%) closer to cities and urban centres.

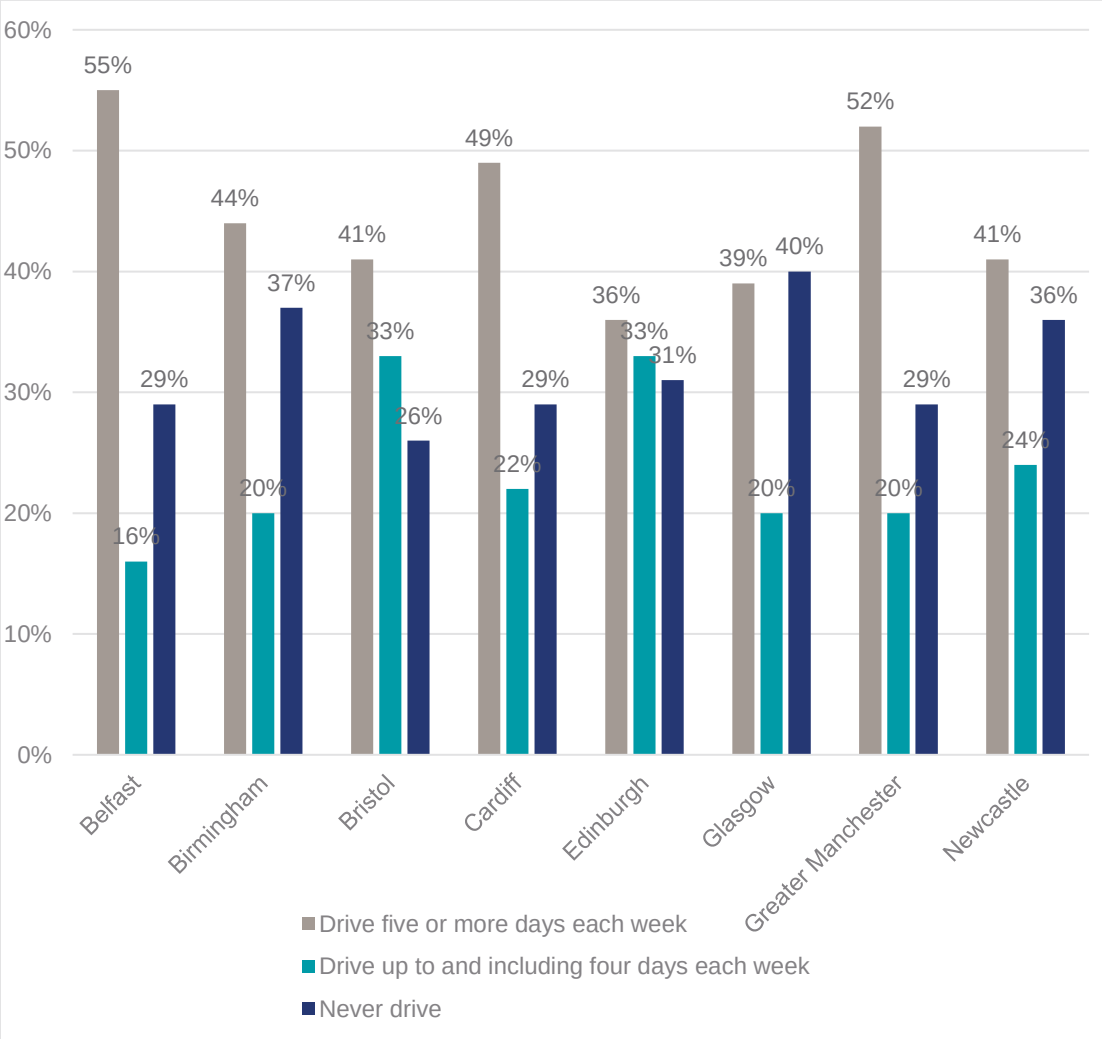
Who is driving in cities?

Analysis of data from Bike Life, the UK's largest assessment of cycling in cities and towns provides additional insight into driving behaviours, as well as what people who drive think about cycling and making travel in their city better. We analysed the data based upon three groups:

- People who drive five or more days each week.
- People who drive up to four days each week.
- Non-drivers.

In Edinburgh and Glasgow 36% and 39% of people drive five or more days each week respectively. In comparison, 31% and 40% of people do not drive at all (see Figure 3 below).

Figure 2: Driving behaviour in the eight Bike Life cities (Sustrans Bike Life data, 2017 with the exception of Glasgow, 2018)



In comparison to the resident population Bike Life found people who drive five or more days each week are unlikely to be:

- Aged under 24.
- Not work full time.
- Come from socio-economic group: E.[c]

[c] Socio-economic classification based on occupation of the Chief Income Earner maintained by the Market Research Society. Group E are state pensioners, casual and lowest grade workers, and unemployed people with state benefits only.

- Rent their property.
- Be disabled or have a long-term illness.

Bike Life data suggests people who drive up to four days each week are twice as likely to cycle at least once a week in comparison to people who do not drive, and people who drive five or more days each week. In other words, most people who cycle regularly also drive but less regularly.

Bike Life also found that of those who drive five or more days each week:

- 70% think things would be better if people cycled more in comparison to 11% who think things would be worse.
- 41% think their city overall is a good place to cycle in comparison to 32% who do not.[d]
- 82% support more roadside cycle lanes even if this can mean less space for road traffic (people who cycle or would like to start only).

What has contributed to our reliance on cars?

We identified four themes that make driving more attractive than other transport choices in towns and cities:

- A built environment designed for the car.
- The low cost of driving.
- The design and convenience of a car.
- The role of the car in society.

A built environment designed for the car

[d] This figure is less than other groups and suggests driving on a regular basis and seeing conditions on the road could make people who drive regularly more concerned about safety.

Over many decades transport planning and spatial planning have been predominantly designed around and for the car. Over this time, we have gradually changed our built environment. This has included:

- Increasing road capacity.
- Spatial planning that extends trip length and makes it easy to drive.
- Relocation of services and amenities away from the high street.

Increasing road capacity

In 1950 there were 2.5 million cars on our roads, in 2011 there are over 30 million.[24] Each time our road network reached capacity the UK has taken an approach to build our way out of congestion. During the 1960s, the construction of motorways and strategic roads accelerated.[25] This approach, that continues to this day, was based on the belief that we must 'predict' future required capacity (based on past increases in road traffic) and then build roads to 'provide' for it.

Research has shown that this approach is exacerbating issues including congestion, climate change, air pollution and health problems, especially in urban centres where space to build no longer exists. In 1994, a government committee concluded that building new roads simply generated more traffic, and was therefore largely self-defeating.[26] Similarly, the 2004 transport white paper, "The Future of Transport: a network for 2030", stated: 'We cannot build our way out of all the problems we face on our road networks'.[27] Despite this, we have continued to develop and invest in our road system and therefore our reliance on cars.

Spatial planning

The UK is facing a housing crisis. In Scotland, just under 18,000 new homes were built in 2017/18 and the Scottish government has a target to build 50,000 affordable homes by 2021.[28]

The Housing and Planning Delivery Framework and Place Standard for Scotland make it clear that developers should be building housing that supports healthier lifestyles and encourages active travel.[29]

However, there is a sense that in the rush to meet housing targets across the UK most development is not necessarily being built in the right places, or following standards that would make transport and mobility sustainable whilst creating neighbourhoods as opposed to just homes.

Research by the Transport for New Homes Project for example, visited 20 new housing developments in England and found that the infrastructure was nearly always car-based, especially in the case of recently constructed developments. The Project found development typically taking place on greenfield sites far from city and town centres, and a trend for the Government to co-fund new roads with developers.[30] More research, including research from Scotland is required in this area.

Relocation of shopping – 'out of town'

The weekly food shop is a journey type that many people say they could not manage without a car.[31] The idea of the 'weekly food shop' however, didn't even exist until the 1960s when the first out of town superstores were opened. Since then, massive supermarkets and retail parks with free parking have revolutionised our shopping habits.

In the first decade of this century, the amount of Out-of-town retail floorspace rose by 30% whilst retail space within towns fell by 14%.[32] Free parking, shopping and entertainment such as cinemas and restaurants makes out of town retail parks very attractive. Bluewater in Kent, for example has 13,000 extra-large car parking spaces[33]. Silverburn outside Glasgow is conveniently location on the M77 and has four car parks with a combined parking of 3,049 free spaces[34].

In contrast, high streets with their proximity to local communities are often struggling. Many towns and cities have shop-vacancy rates over 10%, and in some it is as high as 20%.[35] The decline of the high street is of course multifactorial as outlined in the Portas Review[36], but shoppers' desertion of the high street is associated with what is on offer "out of town", alongside often cheaper online services.

The low cost of driving

In Scotland around 72% of households own a car[37]. Most costs associated with a car are fixed and paid in advance, for example the purchase or lease of the car itself, Vehicle Excise Duty and insurance. Once the upfront costs of owning a car are paid, driving is comparatively cheaper than public transport.

This situation is known as a 'sunk cost fallacy'.[38] A sunk cost fallacy occurs when you have paid for something and therefore want as much value from it as possible. Given the higher fixed costs associated with cars are already paid, there is a natural tendency from people to want to use their car as much as possible. This is also true for the rental market. More and more people rent their cars for a few years before returning them for a new one. The high costs for renting a car put pressure on people to ensure they get the most value out of the car.

The Sustainable Development Commission noted that people were unaware of the real costs of their driving habits, and very few drivers would consider larger societal costs of driving, such as the impact of cars on the environment and health, for example poor air quality on children's health.[39] People have been used to being able to drive on almost all of the UK's roads for free. This means people can therefore react strongly when suggestions are made of additional costs to driving, such as parking fees, congestion zones, low emission zones or increases in Vehicle Excise Duty.

The design and attractiveness of the car

Since the first car arrived in the UK, car makers have continually sought to make cars as convenient and attractive as possible for their users. This includes safety, aesthetics and creating a space that people want to be in – for example comfort, music and a hands-free phone connection.

In academic research, national surveys and focus groups, people who drive regularly give convenience as the key reason for sticking with their car.[40] For most people, the car is simply more attractive than other modes, providing control over timetables, locations and activities. The convenience of having a car parked outside a home or workplace and flexibility to go wherever you want to means that drivers can be spontaneous and last minute about where they want to go or change their mind mid-journey.

There are other, more emotional aspects of people's attachment to driving. Researchers have shown that even when even when given alternative travel options that are "time competitive", people may still opt for the car.[41]

The car as a safe and familiar space helps to explain people choosing to sit in a traffic jam even when taking public transport could be quicker.[42] The car is providing something additional for many people that is not be found on other forms of transport. This has been described as "the sensory experience provided by the cocoon of the car."[43]

Researchers suggest that this role of cars as a cocoon is growing in importance as they provide privacy, comfort, cleanliness and a way to escape the outside world.[44] Cars help people deal with uncertainty and concerns about personal security.

Car culture - the role of the car in society

Our social environment also helps to persuade people to drive. Over many decades we have created a 'car culture'. Through car manufacturers, and our media we have placed driving,

and the car at the core of our society. For many people, owning a car is a status symbol demonstrating wealth, power or even strength.[45]

The car industry spent £314 million on TV advertising alone in the UK in 2016.[46] The vast resource spent on advertising cars influences our perceptions, both consciously and subconsciously.[e]

Advertisements portray the driving experience as exhilarating and rewarding. Spotless cars with gleaming bodywork are driven along deserted, sweeping roads in stunning locations. Furthermore cars are also frequently linked with achievement and glamour in television programmes and films.

The media have 'weaponised' the debate about the rights of motorists. Emotive language confirms the sense of outrage at any proposed changes to people's right to drive, for example, "Sturgeon's war on Motorists: SNP's green crusade could see up to one million cars scrapped".[47]

The war analogy is also used by motoring organisations, such as the RAC[48] as well as campaign groups like the Alliance of British Drivers, to highlight national and local government policy on issues ranging from fuel tax to speed limits.

This polarisation by media, politicians and motoring groups of perceptions about the right to drive is perhaps one of the aspects that make introducing policies of traffic restraint so contentious and therefore not politically palatable.

What influences travel choices?

Scottish data on commuting shows that in 2017 most journeys tended to be over short distances, with 18% of all journeys being under 1 km long and a further 23% between 1 and 3 km[49]. Of those who travel to work, 36% had a journey of under 5 km. This equates to approximately 750,000 people in Scotland[50]

[e] To put this in context the first Cycling and Walking Investment Strategy in England ring-fenced £316m for walking and cycling schemes and projects over the course of five years and Scotland currently invests £80m each year in walking and cycling.

These are distances that could be easily walked or cycled. It takes 20 minutes to cycle 5 km at a relaxed pace. So why is the car the most common form of transport, even for shorter journeys, and what influences our driving habits?

What influences personal travel choices?

Most people are multi-modal, they use different types of transport to get around, generally based upon what they perceive is the most attractive. Most people are reliant on cars but not dependent upon them. This means whilst other choices exist, the car is the most attractive option.

In Great Britain for example, 80% of the working age population can in theory, reach seven or more large employment centres within 45 minutes by car. The corresponding figure for public transport is only 20%.[51]

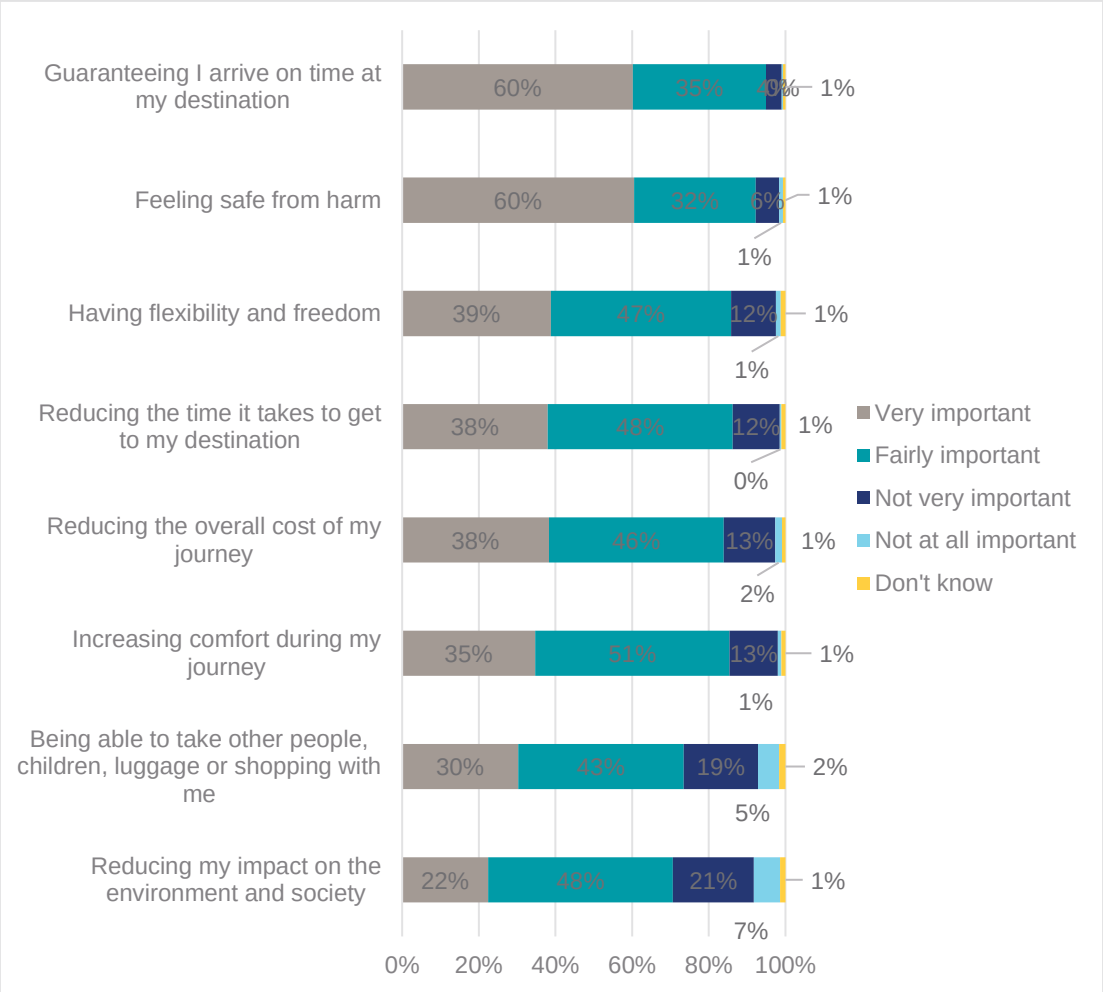
Our workshops revealed a wide variety of factors that people consider when choosing what transport mode to take, including:

- Where people live and where they need to get to.
- Genuine travel choices available.
- Time of day (for both outward and return journeys).
- What they needed to take with them (luggage, shopping and children).
- Trip duration.
- The weather.
- Trip-chaining (more complicated trips with more than one stop).
- Costs.
- Safety, including both road safety and personal security.
- Comfort.

Our YouGov survey of people who live and drive in towns and cities in Scotland (see Figure 4 below), asked people who live and drive in cities and towns in Scotland what factors they deem important to decide what type of transport to use for a journey.

Most important to people is, ensuring that you arrive on time at your destination (95%), and feeling safe from harm (92%). Having the flexibility to change your mind and go a different way, for example picking up food on the way home, is also very important (86%).

Figure 3: How important, if at all, are each of the following in helping you decide what type of transport to take for a journey? (YouGov Survey of 1,048 Scottish residents who live in urban areas and drive)



What do people think about different modes of transport?

Driving

People are usually very positive towards driving. They find travelling by car comfortable, fast and usually easy. They also associate driving with convenience, freedom, and being happy. A sense of convenience, being in control, and enjoyment were the main reasons why participants choose to drive instead of taking different modes of transport for most journeys.

Some situations, however, did made people feel driving was stressful or a chore, especially when driving in the city in congested areas or times of day, or to areas where parking is limited or expensive. Other people felt that a lack of alternatives to the car was the main reason why they drove.

> **"It's [driving] part of my personal freedom**
>
> **"I don't enjoy driving and would rather not drive if I could get away from it – I am considering alternatives but feel a bit stuck"**
>
> **"It's [car] just outside the house"**
>
> **"We do have access to alternatives, but they are not as attractive to us"**
>
> **"Activities are not always on the doorstep – you need a car"**

Evidence also suggests our use of the car can grow over time and become habitual,[52] leaving us with the feeling that there is no alternative to the car[53], especially where this is normalised across family, friends and society. Similar to other habitual behaviours, shocks and life changes can help to break these habits.

> **"I was aware that I used my car all the time – it was an automatically default. When it went in for work – I was worried about what would I do? It affected the children more than me – they had to get up earlier to walk to school. I think it's just a time constraint and laziness that you automatically default to the car. And it's quite liberating to not use it. Since then I definitely walk to more places – I also quite often take the bus instead into town."**

Walking

People find walking peaceful, therapeutic, relaxing and positive. Walking was also seen as a social activity, and a way of being active and outdoors.

In the context of everyday journeys however, people associated walking with being too slow and the journey being too far to walk.

Importantly, we found that people do not normally associate walking with travel or transport in and around their city. If a journey has a walking stage within it, for example from the car park or the bus stop to the office, it is usually overlooked and people focus on the longer stage of the journey, i.e. the car or bus. This can also mean that people can underestimate journey time by not considering the walking stage, for example between the car park and their destination.

"I would walk for a few miles, or with the dog, but if it's going to take more than 30 mins"

"You can make extra time for changing your behaviour – I would use a car to go to the shops around the corner but not anymore"

"When I am walking and cycling I feel so much better than driving – fresh air, take in the views – It makes you feel good"

Public transport

People associated trains with being quick, relaxed and calm and good for long distance trips. However, people also felt trains were annoying, expensive and unreliable. Generally, longer journeys by train to different parts of the UK or days out were seen positively, whilst commuter journeys were seen more negatively.

Some people found buses handy and convenient, easy to use and low cost, especially older people where buses are free to use. Others, however found buses claustrophobic, cramped and an invasion of personal space. Buses were also felt to be slow. For some people buses were inconvenient and infrequent and again commuter trips were less favourable than trips at other times of the day.

"Public transport – you can switch off and watch out the window or read a book"

"Cancelled train – stressed, going to be late"

"The bus I tend to get – there is only one service – by the end of Haymarket its full, hot, windows are steamy it's horrible"

When you are near a hub – it's convenient"

Cycling

Most people found cycling unsafe, and associate cycling with fear, panic and stress. At best cycling was seen as inconvenient and difficult.

People also saw cycling associated with fitness and being energetic. It was mainly thought to be a summer leisure activity and being green, rather than everyday travel.

Where people do cycle for their everyday transport needs, they associated cycling with many of the same feelings as driving - the convenience (you can park anywhere and go anywhere), the speed, being in control and having the flexibility to go anywhere.

> **"I fear for my safety. The route that would take me into work is not worth it – a helmet is not going to save my life. There are no protected routes"**

> **"Whenever I see someone that's cycled to work, I think good for you. I don't. I panic when I overtake a cyclist, let alone to be a cyclist"**

> **"In the summer off-road with the kids – it's lovely"**

In summary, we found that people find driving satisfies more of their needs and is more attractive for most everyday journeys than other forms of transport.

Walking is seen as too slow for the context of most everyday, however there is also a tendency to sometimes ignore walking. We believe the term 'transport' is not helpful in this respect as people tend to not think of walking as a form of transport. Instead thinking about everyday travel and how people access everyday destinations might be a better to ensure walking is better considered.

Cycling is seen as unsafe and not a genuine choice for most people's day to day travel needs. People do not want to share road space with motor vehicles when cycling and our cities currently have a fragmented and poorly designed network for cycling. Until the cycling network in cities and towns improves most people are unlikely to consider cycling.

Overall, public transport is seen as the only viable alternative to driving for most people. However public transport can be expensive, uncomfortable, unreliable, and slower than driving, especially during rush hour. Public transport doesn't reach everyone and does not serve all common destinations. Without major improvements public transport is unlikely to become as competitive or attractive as driving in most cities or towns.

Where do people want to live?

What do people want from their neighbourhood?

Generally, people agree that too many cars is a negative thing and do not want to live in an area dominated by high traffic levels.

Most people want to live with everyday destinations on their doorstep. This includes being close to shops and services, good schools, green and public space and employment opportunities. In Edinburgh there was a strong desire for affordable housing. People often felt they were being pushed out of the city as house prices continue to rise. People also want to live somewhere that feels safe, has low crime and clean and quiet streets.

Finally, there was a recognition that people needed to be able to access destinations, services and places further afield. A good public transport system is important alongside a good road network.

In our workshops, people felt that cars can had both a positive and negative impact on their neighbourhood. There is a practical sense of needing a car to get around.

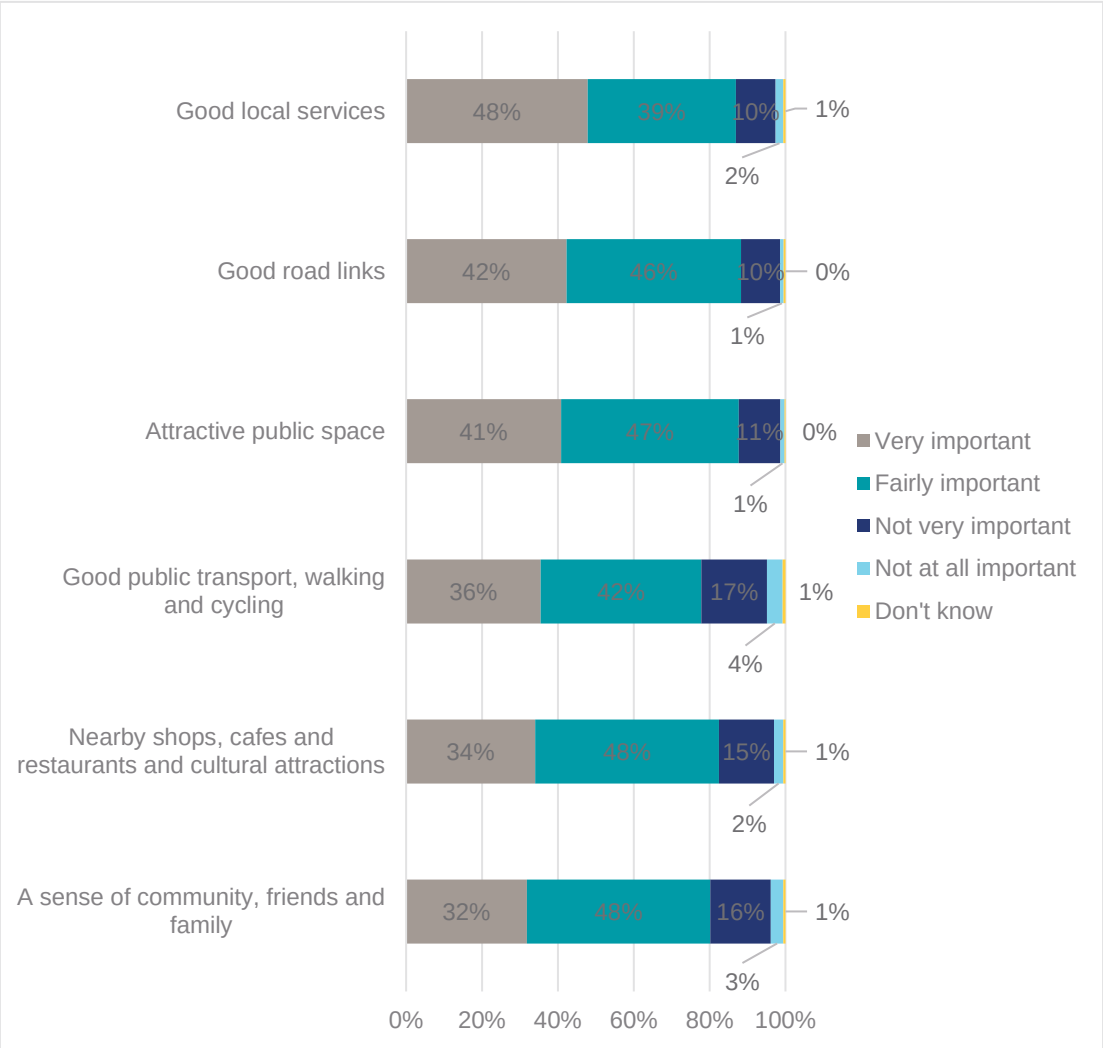
> **“It would be great to have everything on your doorstep, however the reality is different"**

> **“Too many cars make places less attractive to walk around or spend time in”**

Participants also expressed safety concerns with not having access to a car. For example, late at night travelling on public transport or walking through a quiet neighbourhood from the bus stop to home.

We asked people who live and drive in cities and towns across Scotland what was important in terms of choosing a particular area to live in (see Figure 5 below). Most people think it’s important to live near all sorts of everyday destination and amenities. In particular we found highest importance attached to good local services (87%), road links (88%) and attractive public space (88%) were the most important.

Figure 4: How important, if at all, would each of the following be to you when choosing a particular area to live in? (YouGov Survey of 1,048 Scottish residents who live in urban areas and drive)



What do people want from their streets and transport links?

We explored this question further with people who live in cities and towns in Scotland and drive. This included exploring the functions of streets, both as places that enable people to move around, and people want to live and spend time in.

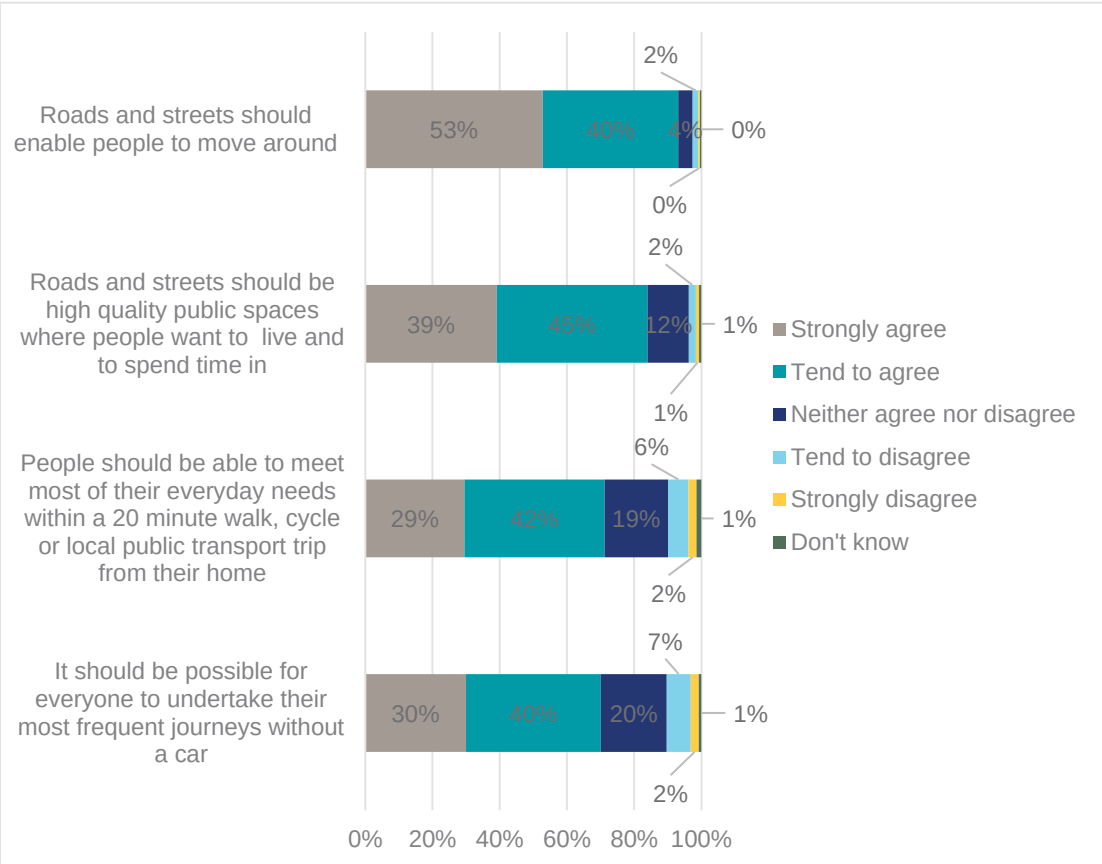
Both of these factors are important to most people and from our workshops it is clear that people recognise the tensions between streets as places people live and streets as places that allow movement through our cities and towns.

We also asked people who live and drive in cities and towns across Scotland about the role of streets and what ideally they want from their neighbourhood (see Figure 6 below).

Most (71%) agree that people should be able to meet most of their everyday needs within a 20-minute walk, cycle or public transport journey from their home. Interestingly, 70% of urban car drivers felt it should be possible for everyone to undertake their most frequent journeys without the use of a car.

People agree that roads and streets should both enable people to move around (93%) and be high quality public spaces where people want to live and spend time in (84% agree).

Figure 5: To what extent do you agree or disagree with the following statements?
(YouGov Survey of 1,048 Scottish residents who live in urban areas and drive)



Overall evidence from both our workshops and the YouGov survey across Scotland suggests people are committed to their cars. People support the need for better and more attractive alternatives, including public transport, walking and cycling. They also understand the importance of improving the proximity of everyday destinations, services and amenities to where people live. However we should not forget the attractiveness of the car to most people and that some people are more dependent on travelling by car due to their life circumstances, for example other options do not exist.

Nevertheless people who live and drive in cities and towns in Scotland support a need to improve existing and build new neighbourhoods and communities that both include housing, but also other services and amenities and connect to public transport networks, and walking and cycling provision.

Approaches to reduce car use

Keeping the city moving and reducing congestion is a high priority for transport planners, especially with increasing population growth and potential demand. In cities and towns additional space to increase street capacity rarely exists. Alternatively, we can design streets to facilitate transport modes that are more efficient in moving people.

Making street space more efficient

Evidence suggests that reallocating street space away from private cars leads to improved street efficiency, meaning that streets can move more people. For example, the city of Copenhagen recently reported that the total number of people traveling across a main thoroughfare bridge increased following reallocation of the street space on the bridge.[54] This was the result of reducing space for private motor vehicles and increasing space designated for walking, cycling, and public transport.

The city of Vancouver in British Columbia, Canada, calculated that a three-metre-wide lane on one of their typical arterial streets could carry roughly double the number of people per hour if people travelled by cycle rather than by car.[55] This also works for parking space whereby up to 10 cycles can fit into a standard space for a car.

Reducing the need and distance to travel

Another way of increasing capacity is to reduce the number of journeys and the length of journeys taken. The rise in people working from home is a good example of this. However, we need to design it into our plans for improving cities and towns. Good spatial planning enables people to live in neighbourhoods where there is access to services local to where they live. Having shops, employment, healthcare and schools on your doorstep is likely to influence both the distance and transport mode you use for these everyday journeys and reduce the risk of transport poverty.

Melbourne, for example, has an ambition for all neighbourhoods within the city to have access to everyday services within 20-minutes of where people live[56].

The future of vehicles

Finally, we may look towards innovation in the vehicles sector to reduce traffic congestion in cities. Autonomous vehicles could improve congestion by managing flow and effectively reducing the distance between moving cars to a little as ‘safely possible’. A transition from ownership to shared use models for cars may also have an impact by reducing the number of vehicles overall and the amount of space required for car parking.

The evidence that shared use will reduce congestion is unclear, for example, in San Francisco, a study showed between 2010 and 2016 traffic congestion increased by about 60% and that Uber and Lyft were responsible for over half of this increase[57].

In conclusion, if we are to reduce traffic in cities and towns, we almost certainly need to take steps to reduce car use and change behaviours to other modes.

What is likely to change behaviour?

There are many theories and evidence-based approaches to changing behaviour, including modal shift from driving to walking, cycling and public transport.

As already stated, most people who live in cities and towns are multi-modal. They take different transport modes for journeys depending on a number of factors including time, cost, safety, the weather and flexibility.

Generally, people use the transport option that is most attractive to them. This means if a city is to enable people to drive less and to walk, cycle or use public transport more, it must make these alternative modes more attractive to people than driving.

An approach that taps into the individual, social and material influencers to make other forms of transport more attractive is most likely to be successful.

We recommend three approaches to encourage driving less that are likely to be important to any city or town strategy. They are:

- Improving proximity to services and amenities.
- Improving public transport, walking and cycling.
- Making it less attractive to drive.

This research focuses on how we reduce car use by making it less attractive to drive. In order to do so it is essential that do so in a way that is fair for everyone. We therefore need to better understand people who drive, including what evidence they find most compelling to change behaviours and how they would seek to implement solutions that could reduce car use.

What evidence do people find most compelling?

In order to implement measures that make it easier to use other travel options rather than the car we need to communicate these effectively. This includes better understanding what evidence people are likely to find compelling as an argument to drive less.

The process of providing space for citizens to learn, explore and debate issues and ideas was followed in our two workshops in Edinburgh and Glasgow. Following this, participants were asked what the main issues associated with too many cars in cities were. Participants then rated each issue depending on:

- How important they felt it is.
- How likely it is to influence their behaviour.

The main issues to people, both in terms of how important they are and how likely they are to change someone's behaviour were for Edinburgh and Glasgow:

- Health (physical and mental).
- Air pollution.
- Climate change.

Health and wellbeing, including mental and physical health, was deemed to be important for people participating in our workshops in Glasgow and Edinburgh and a significant factor in making people consider driving less and travelling more actively.

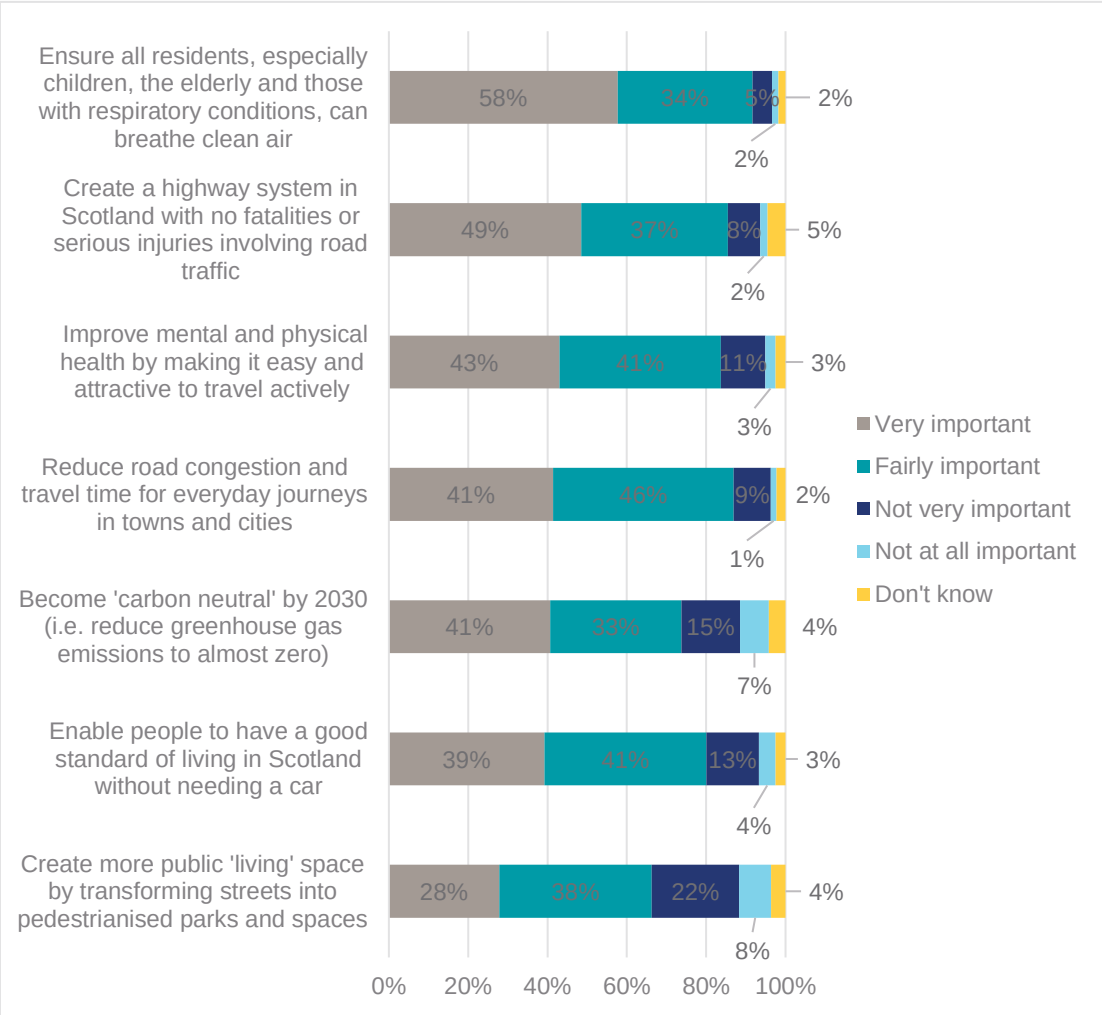
Closely linked to health, and currently in the public eye is air pollution. Participants felt air pollution was important to act upon especially for the sake of children and toddlers who are particularly at risk.

Finally, climate change is a significant factor in people's consideration to drive less. Climate change is getting traction at all government levels across the UK following campaigning by the Extinction Rebellion resulting in nations, cities and towns declaring a climate emergency.

In Edinburgh high congestion and the difficulty and cost of parking was also important in influencing travel behaviour, whilst in Glasgow road safety featured more prominently on people's minds.

We tested our findings from the workshop with people who live and drive in cities and towns across Scotland (Figure 7 below).

Figure 6: Thinking about motor vehicles in cities and towns, how important do you think it is that Scottish government take action to achieve each of the following aims? (YouGov Survey of 1,048 Scottish residents who live in urban areas and drive)



Overall people felt it was important to take action on all issues posed. There was especially strong support for taking action to reduce air pollution (92%), reduce fatalities and serious injuries on our roads (85%), and reduce congestion (87%).

Strong support was also given to improving people's health and wellbeing (84%) and becoming carbon neutral by 2030 (74%). This is 15 years before the Scottish Government target of 2045.

People who live and drive in cities and towns also thought it was important for the Scottish Government to enable everyone to have a good standard of living in Scotland without needing a car (80%).

Finally, support also existed from people for the Scottish Government to create more public living space by transforming some streets into pedestrian parks and spaces (66%).

Practical solutions to reduce car use

We explored six solutions that cities in the UK and globally have implemented in order to reduce car use.

Several of the solutions also have the potential to raise funding to improve public transport, walking and cycling, and all have benefits beyond transport by improving the attractiveness and liveability of streets, improving public health (including reducing air pollution), and local economic vitality. All solutions are likely to have a positive impact on reducing greenhouse gas emissions.

The solutions were tested with people who live in cities and towns and drive during the two workshops in Edinburgh and Glasgow.

We wanted to better understand how people would seek to implement them based on role-playing as a city decision maker that needed to act in order to reduce air pollution and greenhouse gas emissions, and improve congestion and road safety.

We were specifically interested in:

- How people would seek to communicate and promote the solutions to people who were likely to object.
- How they would seek to make the solutions fair for all people.
- The level of support from other participants for each solution.

The solutions tested were:

1. Charging or banning polluting vehicles to enter the city.
2. Charging businesses for employee parking provision.

3. Road space reallocation to create protected space for cycling.
4. Reducing through-traffic on local streets.
5. Creating regular car-free days.
6. Road pricing: charging people to drive.

1. Charging or banning polluting vehicles to enter the city

The UK is under legal obligation to meet its air quality targets set by the EU for Nitrogen Dioxide pollution, of which motor transport, especially diesel vehicles, is the main contributor. The approach UK Government is taking is to create Low Emission Zones or Clean Air Zones. These are defined areas where polluting vehicles are either banned from entering (Low Emission Zones in Scotland), or have to pay a charge to enter (Clean Air Zones in England).

Scottish policy context

The Scottish Government is committed to establishing Low Emission Zones (LEZs) in Glasgow, Edinburgh, Aberdeen and Dundee by 2020. These cities are already developing LEZs and the Scottish Transport Bill passed in October 2019 provides local authorities with the necessary powers to deliver LEZs in their city.[58]

Glasgow was the first city in Scotland to begin a phased programme for Low Emission Zones in December 2018. Hope Street which has the worst air pollution in Scotland has been selected for the first LEZ. Initially, the requirement is that 20% of buses driven on this street must be Euro 6 standard or above, and this will go up to 40% shortly. Glasgow's current LEZ does not include private cars, although the plan is to ban them completely from the LEZ in 2022 and to extend the total area covered by the scheme.

Edinburgh is working towards implementing an LEZ in 2020. The exact nature of the scheme however is still being consulted on. Public support for LEZs in the city is high with 75% of survey respondents supporting controlling access within the city for the most polluting vehicles through an (LEZ).[59]

Case Study: London's Ultra Low Emission Zone

London's Ultra Low Emission Zone (ULEZ) commenced in April 2019 in central London across the same area as the congestion zone. All vehicles must pay the charge if they do not meet certain emissions standards.

Roadside nitrogen dioxide concentrations have declined by 36% between February 2017 and September 2019 of which 29% is solely attributable to the ULEZ.[60] The ULEZ has also reduce 13,500 cars each day from the zone.

Workshop findings

Participants made the following recommendations to implement Low Emissions Zones in Scottish cities and towns:

How do we promote this solution?

We need to:

- Include cars as they are the biggest problem, but also recognise they are the biggest political difficulty to get over.
- Provide high quality evidence demonstrating how this improves people's lives through case studies, for example toddlers breathe faster and are often at exhaust height.
- Share case studies of places that have done it before and how they have improved.
- Introduce real-time public displays showing the level of pollution.
- Ensure a phased-in approach so that people can adapt their travel patterns and plans.

How do we make it fair?

We need to:

- Consider if we need a charge or a fine? A charge is more positive and gives choice but is also a cost to drivers, which is likely to impact more deprived households that happen to be car dependent/reliant. A fine feels punitive although could have the greatest impact.
- Ensure disabled people have access to city centre buses.
- Support for the poorest who are car dependent and who will be most affected.
- Support local businesses in the city centre who are likely to be most affected by the scheme.

"My business is in the city centre, so my customers might choose to go elsewhere"

Reflections and support:

Overall across the workshops there was widespread support for charging polluting vehicles entering polluted areas. People felt it would have a large impact on reducing car use

2. Charging businesses for parking (Workplace parking levy)

A Workplace Parking Levy (WPL) is a levy or charge imposed on businesses in cities that provide free employee parking. The proceeds are used to fund sustainable transport including walking, cycling and public transport. Currently WPLs do not exist in Scotland although local authorities have just been given the power to implement them.

Case Study: Nottingham's WPL

Nottingham City Council is the only local authority in the UK to have introduced a WPL in 2012 to tackle traffic congestion. Nottingham's WPL has been successful in raising funding for public transport.

The levy is an annual charge (currently £415) paid for by employers in the city with more than 10 parking spaces. It provides over £9m each year in funding for public transport including rail, bus and tram infrastructure and simultaneously acts as an incentive for employers to manage and reduce workplace parking. Since the WPL was introduced the city has seen an increase in jobs but not traffic, which has actually declined by 8%[61].

Public transport in Nottingham is now used for over 40% of journeys, and public transport usage rates are second highest in the country outside of London.[62] Furthermore, Nottingham City Transport recently scored 97% in overall satisfaction- the highest bus operator score in the UK[63].

Scottish policy context

Until recently, local authorities in Scotland did not have the powers to introduce WPLs, however this was introduced as an amendment to the Transport (Scotland) Bill, which was passed in October 2019.

In Glasgow the WPL was approved by the council committee in February 2019. The Connectivity Commission reports that Glasgow has one of the highest number of car parking spaces per capita in the UK, but also major under-use of these spaces[64].

Workshop findings

Participants made the following recommendations to implement Workplace Parking Levy's in Scottish cities and towns:

How do we promote this solution?

We need to:

- Develop a vision for public transport, walking and cycling that could be delivered with this funding.
- Use Nottingham's success to help sell this in Scotland.
- Be specific about how this will benefit people and business, for example buses will be 50p cheaper.
- Help employers reward people – contribution towards a bus pass, a cycle.
- Show what parking space could be used for – space costs money.

How do we make it fair?

We need to:

- Lead by example and make the council's own parking included in the scheme.
- Introduce residents parking schemes so that people don't park elsewhere in the city.
- Have a sliding scale for payment – for example by size of workforce or profit and if the costs are passed on by pay scale.
- Make people with disabilities and shift workers exempt.

Reflections and support:

Overall amongst the groups there was mixed support for WPLs. People did think it would have an impact on reducing car use but were worried about costs being passed on to employees.

"I think it will encourage people that drive shorter distances to walk or find alternatives to get to work"

3.

Road space reallocation to create more space for cycling

The scale of cities and towns is perfectly suited to cycling, but this potential is currently unrealised in the UK. Reallocating road space to create dedicated space for cycling, physically protected from motor vehicles, can make cycling more inclusive whilst improving the efficiency of streets. It also creates a nicer environment for people and better places to dwell, socialise and shop.

Case Study: London's East-West Cycleway

London's new cycleways offer direct and continuous cycling on major routes usually protected from motor vehicles. Monitoring by TfL in 2016 showed the East-West and North-South cycleways (former Superhighway) were moving, at peak times, an average of 46% of people along the routes despite occupying only 30% of the road space. In fact, 5% more people per hour (across all modes of transport) were moving along them despite the reallocation of road space from motor vehicles.[65] Improving the environment for people cycling has therefore improved the efficiency of the road network.

Glasgow

Glasgow is already reallocating road space to build better cycling infrastructure. The city's wide roads and central grid layout mean that there is more space for reallocating space to walking and cycling, for example the South City Way[66]- the cities fourth segregated cycleway.

Furthermore, the Avenues Project in Glasgow city centre aims to improve and increase space for walking and cycling, for example along Sauchiehall Street.

The Glasgow Avenues Project

Before and after example of Sauchiehall St and Avenues project

Edinburgh

Proposed schemes include Meadows to George Street which is a project that aims to transform the quality of walking and cycling, on some of Edinburgh's busiest streets, including Hanover Street, the Mound and Bank Street.[67]

The City Centre West to East Link is a multi-million pound project from Roseburn path to Leith Walk and a shopping area, via the city centre, with a two-way cycle path.[68]

City Centre West to East Link

Workshop findings

Participants made the following recommendations to reallocate road space for cycling in Scottish cities and towns:

How do we promote this solution?

We need to:

- Make cycling attractive for everyone not just those prepared to share road space with cars.
- Ensure it is fair to people walking as well through a better walking environment, including green space.
- Support residents and visitors to cycle, for example cycle training and to feel comfortable and confident cycling.
- Get doctors involved – advice for patients and exercise prescribed.

How do we make it fair?

We need to:

- Ensure we do not reallocate pavement space, in fact expand this too where possible.
- Provide e-bikes and adapted cycles for disabled/older people.
- Create healthy streets to encourage people to spend more time and browse shops.
- Show drivers the benefits of less cars, congestion and conflict with people who cycle.

Reflections and support:

There was medium to high support for a road space reallocation for cycling. People felt it would have an impact on reducing car use.

"Passing in a car you may think – oh yeah I would like to do this myself"

4. Reducing traffic on local streets

Too much traffic, especially through-traffic on local streets in urban areas reduces the safety of streets for people living there, for example children cannot play. It also can put parents off letting their children walk or cycle to school, and can increase air pollution.

Reducing through-traffic in local streets is one approach to overcome this and has been widely used in The Netherlands, for example in Houten (see case study below). Modal filters on streets stop motor traffic between certain streets but still enable walking and cycling. When designed well and at a neighbourhood scale this can keep through-traffic away from residential streets whilst also making it much quicker and easier to walk or cycle for local journeys.

Case Study: Houten, The Netherlands

Houten, a city near Utrecht is a successful case study in how to build a large town to prioritise active travel and sustainable transport. The town was built on a rail corridor with the addition of two train stations in the north and the south. These connect Houten to the larger city of Utrecht five miles away.

Within the ring road is a network of low-speed streets where cycling and walking is prioritised. The streets are arranged in a series of neighbourhoods accessible from the ring-road but not from neighbourhood to neighbourhood, except by bike or foot. This layout makes it far more convenient to travel actively for all internal journeys in Houten. As a result, 66% of trips are made without the use of a car.

Glasgow

Connecting Woodside[69] is an £8m project that will develop connectivity and liveability through improved pedestrian access, filtered permeability and 20mph limits. Woodside is an area that has been cut off from other parts of the city by the M8 and the connection is described as Glasgow's 'missing link'. The project enables Woodside to be joined with adjacent City Deal projects.

Edinburgh

School Streets is an initiative designed to reduce motor vehicle use directly outside schools and uses timed traffic restrictions on the road outside the school gates.

There are currently nine schools in Edinburgh with a School Street scheme in place. Roadside signs with flashing lights show when the schemes are in operation and vehicles are unable to pass. Residents and local businesses with a permit are still able to drive during this time.

Evaluation of the pilot project in Edinburgh showed a 6% reduction in the number of children being driven to and from school. Perceptions of safety improved, with around two-thirds of all respondents agreeing that the school streets felt safer during operating times. [70]

Workshop findings

Participants made the following recommendations to reduce through traffic on local streets in Scottish cities and towns:

How do we promote this solution?

We need to:

- Explain that reduced through-traffic on your street means less pollution and safer streets for local residents, especially children.
- Use a ‘Houten-style’ approach of filtered roads to stop rat running.
- Encourage more fun and relaxed streets, for example Play Streets
- Enable local access only for residents and traffic calming.
- Trial the ideas – use bollards and blocks to temporarily test out approaches and see what happens then move onto permanent changes, e.g. modal filters.

How do we make it fair?

We need to:

- Improve the environment for all residents and especially children.
- Involve the community in the design.
- Ensure the scheme is accessible for all including wheelchair, mobility scooter and adapted bike access.
- Set up a community forum to provide a representative voice.

Reflections and support:

There was widespread support for a reducing traffic on local streets from participants in Edinburgh and Glasgow. They felt it would have an impact on reducing car use.

“If somebody has a busy street their kids cannot play”

“People would be keen to push it forward”

5. Road pricing - charging people to drive

Whilst the upfront costs of car ownership, including Vehicle Exercise Duty and insurance are high, once these are met driving a car is cheaper than most other modes of transport.

Driving on almost all roads in the UK is free (and subsidised by all taxpayers, including those that do not drive). Parking is often free or relatively cheap in many places. Fuel duty has been frozen for the past nine years. Overall, the cost of buying, owning and using a car fell by 16% between 1997 and 2016. In contrast, the cost of bus and coach fares increased by 33% and rail fares by 23%.[71]

This pricing structure incentivises anyone who owns a car to drive more for journeys that could be made using other forms of transport as they have already paid for the high upfront costs, whereas the cost to drive in relation to public transport is cheap.

One way to tackle congestion and raise revenue from driving and is to change how we pay for road use.

A study in 2002 by the UK Commission for Integrated Transport[72] showed that replacing fuel duty with road pricing and not charging road users anymore in aggregate would lead to a 48% reduction in traffic across the UK.

Currently, there are three main approaches to road pricing:

- Distance based schemes - charge drivers per mile driven and are common on the motorway networks of countries such as France where 76% of the motorways are toll roads. In England, the privately owned M6 toll is an example.
- Cordon based schemes - drivers pay to enter a defined area, e.g. London’s congestion zone.

- Variable cordon charging schemes. The price varies depending on the time of the day, and real time congestion, for example Singapore.

Case Study: London's Congestion Charge

In 2003 the scheme was launched. It is a cordon-based charge that covers a 21km² area of London. It's a simple system: if you enter the zone between 7am and 6pm on a weekday, you pay a flat daily rate. All revenue raised must be reinvested in London's transport infrastructure.

Traffic volumes in the charging zone are now nearly a quarter lower than a decade ago[73]. However, in the past few years, congestion has started to creep up again, possibly as a result of the explosion of private hire vehicles (an increase of 78% between 2009 and 2018[74]).

Case Study: Singapore's Electronic Road Pricing (ERP)

In 1975, Singapore was the first place in the world to introduce a congestion charge.[75]

Singapore ERP charging gantry, Creative Commons Image

The Singapore system has developed over the years to be variable and responsive to real-time traffic congestion. In 1998, Singapore launched the Electronic Road Pricing (ERP) system. It is based on a pay-as-you-use principle. Motorists are charged when they use priced roads during peak hours. ERP rates vary for different roads and time periods depending on local traffic conditions.[76]

Despite population growth in Singapore (44% between 1998 and 2016), weekday traffic entering the restricted zone has dropped 24%.[77] Levels of CO_2 and other greenhouse gas emissions have been reduced by 10-15% within the inner city.[78]

Workshop findings

Participants made the following recommendations to charge people to drive in Scottish cities and towns:

How do we promote this solution?

We need to:

- Introduce a variable charging scheme based on congestion and air pollution where the price to enter increases as air pollution and congestion increases, using real time reporting.
- Develop an app for people to inform them of the air quality situation and congestion levels in the city and what this translates into in terms of cost to drive.
- The savings in road maintenance and reduced need to develop roads would be spent on public transport and park and ride.

How do we make it fair?

We need to:

- Invest in better public transport and walking and cycling infrastructure.
- Make public transport free before 7am.
- Provide exemptions for disabled people.

Reflections and support:

Participants felt this would have a medium to high impact in reducing car use, however there was less support from people for this measure. A participant from Singapore who had seen how Singapore's Electronic Road Pricing scheme works fully supported the idea.

"Where it operates people get used to it quickly. It must be supported by good public transport"

Creating regular car-free days

Streets are the biggest public place and asset in a city or town. People living in urban areas need to be able to move and travel to everyday destinations and enjoy and live there too. Streets that are dominated by too many cars can be damaging for people using the same space to live, shop and enjoy. Too many cars can also put off business and investment, tourist and local residents.

Many cities are introducing regular car-free days, usually in the city centre where cars are banned from certain streets. Car-free days are most likely to take place at the weekend when

the number of journeys is reduced and linked with events taking place to demonstrate the potential of using streets for other purposes.

Case Study: Bogotá's Ciclovía

The city of Bogotá in Colombia has been running car-free Sundays for over 40 years and is the largest scheme of its kind in the world. Ciclovía sees over 75 miles of tarmac turned into cycle lanes every Sunday and public holiday. The events attract over 1.5 million people.[79]

Ciclovia, Bogota, Creative Commons Image

Streets across the city become a welcoming venue for the people who come to cycle, walk, jog or just hang out with family and friends. Once a year, Bogotá holds the world's largest car-free weekday event covering the entire expanse of the city's 28,153 hectares.

Glasgow

Glasgow held two car-free events in the central George Square in 2019, one of which was held on Clean Air. Each year the city hosts the HSBC Let's Ride event and it also participates in International Car-Free Day. The Play Streets initiative is vibrant in Glasgow with selected residential streets closed each Sunday.

Edinburgh

Edinburgh is the first city in the UK to join the Open Streets movement[80] which includes Bogotá as well as Paris and many North American cities. The first event took place in May of this year and now runs on the 1st Sunday of the month. Open Streets involves the closure of the first part of a loop that includes the Royal Mile, Victoria Street, Grassmarket and Cockburn Street. These streets are closed on the afternoon of the first Sunday of every month.

Workshop findings

Participants made the following recommendations to charge people to drive in Scottish cities and towns:

How do we promote this solution?

We need to:

- Make the city centre a nicer place to be, enjoy and socialise in.
- Use this as a taster approach (needs to be part of something bigger if it is to impact on car use).
- Sell the economic and retail benefits from more people enjoying the city centre.
- Go big: don't mess around.
- Have good publicity/tourism– coordinate with other initiatives.
- Create a social/carnival atmosphere – fireworks, celebrate Scottish culture, street stalls.

How do we make it fair?

We need to:

- Balance local and central needs – events in the city centre would have the greatest benefit but local events can be more accessible to more people.
- Put on more frequent buses, and make them free on these days.
- Support residents who live just outside the road closure zone who might be impacted by increased traffic or parking.

Reflections and support:

There was strong support for car-free days from our workshop participants. People felt it would have an impact on reducing car use although it needed to be a stepping-stone held in conjunction with other solutions.

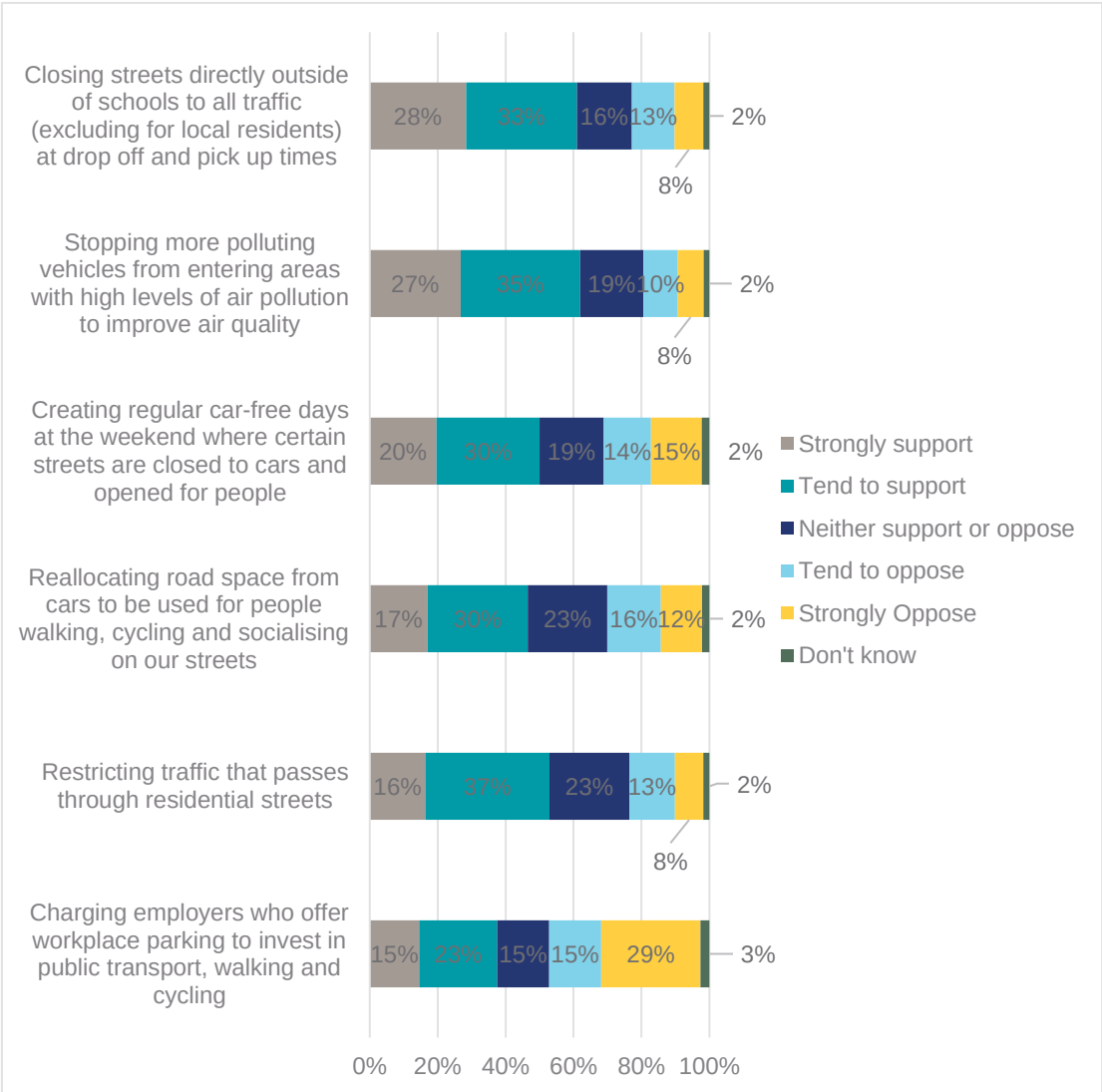
"You can see another side of the city without cars"

Support from urban drivers in Scotland for solutions

Through our YouGov survey we also asked if people who live and drive in cities and towns across Scotland their opinions on these solutions (see Figure 10 below). As a result of the

lack of support towards road pricing we decided not to ask the wider public and instead asked about school streets – where streets are closed to traffic directly outside of schools at drop off and pick up times.

Figure 7: To what extent, if at all, would you support or oppose the following traffic management solution in Scottish cities? (YouGov Survey of 1,048 Scottish residents who live in urban areas and drive)



Support from people who live and drive in cities and towns is highest for closing streets to traffic directly outside of schools at drop off and pick up times (61% in support) and stopping more polluting vehicles entering areas with high levels of air pollution in order to improve air quality (62% in support).

Support also exists for:

- Regular car-free days at the weekend where certain streets are closed to cars and opened for people (50% support, 29% oppose).
- Reallocating road space from cars to be used for people walking, cycling and socialising on our streets (47% support, 28% oppose).
- Restricting traffic that passes through residential streets (53% support, 22% oppose).

The only proposed measure that had more opposition than support was charging employers that offer workplace parking in order to invest in public transport, walking and cycling. Slightly more opposed this solution (44%) in comparison to supporters (38%).

These findings suggest there is significant appetite and support across Scotland from people who drive to implement measures that make cities and towns better places to live whilst reducing the number of cars.

At the same time however city leaders need to be conscious of significant opposition to these measures. The measures must be implemented in ways that are fair, especially to people who have limited options but to drive due to a lack of genuine alternatives. This is likely to include people with poor public transport connections, especially those that live in the urban fringe.

4. Conclusions

Cities and towns are predominantly designed around the car. Cars are attractive to many people and have numerous advantages and benefits in many situations. However, cars also have a negative health, environmental, social and economic impact.

The challenge to redesign cities and towns to reduce car use therefore is extremely difficult and will reverse a status quo of the past 70 years. If policy makers are to reduce people's journeys by car, they need to make other options more attractive to people than driving.

This will include:

- Developing high quality neighbourhoods as opposed to simply building more houses where everyday services and amenities are on their doorstep, ideally within a 20 minute walk.

- Improving public transport provision, walking and cycling across cities and towns and make them competitive with driving. An attractive walking environment, dedicated and protected space for cycling and more reliable and cheaper public transport options are all important.

- Taking steps to reduce the number of cars within our cities and towns. We need to increase our efforts to reduce car dependency in cities both locally and at a whole-city or town level. There is significant support for measures that help to reduce car use in Scotland including low emission zones, using filtering on neighbourhood streets to discourage through-traffic in residential areas and increasing the number of schools where local streets are closed during drop off and pick up times.

We must ensure solutions are fair for all people and give people a genuine choice in how they travel and where they live. Understanding people who live and drive in cities is critical if this process is to be successful.

5. References

[1] Litman, 2017. Evaluating Transportation Land Use Impacts. Based upon Bruun and Vuchic's Time-Area Concept

[2] NHS (2019). Benefits of Exercise https://www.nhs.uk/live-well/exercise/exercise-health-benefits/

[3] BHF (2018). Physical Inactivity and Sedentary Behaviour Report 2017 file:///C:/Users/tim.burns/Downloads/physical-inactivity-report---mymarathon-final%20(1).pdf

[4] Sustrans (2017). Active Travel Toolbox. https://www.sustrans.org.uk/our-blog/research/all-themes/all/active-travel-toolkit-the-role-of-active-travel-in-improving-health/

[5] Transport Scotland (2018) Key Reported Road Casualties Scotland 2017 https://www.transport.gov.scot/media/42306/sct04185220761.pdf

[6] Department for Business, Energy and Industrial Strategy (2018) 1990-2017 UK Greenhouse gas emissions, final figures by end user. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/789830/1990-2017-uk-emissions-final-figures-by-end-user-sector-fuel-type.pdf

[7] Lawlor (2013) The pedestrian pound. https://www.livingstreets.org.uk/media/3890/pedestrian-pound-2018.pdf

[8] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf

[9] Glasgow Centre for Population Growth (2013) The built environment and health: an evidence review.

[10] Glasgow Centre for Population Health (2014) Understanding Glasgow. The Glasgow Indicators Project https://www.understandingglasgow.com/indicators/population/population_projections

[11] The City of Edinburgh Council (2018) Edinburgh: Connecting our city, transforming our places. https://consultationhub.edinburgh.gov.uk/sfc/connecting-our-city-transforming-our-places/supporting_documents/Connecting%20our%20City%20Transforming%20our%20Places.pdf

[12] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf

[13] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf

[14] Garner, B. (2015) Young non-drivers: Will they always steer clear of getting behind the wheel? Paper presented at 47th Universities' Transport Study Group Conference, January, London.

[15] Chatterjee, K., Goodwin, P. et al. (2018). Young People's Travel – What's Changed and Why? Review and Analysis. Report to Department for Transport. UWE Bristol, UK. www.gov.uk/government/publications/young-peoples-travel-whats-changed-and-why

[16] National Records for Scotland (2011) Scotland's Census: Shaping Our Future https://www.scotlandscensus.gov.uk/census-results

[17] Transport Scotland (2018) Transport and Travel in Scotland, 2017 https://www.transport.gov.scot/media/43105/sct08183658301.pdf

[18] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf

[19] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf

[20] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf

[21] Scottish Government (2016))Scottish household survey 2015: annual report https://www.gov.scot/publications/scotlands-people-results-2015-scottish-household-survey/pages/8/

[22] Department for Transport (2018) National Travel Survey: England - Frequency of use of different transport modes. https://www.gov.uk/government/statistical-data-sets/nts03-modal-comparisons

[23] Sustrans (2016) Transport Poverty in Scotland. https://www.sustrans.org.uk/our-blog/research/all-themes/all/transport-poverty-in-scotland/

[24] Department for Transport. (2011) Transport Statistics Great Britain https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/8995/vehicles-summary.pdf
[25] Sloman, L (2006). Car Sick: Solutions for Our Car-addicted Culture Green Books.
[26] Standing Advisory Committee on Trunk Road Assessment. (1994) Trunk Roads and the Generation of Traffic. https://bettertransport.org.uk/sites/default/files/trunk-roads-traffic-report.pdf
[27] Department for Transport (2004) The Future of Transport: A Network for 2030, White paper CM6234 https://webarchive.nationalarchives.gov.uk/+tf /http://www.dft.gov.uk/about/strategy/whitepapers/previous/fot/
[28] Scottish Government (2018) 4% increase in housing supply in 2017-2018. A National Statistics Publication for Scotland. https://news.gov.scot/news/4-percent-increase-in-housing-supply-in-2017-18
[29] Scottish Government https://www.gov.scot/policies/more-homes/housing-and-planning-delivery-framework/ and https://www.placestandard.scot/
[30] Transport for New Homes. 2018. Project summary and recommendations. http://www.transportfornewhomes.org.uk/wp-content/uploads/2018/07/transport-for-new-homes-summary-web.pdf
[31] Lucas, K. and Jones, P. (2009) The Car in British Society. RAC Foundation https://www.racfoundation.org/research/mobility/car-in-british-society
[32] Department for Business, Innovation and Skills/Genecon and Partners (2011) Understanding High Street Performance https://www.gov.uk/government/publications/understanding-high-street-performance
[33] Bluewater (2019) https://bluewater.co.uk/your-visit/getting-here
[34] Silverburn (2019) https://www.shopsilverburn.com/visitor-info/parking
[35] Royal Society for Public Health (2018) 'Health on the High Street Report: Running on Empty 2018' https://www.rsph.org.uk/our-work/campaigns/health-on-the-high-street/health-on-the-high-street-running-on-empty-2018-report.html
[36] Portas, M (2011) The Portas Review: An independent review into the future of our high streets https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6292/2081646.pdf
[37] Transport Scotland (2019) Scottish Transport Statistics, No 37, 2018 Edition https://www.transport.gov.scot/media/44207/sct01193326941.pdf
[38] Kahneman, D. (2012) Thinking Fast and Slow. Penguin Books.
[39] Sustainable Development Commission (2011) Fairness in a Car-dependent Society, London. http://www.sd-commission.org.uk/data/files/publications/fairness_car_dependant.pdf
[40] Hayden, A., Tight, M., and Burrow, M. (2016). Is Reducing Car Use a Utopian Vision? World Conference on Transport Research - WCTR 2016 Shanghai. 10-15 July 2016 https://www.sciencedirect.com/science/article/pii/S2352146517306427
[41] Steg, L. (2005) Car use: lust and must. Instrumental, symbolic and affective motives for car use. Transportation Research Part A: Policy and Practice, 39(2005), pp. 147-162 https://www.sciencedirect.com/science/article/pii/S0965856404001016
[42] Lucas, K. and Jones, P. (2009) The Car in British Society. RAC Foundation https://www.racfoundation.org/research/mobility/car-in-british-society
[43] Kent, L. (2014) Driving to save time or saving time to drive? The enduring appeal of the private car. Volume 65, July 2014, Pages 103-115 https://www.sciencedirect.com/science/article/pii/S0965856414000962
[44] Wells, P., and Xenias, D. (2015). From 'freedom of the open road' to 'cocooning': Understanding resistance to change in personal private automobility. Environmental Innovation and Societal Transitions Volume 16, September 2015, Pages 106-119 https://www.sciencedirect.com/science/article/pii/S2210422415000246
[45] Steg, L. (2005) Car use: lust and must. Instrumental, symbolic and affective motives for car use. Transportation Research Part A: Policy and Practice, 39(2005), pp. 147-162 https://www.sciencedirect.com/science/article/pii/S0965856404001016
[46] Based on Nielsen data 2016 https://www.nielsen.com/eu/en/solutions/measurement/Advertising-Expenditure.html Accessed at: https://www.thinkbox.tv/News-and-opinion/Newsroom/5-28-billion-pounds-invested-in-TV-advertising-in-2016

[47] Martin, T. (2018). Sturgeon's war on motorists: SNP's green crusade could see up to 1 MILLION cars scrapped. Express online. https://www.express.co.uk/news/uk/972752/scotland-news-nicola-sturgeon-snp-moroting-clean-air-pollution-cars

[48] RAC, (2015). War on motorists is far from over. https://www.rac.co.uk/drive/news/motoring-news/war-on-motorists-is-far-from-over/

[49] Transport Scotland, 2018. Scottish Transport Statistics No 37 2018 Edition https://www.transport.gov.scot/media/44025/scottish-transport-statistics-no-37-2018-edition.pdf

[50] National Records for Scotland (2011) Scotland's Census: Shaping Our Future https://www.scotlandscensus.gov.uk/census-results

[51] Department for Transport (2016). Road Use Statistics. Available at: www.gov.uk/government/statistics/road-usestatistics-2016

[52] Schwanen, T. and Lucas, K, (2011) Understanding Auto Motives, in Lucas, K., Blumenberg, E., Weinberger, R. (ed.) 'Auto Motives: Understanding Car Use Behaviours, pp.3 - 38

[53] Lucas, K. and Jones, P. (2009) The Car in British Society RAC Foundation https://www.racfoundation.org/research/mobility/car-in-british-society

[54] Copenhagen Bicycle Account 2016, (2016). Copenhagen Bicycle Account 2016. Copenhagen: City of Copenhagen Technical and Environment Administration. Available at: https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1698

[55] Bracewell, D. (2018). Vancouver's mobility future: 'automating' policy into sustainable results. Vancouver: City of Vancouver Transportation Planning Engineering Services. Available at: https://council.vancouver.ca/20180130/documents/rr3presentation.pdf

[56] Victoria State Government, (2017). Plan Melbourne 20-Minute Neighbourhoods. Available at: https://www.planmelbourne.vic.gov.au/current-projects/20-minute-neighbourhoods

[57] San Francisco County Transport Authority, (2018). TNCs and Congestion. https://archive.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Congestion_Report_181015_Final.pdf

[58] Transport Scotland (2019). Transport (Scotland) Bill. https://www.transport.gov.scot/our-approach/transport-scotland-bill/

[59] Interim report for City Centre Transformation http://www.edinburgh.gov.uk/CET/info/6/about/12/about

[60] Greater London Authority (2019). ULEZ reduces 13,500 cars daily & cuts toxic air pollution by a third. https://www.london.gov.uk/press-releases/mayoral/ulez-reduces-polluting-cars-by-13500-every-day

[61] DfT, (2016). Nottingham Traffic Profile 2000-2015 http://www.dft.gov.uk/traffic-counts/area.php?region=East+Midlands&la=Nottingham

[62] DfT, (2015). Annual bus statistics: year ending March 2015. https://www.gov.uk/government/statistics/annual-bus-statistics-year-ending-march-2015

[63] Transport Focus, (2016). Bus Passenger Survey, 2015. http://www.transportfocus.org.uk/research-publications/publications/bus-passenger-survey-full-report-autumn-2015/

[64] Connecting Glasgow: Creating an Inclusive, Thriving, Liveable City. Glasgow's Connectivity Commission, (2018) https://glasgow.gov.uk/CHttpHandler.ashx?id=43556&p=0n

[65] Transport for London (2016) Update on the implementation of the Quietways and Cycle Superhighways programmes. http://content.tfl.gov.uk/pic-161130-07-cycle-quietways.pdf

[66] South City Way https://www.glasgow.gov.uk/index.aspx?articleid=19365

[67] http://www.edinburgh.gov.uk/meadowsgeorgestreet

[68] http://www.edinburgh.gov.uk/info/20087/cycling_and_walking/1791/cycling_and_walking_projects/2

[69] Connecting Woodside https://www.glasgow.gov.uk/index.aspx?articleid=21802

[70] Edinburgh City Council (2016) Transport and Environment Committee. School Streets pilot project evaluation. http://www.portobellocc.org/pccpn/wp-content/uploads/2016/08/Item_7.2___School_Streets_Pilot_Evaluation.pdf

[71] National Statistics, (2016). Transport statistics Great Britain 2016: tables https://www.gov.uk/government/statistics/transport-statistics-great-britain-2016

[72] CFIT, (2002). Paying for road use https://webarchive.nationalarchives.gov.uk/20110304133725/http://cfit.independent.gov.uk/pubs/2002/pfru/index.htm

[73] Transport for London (2017). Travel in London. Report 10. http://content.tfl.gov.uk/travel-in-london-report-10.pdf

[74] Department for Transport (2017) Taxi and Private Hire Vehicle Statistics: England 2017 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/642759/taxi-private-hire-vehicles-2017.pdf

[75] US Department of Transportation (2017) Lessons Learned From International Experience in Congestion Pricing. https://ops.fhwa.dot.gov/publications/fhwahop08047/02summ.htm

[76] Land Transport Authority, Singapore. "Electronic Road Pricing (ERP)" https://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/managing-traffic-and-congestion/electronic-road-pricing-erp.html

[77] US Department of Transportation (2017) Lessons Learned From International Experience in Congestion Pricing. https://ops.fhwa.dot.gov/publications/fhwahop08047/02summ.htm

[78] Palliyani, S and Lee, DH (2017) Sustainable transport policy: An evaluation of Singapore's past, present and future. Journal of Infrastructure, Policy and Development Volume 1 Issue 1, pp.112-128. https://systems.enpress-publisher.com/index.php/jipd/article/view/23

[79] https://www.theguardian.com/environment/green-living-blog/2010/jun/16/cycling-ethical-living

[80] https://openstreetsproject.org/