



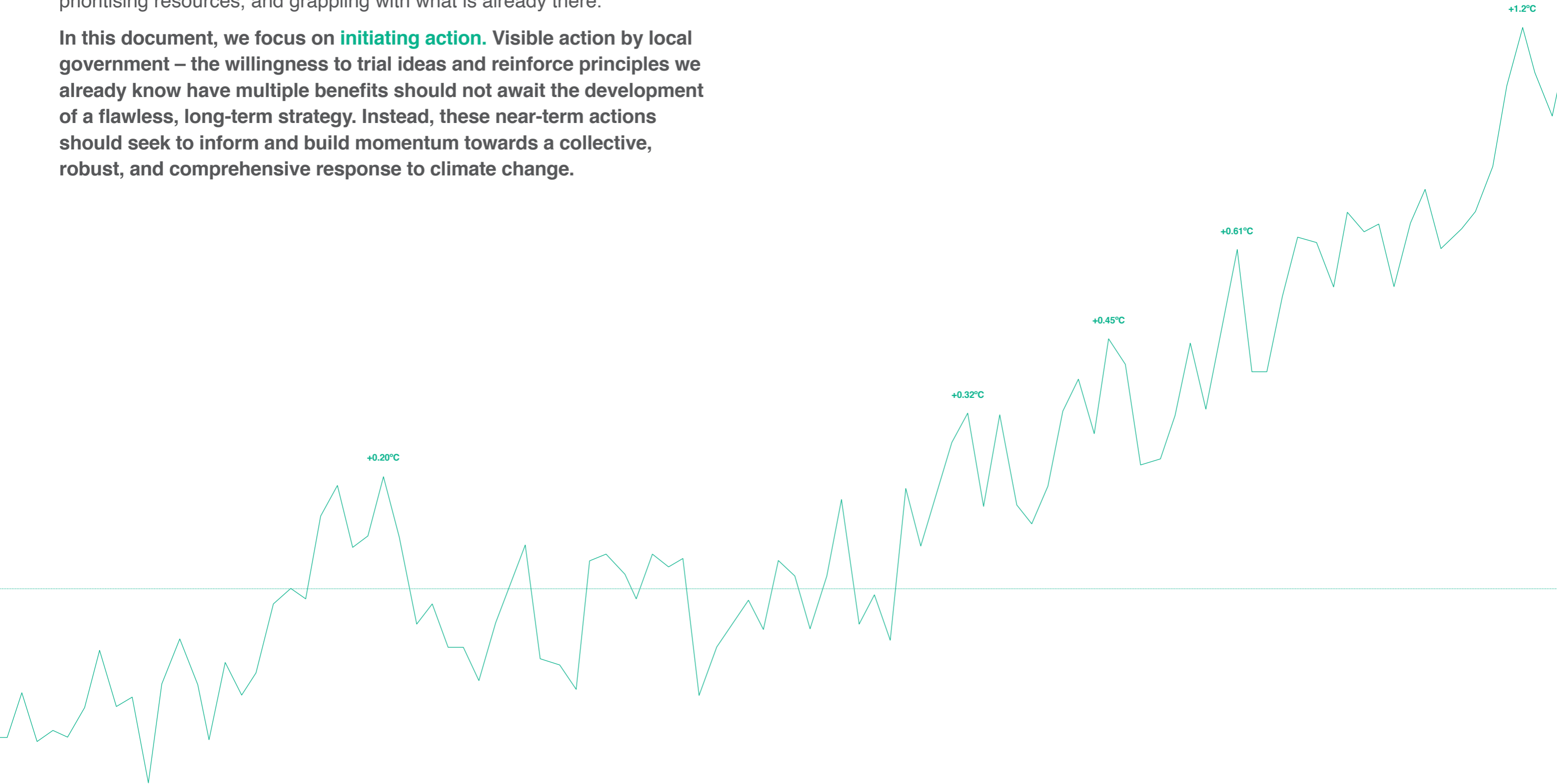
ARUP

You've declared a
Climate Emergency...
Next steps: Transport

Guidance for local authorities

Action towards climate change mitigation in the transport sector is too often stalled by discussions on finding the perfect solution – criticism towards what has failed, waiting for technology solutions, complexities around prioritising resources, and grappling with what is already there.

In this document, we focus on **initiating action. Visible action by local government – the willingness to trial ideas and reinforce principles we already know have multiple benefits should not await the development of a flawless, long-term strategy. Instead, these near-term actions should seek to inform and build momentum towards a collective, robust, and comprehensive response to climate change.**



The surface transport sector is the UK's highest emitter of carbon emissions and the only sector where emissions are still rising. Meeting the pledge for the UK to become overall net-zero directly implies the need for fundamental change in this sector, at all levels of government.

The path to a fully zero-carbon transport system will require national agreement on a coordinated long-term strategy for climate change, transport and the wider built environment. This process is now underway with the Department for Transport's recent announcement on a Transport Decarbonisation Plan. The political complexities surrounding agreement on such a strategy threaten a lengthy timeline towards impactful action. **This paper aims to highlight what local government can start doing now to make the urgently required headway towards zero-carbon transport, while a long-term zero-carbon strategy is developed.**

Fig.1: Total emissions by sectors

Source: Department for Business, Energy & Industrial Strategy (2019)

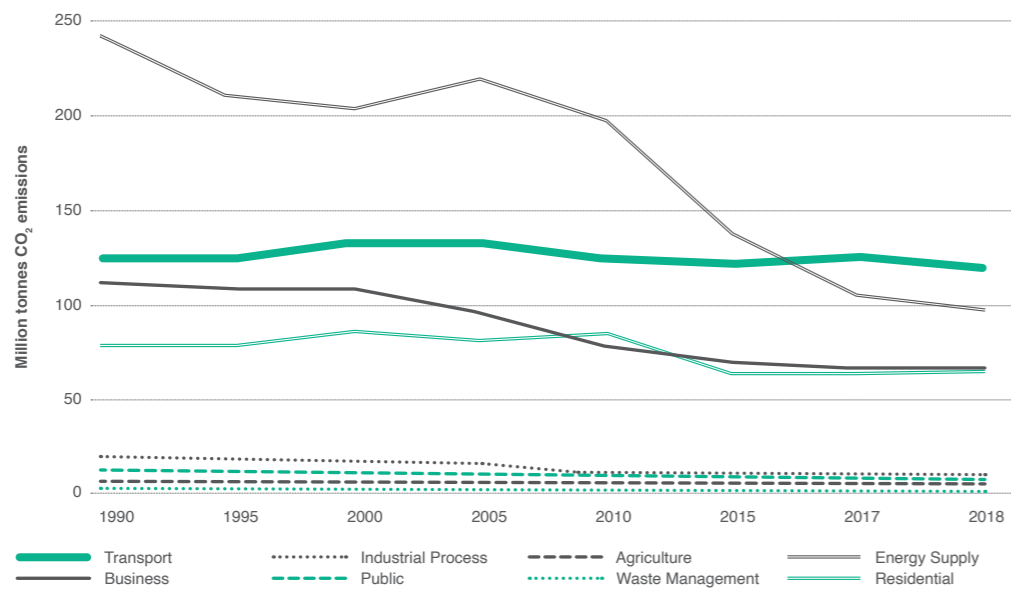
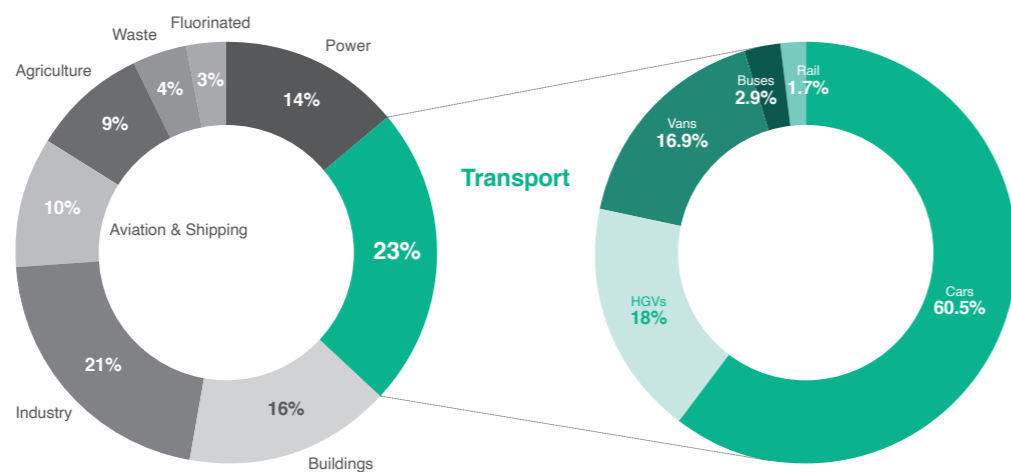


Fig.2: UK greenhouse gas emissions from transport

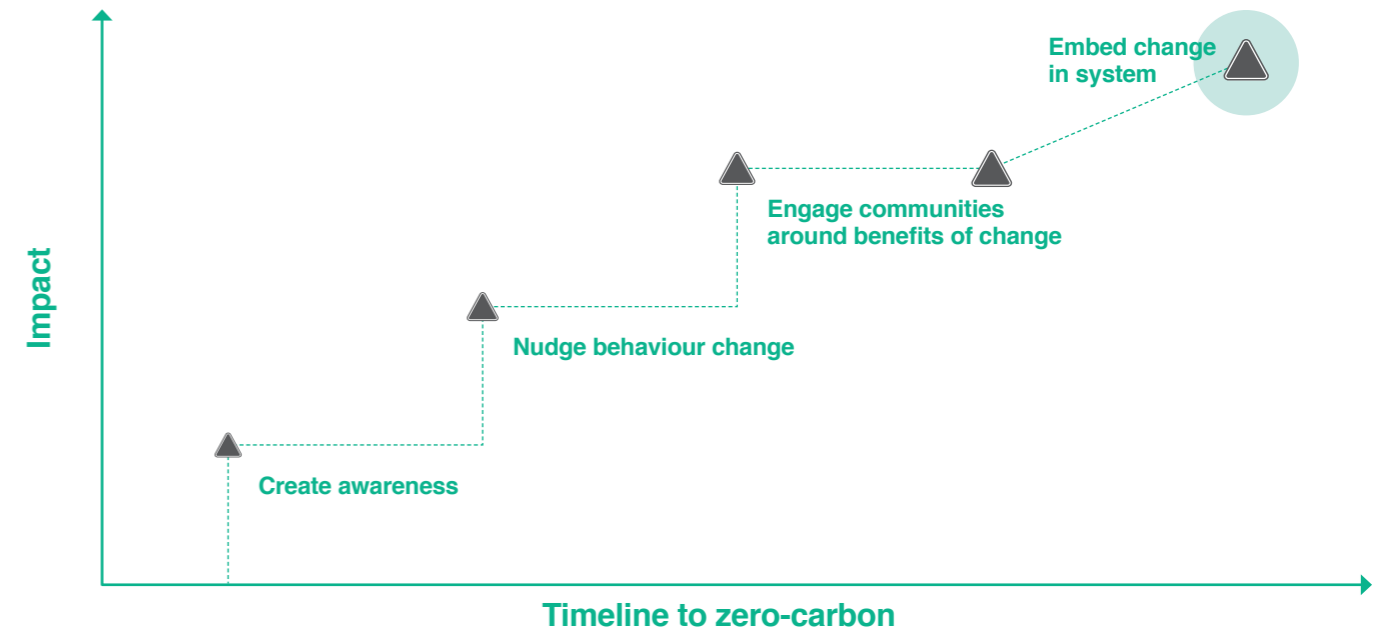
Source: The Committee on Climate Change Net-Zero Technical Report (2019)



Most local authorities in the UK will fall somewhere along the journey to change outlined in the diagram below. **The most difficult stage of change is the first step – creating widespread awareness** of new and different options. How can we make people consider an alternative way of doing something which is as ingrained as the journey to work or going shopping?

Fig.3: Stages to creating change

Source: Arup



Our approach to guide local government seeking to reduce the carbon impact of transport recognises that decisions for transport in a town, city, or region must go beyond 'cleaning-up' vehicles. Transport decisions significantly shape the fundamental experience of living in a place, the well-being of people, and the strength of the economy. Transport solutions to the climate change problem must also address existing problems that cities and urban regions face due to excessive car-dependence (even if it is a clean one).

To facilitate prioritisation and ensure a holistic perspective, the ideas we propose in this document are guided by a hierarchy of aims:

1. Reducing the need to travel
2. Prioritising sustainable transport
3. Minimising the impact of road traffic

We recognise that managing the impact of transport and achieving the aims set out above, require action beyond the boundaries of traditional transport infrastructure and vehicles; **we must consider all channels and stakeholders that impact behaviour, awareness, and experiences relating to transport.**

We understand that stakeholders responsible for delivering and agreeing to change will not all be those who are convinced by the Climate Emergency. In

order to successfully translate ideas into action there needs to be a greater focus on engagement, and clear communication of benefits of action in terms of the party in question and their priorities.

Solutions to the zero-carbon problem must be able to convincingly narrate the story on wider benefits of action to society. Local authorities in the UK spend on average 64% of their revenue on social care. Given the presence of immediate, competing priorities, an urgent response to the Climate Emergency will only be politically and financially viable if the proposals to tackle climate change demonstrate that they are ultimately critical to all systems - including those which enable good health and well-being, economic stability and prosperity.

Our response to climate change presents a chance for us to build momentum and progress changes in transport that benefit society and safeguard the environment that sustains us. **Tackling climate change presents a critical opportunity to re-evaluate how we embed transport in our regions and cities** – not just physically, but how we understand it in our minds, learn about it as children, and weigh our options as commuters, consumers of services, and as tourists.

Framing actions for transport in the UK

TOWARDS ZERO-CARBON TRANSPORT

In the pages that follow, we present a selection of ideas for all types of local authorities in the UK to consider. **We focus on simple, scalable, and deliverable measures** – ideas that can change everyday perception and set the foundation for a cultural change in how we think about accessing goods and services.

Actions local authorities can take now



The ideas we propose are well-known sustainable transport best practices. The nuance is in our emphasis on an integrated approach to delivery (across sectors and disciplines) and in the details we highlight as key to the success of these measures.

- 1. Bringing on board key stakeholders:** Make key stakeholders understand how the climate change agenda is crucially tied to their existing roles and priorities. Initiatives should be promoted not only for their emissions reduction impact or transport system benefits – but holistically in terms of wider health, economic, and community benefits.
- 2. Identifying the real costs of inaction:** The implications of not taking action and not prioritising these initiatives should be costed alongside the cost of the initiative and duly considered in investment decisions.
- 3. Working in partnership:** The role of government should be to create conditions that enable desired behaviours and functions. Local authorities should actively seek opportunities and establish platforms to engage talent in the private sector, academia, volunteers, and community groups to develop and implement ideas.
- 4. Engaging with the public:** The impact of climate change inaction needs to be broken down and out of technical jargon. Its implications for all local areas need to be expressed in tangible, relatable terms to people. This information needs to be widespread and accessible to the general public on an ongoing basis.

Reduce the need to travel	1 - Create a community – digitally and in reality
	2 - Manage denser, commercial zones to discourage driving
	3 - Integrate spatial and transport considerations
Prioritise sustainable transport	4 - Give people better information and options
	5 - Experiment with road space and networks
	6 - Create conditions for increased uptake of active travel
	7 - Maximise use of the public transport network
Minimise impacts of road traffic	8 - Minimise impact of freight/deliveries
	9 - Encourage cleaner vehicles

CREATE A COMMUNITY – DIGITALLY AND IN REALITY

What is the aim?

Initiatives should **connect people and resources** to enable flexibility, sharing, local consumption, and reduce dependence on regular solo car use.

What do we mean?

Local authorities should think about how individual goals, skills, and under-utilised resources within their communities can be tapped to encourage sharing trips, use sustainable transport modes, and consume more locally. Such an approach will not only lead to reduced emissions and cut down unnecessary vehicle trips, but it will also make sure these initiatives are seen as measures that enhance community, rather than perceived as top-down measures that impede individual lifestyles to meet ‘abstract’ targets.

On the following page we present just a few specific actions local authorities can take now to make greater use of resources, knowledge, and demand for certain services in their jurisdictions.



IDEA 1

What exactly?	Potential partners	Benefits
Each week, ask a local business owner to share their story – make it an ‘event’ or organise local markets selling local goods in walkable/ cyclable locations	Local businesses, volunteers and community advocacy groups.	Supports local consumption and cuts down emissions from long distance freight vehicle trips, strengthens community, creates a unique character for the place (potentially boosting tourism). This would strengthen local economy and its resiliency, as well as health and well-being of residents due to the increase in personal fulfilment and perceived opportunity for individual economic progress.
Offer a platform for sponsored volunteer groups to train ‘active’ commuters, cycle/walk-to-work days, walking tours weekly or monthly	Local businesses, college or university students, volunteers to develop an online platform to offer ‘active travel training’ sponsored by local authority.	Increases willingness of local residents to incorporate active travel in their lifestyles – successful programmes will lead to reduction in vehicle trips and emissions and increase general health and well-being.
Offer a platform to connect people who work and live in the same areas and organise city/town-sponsored carpools	Work with technology providers who can provide carpool matching app services or a tool (endorsed by the local authority) to encourage carpooling. Engage employers to offer incentives to employees who carpool.	Reduces vehicle trips and emissions, offers people a practical option to drive less.
Electric car sharing club or services	Car share companies, technology providers.	Encourages people to reconsider owning private vehicles (and using alternative modes on a more regular basis) by ensuring access to vehicles when it is needed. By ensuring car share options are all electric vehicles, trips made through car share will be zero or low-emissions.

How could this be funded and delivered?

This action is low to medium cost with high impact. It requires local authorities to heavily engage with community organisations and initiate partnerships with businesses and/or major technology providers. There is an opportunity for businesses to benefit from the new customers attracted to their services or platforms through the endorsement of local authorities, and for local authorities to take advantage of social media networks to create awareness, change, and introduce people to sustainable travel options.

GREENER GRANGETOWN

ARUP PROJECT

Cardiff, UK, 2018

What?

Greener Grangetown is an area-based scheme which has improved a residential neighbourhood by developing green infrastructure and a low-traffic neighbourhood.

How?

A low-traffic neighbourhood was created through the introduction of changes/modifications to side streets to prevent through-traffic. All parking was removed from one side of the road, so the space reclaimed was used to create rain gardens, street trees, seating, cycle parking and bike hire docks, creating an interesting and engaging place to walk, cycle and spend time.

Residents and community groups were encouraged to get involved with planting flowerbeds, embankments and rain gardens and now help to care for the areas, enhancing the sense of community.

Cardiff Council partnered with Dŵr Cymru Welsh Water, Natural Resources Wales and Landfill Communities Fund to fund the £2 million partnership.

1,600m²
of green space

Early feedback is that **trade has improved** despite the removal of car parking.

Increased community pride and social interaction has helped to **reduce crime and anti-social behaviour**

The project has created **quiet and attractive streets**, giving children a space to play and residents a place to socialise



IDEA 1 – CASE STUDY 1

Create a community – digitally and in reality

PLYMOTION

Plymouth, UK, 2017-present

What?

Plymotion is a Plymouth City Council scheme which offers incentives and travel advice to encourage Plymouth's residents to try more sustainable ways of traveling to and from their destinations.¹¹

How?

Plymotion offers incentives to promote cycling, walking, and public transport through extensive engagement with the community – schools, workplaces, and organisations. Plymotion offers participants the option to be able to speak to travel advisors to discuss transport options and make journey plans. They publish a newsletter and maintain a website throughout the year to keep local residents informed on and engaged with Plymotion's activities, initiatives and impact.

In 2018, Plymotion match-funded the Sustainable Travel Grants to provide facilities or initiatives to encourage employees to travel to work without their cars. Successful applicants used the grant funding to provide improved cycle parking, enhanced shower and changing facilities, electric pool bikes, electric bikes and bespoke travel web packages. In 2019, Plymotion's travel advisors knocked on 2,943 doors, targeting new members of the community who would not yet have formed their travel habits.

Plymotion recently secured £1.5 million following a successful bid to the Department of Transport's £60 million Access Fund for Sustainable Travel.

Increased cycling by
13%

Increased bus use among the people they engaged with by

22%

Plymotion has engaged with

2,300

employees in 44 workplaces since 2017

Plymotion has provided **daily bus tickets to job seekers**, helping

50

to land jobs using the **free bus pass**

IDEA 1 – CASE STUDY 2

Create a community – digitally and in reality



MANAGE DENSER, COMMERCIAL ZONES TO DISCOURAGE DRIVING

What is the aim?

Dense, developed, and mixed-use areas of the city or town should **heavily prioritise public transport and active travel** and actively price the use of private vehicles to minimise their use.

What do we mean?

Established town and city centres with strong existing or potential for access via public transport and active modes should directly discourage the use of private vehicles by charging for their use, restricting the space available to operate and park vehicles, and reducing speed limits. Emerging mobility services that risk creating more vehicle traffic should be heavily regulated for their environmental impact.

On the following page we present just a few specific actions local authorities can take now to ensure more sustainable and low-impact modes of transport are prioritised and unnecessary vehicle trips are eliminated.



IDEA 2

What exactly?	Potential partners	Benefits
Remove on-street parking and reduce space for car parks	Adjacent businesses, urban designers and transport planners to 'rethink' use of space, advocacy groups.	Discourages the use of vehicles in congested areas (cutting down emissions and noise), opens up space for seating (parklets), dedicated cycle lanes, or extended pavement for walking.
Pricing for all parking (consider dynamic pricing), using generated revenue to invest in public transport	Community advocacy groups.	Discourages the use of vehicles, generates funding for public transport and active travel infrastructure and services.
Low-emission zone in town centre (cordon or emissions-based surcharge on parking) and reduction of speed limits	Community and health advocacy groups.	Discourages the use of non-compliant vehicles, reduces risks to safety through speed reductions, and directly cuts down emissions. Potential to generate funds for public transport, active travel, or public health.

How could this be funded and delivered?

Actions under this idea require little additional funding and have the potential to raise revenue and be highly impactful in existing dense, mixed-use areas. The real 'costs' associated with this idea relate to the development of a strong policy commitment by the local authority and relating transport authorities, alongside extensive and strategically guided engagement with the public.

NOTTINGHAM WORKPLACE PARKING LEVY

Nottingham, UK, 2017

What?

Nottingham Council implemented the Workplace Parking Levy (WPL) that charges employers for parking spaces to tackle traffic congestion associated with commuting.

How?

The WPL is a parking demand-management tool requiring employers whose work premises have more than 10 employee parking spaces to pay £424 per parking space per year²⁸.

The Levy works by both providing funding for major transport infrastructure initiatives and acting as an incentive for employers to manage their workplace parking provision.

So far the WPL has raised over £61 million for reinvestment in public transport and active travel including extending the tram and redeveloping Nottingham Station.

Due to this and other policies **CO₂ emissions down by**

41%

since 2005, surpassing target²⁹

WPL and construction of new tram lines has led to

9.7m

additional public transport journeys each year³⁰

£61m

raised for reinvestment



IDEA 2 – CASE STUDY 1

Manage denser, commercial zones to discourage driving

OSLO CAR-FREE CITY

Oslo, Norway, 2015-present

What?

In 2019, Oslo recorded no pedestrian and cyclist fatalities. This achievement has been the result of a mix of measures focused on the city centre and its surroundings including dramatic speed reductions, banning cars from central areas, investing in cycling infrastructure, and restricting traffic near schools.

10%

increase in pedestrians between 2017 and 2018³¹

0

pedestrian and cyclist fatalities in 2019

3x

growth in number of trips by bike share

The city hopes to **double the number of trips people take by bike** by 2025 and **reduce its greenhouse gas emissions** by

95%

from 1990 levels by 2030³²

How?

Oslo took its first major step toward achieving Vision Zero by devising a plan in 2015 to restrict cars from the city centre and increase pricing for vehicles entering and parking around the city's core. Price increases for vehicles entering the city centre were enacted in 2017. At the same time, 700 parking spaces were removed and 60 km of bike lanes and pocket parks were created. The city centre ban on cars went into effect in early 2019.

Simultaneously, speed limits inside and outside central areas were decreased dramatically, and "Hjertesoner" or "heart zones" were created around every primary school – areas where vehicles are not permitted to pick up or drop off children.

IDEA 2 – CASE STUDY 2

Manage denser, commercial zones to discourage driving



INTEGRATE SPATIAL AND TRANSPORT CONSIDERATIONS

What is the aim?

Local authorities should identify all mechanisms and decisions, however small, that shape the future of development in their area. All decisions starting now should be geared towards **integrating new developments with public transport and active travel** – prioritising sustainable modes of travel.

What do we mean?

Starting now, all decision and approvals of planning applications and permits for new developments should be driven by plans to increase density and focus growth on public transport accessible areas.

On the following page we present just a few specific actions local authorities can take now to better align spatial planning and wider objectives for transport.

What exactly?	Potential partners	Benefits
No further approvals of out-of-town shopping centres and big box stores	Economic development planners and decision-makers (internal and external to local authority), business improvement districts.	Discourages car-dependent shopping and focuses retail/commercial activity along high-street and local businesses. This would help reduce emissions from long-distance supply chains and vehicles driving from great distances to do shopping could be replaced by local walking/cycling trips or buses. An emphasis on improving high-streets and encouraging local business and providers would also strengthen the local economy and town-centres over the long-term and bolster a unique identity for the community.
Only approve housing close to public transport or with sufficient planned public transport improvements. Plan mixed-use development with balance of housing and jobs	Developers, town planners, commercial property owners.	Enables residents of local area to readily choose public transport, walking, and cycling to access services and desired destination due to proximity and design of the development and transport system. Increases agglomeration of people and activities, leading to economic growth and creativity. Reduction in private vehicles and increased emphasis on active modes of transport would lead to decrease in emissions and benefit public health.



IDEA 3

How could this be funded and delivered?

Actions under this idea require little additional funding but a firm and consistent policy stance translated into clear protocols for assessing all new development permits and applications. This will have high impact and is essential for achieving zero-carbon transport in the UK over the long-term.

BATH RIVERSIDE

Bath, UK, 2019

What?

Bath Riverside is a new housing and office development taking shape on the site of a disused gasworks 1km west of the centre of Bath. The site provides excellent walking, cycling and public transport connections to the city centre and transport hubs.

How?

The plans for the site have been developed alongside consideration of improved connections to, and provision of, public transport (increased frequency of the MetroWest rail service, new bus service) and options for walking and cycling (better routes, new bridges, and signage).³⁴

The development is within walking distances to shopping, entertainment, the railway station, bus station and bus stops.³⁵ Car parking is limited and not directly visible. Attractively designed and convenient walking routes through the development link up with two traffic-free walking routes into the centre of Bath.

The development is served by 14 bus routes, some of which operate at a high frequency. A bus into the centre arrives every 5-10 minutes, with all of the main bus stops featuring real-time service information.

In addition, every household in Bath Riverside receives a free one month bus pass, access to a free car club membership, and a £100 cycle voucher.

70%

of people moving into Bath Riverside have changed their primary mode of travel to walking, cycling, or public transport³⁶

74%

of residents in Bath Riverside use non-car modes for their journeys



IDEA 3 – CASE STUDY 1

Integrate spatial and transport considerations

TWENTY-MINUTE NEIGHBOURHOOD

Melbourne, Australia, 2018

What?

20-minute neighbourhoods encourage 'living locally' by developing places that allow people to fulfil most of their daily needs without the need to drive.

How?

The Government of Victoria set out the 20-minute neighbourhood concept in their long-term planning strategy Plan Melbourne 2017-2050, based on evidence that 20-minutes (or approximately 800 metres) is the maximum people are willing to walk to meet their daily needs locally.

The main elements of the 20-minute neighbourhood are safe, accessible places, diverse housing, good access to public transport, attractive streets and open spaces, availability of varied destinations, services and local businesses, etc³⁴.

Community engagement has been central to the project in Croydon South, the community identified local assets that could be enhanced i.e. existing green areas and walking tracks.³⁵

Walkability and cyclability reduce driving pollutants as much as

18%
and CO₂ by
10%

Increasing urban density by just

1%
can raise wages by 4%, reduce per capita energy use by 7% and car use by 7%³⁶

Household transport costs in walkable neighbourhoods are

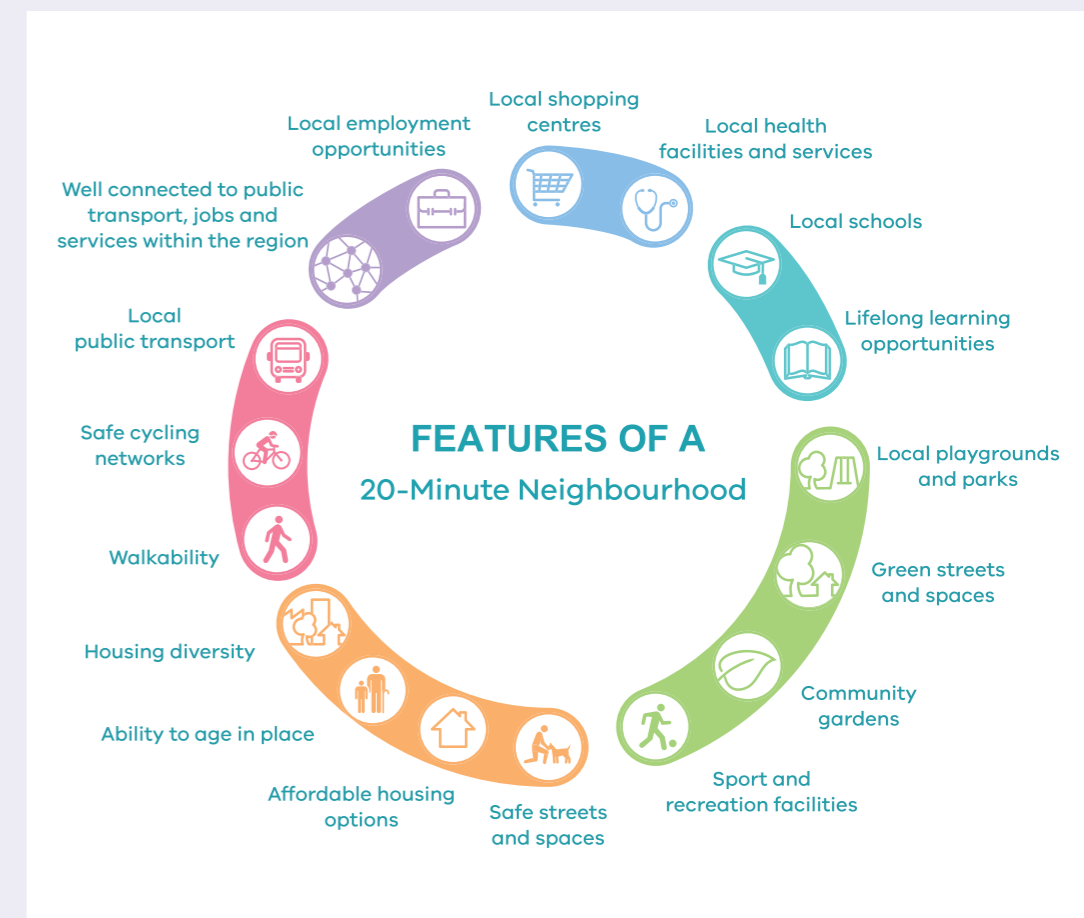
50%
of those in car-dependent ones

High walking rates can increase incidental trading in local shops by up to

40%

IDEA 3 – CASE STUDY 2

Integrate spatial and transport considerations



GIVE PEOPLE BETTER INFORMATION AND OPTIONS

What is the aim?

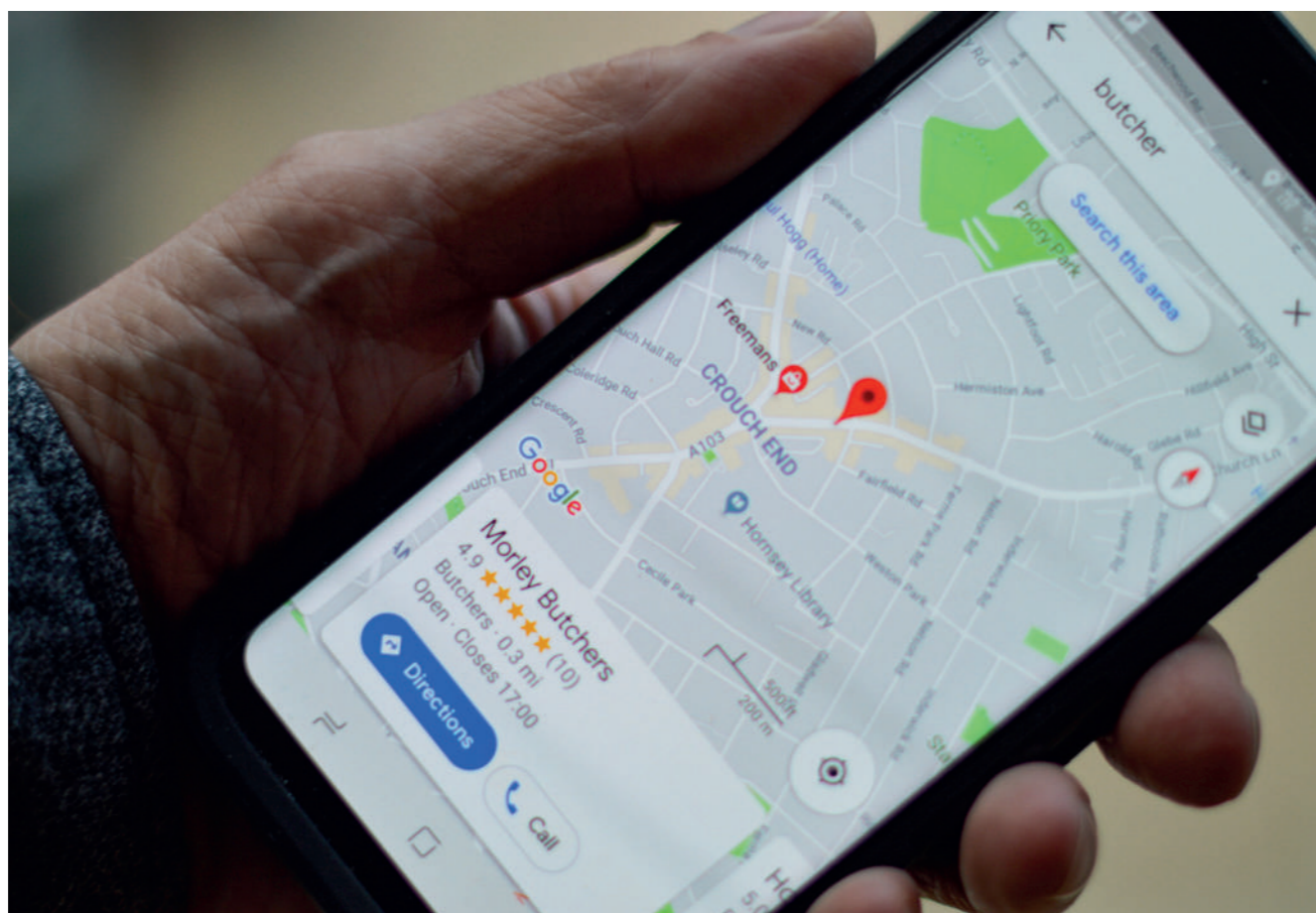
Initiatives should **raise common awareness** and **genuine interest** amongst residents of the local area about the impact of transport choices on the environment, on health, and on the social and economic well-being of the community.

What do we mean?

Giving people information on how they can access services or try new modes for going around town – while still travelling safely and efficiently – will make people aware of how their choice of transport has impacts and benefits that extend beyond the immediate convenience they experience.

On the following page we present just a few specific actions local authorities can take now to encourage people to (directly or indirectly) reduce their transport impact.

IDEA 4



What exactly?	Potential partners	Benefits
Provide maps or incentives to explore local amenities and community by walking, cycling, or public transport – specifying existing or new paths people can 'explore' safely	Local authorities could invite businesses, community groups, and work with major tech companies (particularly those seeking to create 'social value' in their surroundings) to create a 'local' layer of businesses, attractions, services and goods, along with safe routes of walking and cycling on printed or digital maps.	Local purchasing and consumption reduces traffic and emissions from the wider supply chain, boost local economy, help forge a local identity and community. Public health would benefit due to increased activity and more socially connected and safer streets. Digital solutions could help people find the route that's best for their circumstances (elderly, disabled, mother with pushchair, etc.).
Quantify and allow people to track the environmental impact of consuming locally, walking a little more, driving a little less	Volunteer organisations, schools, local news/publications, hospitals, supermarkets, recreation centres, community services could provide and spread information on the impact of transport choices on the environment in measurable terms for an individual.	Increases awareness relating to daily actions and choices, provides greater motivation, and initiates dialogue on practical ways individuals can make changes that reduce their impact.
Receive online/over-the-phone healthcare, legal, financial, social services	Multiple local authorities could partner with large service providers to establish and promote online services.	Reduces emissions from trips avoided, time savings for customers due to avoided travel, reduced costs for businesses (higher customer processing rates, reduced provision for parking/access).
Work with major employers to support working from home more regularly	Work with all employers in area to institute work from home, where possible.	Reduces trips, reduces costs for employers, reduces costs of road/parking maintenance.
Support educational programmes on active travel and sustainable consumption for children in schools (all ages)	Actively engage schools at all levels to educate children (and parents) on importance of active travel and public transport.	Changes perception and culture around travel and transport by teaching children at an early age about choices not just based on convenience, but also on the basis of health, environment, community and social connectivity. This would lead to reduced vehicle trips over the long-term and significantly more active travel.

How could this be funded and delivered?

This action is low-cost and critical. Most local authorities will be able to find something in the list they can do at relatively little or no cost. Local authorities would need a dedicated team to engage with private sector partners and the community to implement one or more of the types of initiatives listed above.

LIVING STREETS WOW

Oxford/multiple locations, UK, 2017-present

What?

WOW is a behavioural change programme which rewards pupils who walk, scoot, cycle or Park and Stride to school, with collectible badges.

How?

Schools or Councils can partner with Living Streets to provide WOW to incentivise active travel to get to school year-round³. In 2017, Oxfordshire County Council implemented WOW in 20 schools and saw strong benefits in transport mode change. Schools monitor long-term behaviour change through an interactive WOW Travel Tracker which pupils log each day. At the end of each month if pupils have logged at least one sustainable travel journey a week for a month they get a badge reward.

WOW in Oxfordshire was funded for the first year by the Council and further funding could be secured through the Physical Education and Sport Premium budget, which allows schools to offer more sustainable physical activity initiatives to pupils.

After five weeks of taking part in WOW, an average

23%
more children walk to school, one year on this was still 22%

Car trips right to the school have fallen from **31% to**

16%⁴
(Oxford)

Park and Stride has increased from **7% to**

15%
(Oxford)

Walking has increased from **47% to**

54%
(Oxford)



IDEA 4 – CASE STUDY 1

Give people better information and options

BT WORKSTYLE PROJECT

Global, 2005-present

What?

From 2005, BT transformed its business using flexible working to gain a competitive advantage by increasing efficiency, reducing environmental impact and increasing employee satisfaction.

How?

To ensure the greatest benefits were derived the programme began on a small scale to test systems and equipment before roll-out across the company.

Key to the success of the programme were development of equipment and workspaces suited to flexible working, clear policies and management to identify challenges, and cultural and behaviour change including significant time allocated to training. Company leaders were encouraged to be early adopters of the new ways of working and to lead by example.

The flexible working programme incorporated multiple styles of working including nomadic and in-building.

This reduced the need for

1.5m
return journeys, saving equivalent of **1,800 years commuting**⁵

Up to **20%**
greater productivity

Staff take

20%
less sick leave

Avoided purchase of approximately 12 million litres of fuel per year, resulting in

54,000
tonnes less CO₂⁶

In one year, BT's office estate reduced by nearly

40%
saving over **€725 million a year**



IDEA 4 – CASE STUDY 2

Give people better information and options

EXPERIMENT WITH ROAD SPACE AND TRAVEL NETWORKS

What is the aim?

Initiatives should **change established perception** about roads, community spaces, and travel choices.

What do we mean?

Local authorities should think about how and where they can make changes to draw attention to different travel options. Projects should showcase the attractiveness, benefits, and joyful elements of flexible streets and more active, shared travel networks in towns and cities that are primarily car-dependent.

On the following page we present just a few specific actions local authorities can take now to redefine the use of streets in their communities.



IDEA 5

What exactly?	Potential partners	Benefits
Closure of a primary road (or a network of streets) to vehicle traffic on a regular (weekly, monthly) or permanent basis; using free space for markets, events, gathering, running, walking, cycling, skating, etc.	Local businesses, vendors, performance groups, artists, advocacy groups who would benefit from the gathering of local people.	Makes local community visually aware of the benefits of reducing the amount of space dedicated exclusively to cars and changes perception of urban space and roads. Creates more places to gather and experience the town/city as a community – economic benefits of boosting opportunities to exchange ideas, form social ties, and engage in local issues. Increases interest, likelihood and perceived comfort in walking and cycling. Experimentation could ultimately enable permanent road closures to vehicular traffic and marked shift onto sustainable transport modes.
Give space to children – regular play streets	Schools, advocacy groups, or volunteer groups.	The idea of using streets freely for being active and exploring 'along the way' to a destination would become embedded in children and something that they could start to introduce to their parents at home. The ability to recognise the benefits of sustainable transport would then be instinctive to these children when they grow into adults. This would have health benefits due to increased activity. Those living close to and passing by play streets would also become more aware of the benefits or relieving space from traffic and potentially consider alternative modes for trips possible by walking, cycling, or public transport.
Green routes – gardens, parks to a local destination to improve experience of walking and cycling	Local businesses that may benefit from additional cycle/foot traffic along the route or engage volunteers, artists, residents who are interested in redesigning/trialling alternative uses of road space.	Changes perception of existing roads, encourages active travel for local trips, engages local residents and users of the street – potential to initiate changes in behaviour and preferences.

How could this be funded and delivered?

This action is low to medium cost with high impact. For example, closing down a street or creating play streets would require little or no funding if the local authority can find dedicated partners and communicate a vision and its benefits to the implementation team.

CICLOVIA

Global, 1970-present

What?

Ciclovias are the periodic closure of streets to motorised traffic, to provide access to open space and active travel for all. The idea began in 1974, when the Mayor of Bogotá, Colombia agreed to close some roads to cars and buses on Sundays so that people could use the space for walking.⁷ Today, ciclovias take place in over 400 cities around the world including Edinburgh, Mexico City, Bangalore and Cape Town.

Ciclovias have led to the construction of a

376km

network of permanent cycle routes in Bogotá, increasing cycling from less than 1% of trips in 1998 to

6%

of trips in 2012

Before

50%

of participants were not doing regular physical activity on Sundays (Lima)⁸

Every dollar spent running Sunday Streets yielded an estimated saving of

\$2.32

in medical costs (San Francisco)⁹

70%

of businesses reported a clear benefit (Fort Collins)¹⁰

How?

Every city can implement ciclovias in their own way at a scale that suits them. The core themes of ciclovias include:

- Taking a **partnership approach** with different agencies, local authorities, health departments, non-profit organisations, private businesses and sponsors, etc.
- **Regularity**, the more regularly these events are held the greater benefit they bring in terms of community and shifts to active modes of travel
- **Free** and accessible to the whole population
- **'Recreovia' concept** with free activities along the ciclovia routes e.g. cycling lessons, aerobics, dance workshops, etc.
- **Volunteering**, many of the staff supporting the initiative are volunteers

In Fort Collins, Open Streets take place twice a year, exploring different routes each time. In San Francisco, the scheme has expanded and become a local institution with 11 events yearly, at different locations. In Lima, the ciclovia takes place every Sunday closing 6km of one of the city's main arteries to cars.

Edinburgh became the first UK city to implement Open Streets in 2019, events take place first Sunday of every month.



PARKLETS

ARUP PROJECT

London, UK, 2017-2018

What?

Fitzpark transformed a delivery bay on a busy urban street into a parklet containing seating and planters for local residents, employees and visitors to enjoy. Hackney Borough Council offered grants to residents to repurpose a parking space for community uses.

How?

Parklets demonstrate how small spaces can be adapted to provide people-friendly, active uses. This promotes health and wellbeing and encourages people to walk, cycle and spend more time outdoors.

Fitzpark was developed through partnership with the Fitzrovia Partnership, Arup and Clean Air Better Business (CABB) and drew on funding from the Mayor's Air Quality Fund. Originally installed as part of a temporarily trial, the Fitzpark parklet was extended for an additional 9 months and re-installed in 2019 on Warren Street.

Hackney Council invited proposals for development of up to 15 parklets across the Borough which could include planters, benches, games noticeboards or anything else. Successful designs were implemented for a one-year period before being judged to decide if this should be permanent.

Parklets are delivered in partnership between the Council and residents, with the Council supporting set-up, parking suspension and design. Residents take on responsibility for maintenance which creates opportunities to enhance sense of community.

41%

increase in self-reported well-being (Fitzpark)

100%

support from local business (Fitzpark)

70%

reported positive impact on business (Fitzpark)



IDEA 5 – CASE STUDY 1

Experiment with road space and travel networks

IDEA 5 – CASE STUDY 2

Experiment with road space and travel networks

CREATE CONDITIONS FOR INCREASED UPTAKE OF ACTIVE TRAVEL

What is the aim?

Initiatives should **create a dedicated network for walking and cycling** to cut down vehicle trips where they can be substituted, improve population health and well-being, and transform streets into safer and more vibrant spaces.

What do we mean?

Local authorities should prioritise the creation of a culture for cycling and walking by establishing seamless and safe networks in order to make these modes truly practical for everyday trips. This will not only cut down vehicle trips, emissions, congestion, accidents, but also promote general health and well-being of the population at all ages.

On the following page we present just a few specific actions local authorities can take now to replace vehicle trips with walking and cycling trips.



IDEA 6

What exactly?	Potential partners	Benefits
Create a continuous high-quality cycle lane on a key corridor, with minimum widths and segregation	Cycle and safer streets advocacy groups, healthcare providers, local businesses that would benefit from increased foot/cycle traffic.	Reduced car traffic, safer, more vibrant streets, physically and mentally healthier population, encourages a diverse range of users to cycle.
School streets network and a walk/cycle to school policy for children above a certain age	Schools, cycle and safer streets advocacy groups, volunteer organisations for children. Schools/neighbourhoods could be responsible for organising groups to accompany/guide children.	Greater mobility and freedom for children on streets, more active children, early habit and acquaintance with cycling and walking as a means for traversing towns/cities.
If difficult to establish a permanent walking/cycling network, close down a network of streets to traffic regularly to create a weekly/monthly walking/cycling network	Cycle and safer streets advocacy groups, healthcare providers, local businesses that would benefit from increased foot/cycle traffic.	Encourages people who are unwilling to commit to a permanent change in transport modes to try using a cycle or walking for trips on special days when the walking/cycling networks are 'open'.
Encourage electric scooters/bikes to meet the needs of diverse contexts and users	Manufacturing or supplying businesses	Provides flexibility and variety of ways for people to traverse the city or town. Enables cycling in landscapes with steep slopes or over long distances.
Enhance quality of cycling and walking through technology and amenities - synchronised signals for cyclists at given speeds (green wave technology), repair stops, safe crossings for disabled active travellers	Local businesses offering cycling equipment or repairs, advocacy groups, designers.	Improves the experience of walking and cycling and makes it a practical option for a larger share of population.

How could this be funded and delivered?

This action is low to medium cost with high impact. It requires local authorities to heavily engage with community organisations, schools, and volunteer groups. To make permanent changes to the street network, funding would be required but would yield significant benefits – particularly from potential decreased healthcare costs for the local authority over the long term due to the direct improvement in health of the general population.

BEAT THE STREET

Reading, UK, 2014-2016

What?

The Beat the Street initiative aims to make active travel fun by using the street as the setting for a real-life game.

How?

In Reading, the Beat the Street initiative took place during April and May for three consecutive years and was funded by Reading Borough Council. People were challenged to see how much they could walk, run, or cycle. By tapping their cards or fobs on "Beat Boxes" located across town, they collected miles which then translated into rewards, such as lucky prize draws, team competitions, vouchers to be spent locally, etc.¹²

Intelligent Health helps Local Authorities implement the Beat the Street initiative within their jurisdiction. Sometimes these are funded by the council itself, sometimes by partnering with local stakeholders or National Lottery Funds.

In 2015,

24,000

people took part in the competition in Reading during April and May

84%

of participants agreed the programme made them **more active**

78%

reported they **walked more** and "**felt healthier**"

Popular demand has prompted the competition to be repeated **annually for 3-years in a row**¹³



IDEA 6 – CASE STUDY 1

Create conditions for increased uptake of active travel

SCHOOL STREETS

Multiple locations, UK, 2014- present

What?

School Streets involve closing streets outside schools to vehicles for 45 minutes at the start and end of the school day to reduce kerb side pollution and encourage a shift to more active modes of transport.

How?

Local Councils around the UK including Hackney, Edinburgh and Camden have started to pilot and implement School Streets schemes.

Hackney Council invited applications to the pilot scheme and assessed these for suitability based on NO₂ levels, traffic impact, existing active travel engagement and level of local support etc. The greatest benefits were derived in schools where car use was high and behaviour change campaigns were implemented.

To facilitate street closures the Council pilots used Experimental Traffic Regulation Orders (ETRO) and installed signage indicating operating times. Enforcement during the closure can be undertaken by Automatic Number Plate Recognition (ANPR) or police presence, this also presents an opportunity to recoup some scheme costs through Penalty Charge Notices (PCNs).

43%

reduction in driven school trips during pilot¹⁴ (Camden)

3.8%

reduction in NO₂ levels overall on school days – likely much greater during times of closure (Camden)

6%

decrease in driving to/ from school (Edinburgh)

66%

of parents and

61%

of residents agreed that streets with vehicle restrictions felt safer during operating times (Edinburgh)¹⁵

NO_x levels decreased by

1,631g/km

(Edinburgh)

Proportion of children cycling to project schools **increased by**

50%¹⁶

(Hackney)

Traffic outside schools **reduced** by around **two thirds** (Hackney)

IDEA 6 – CASE STUDY 2

Create conditions for increased uptake of active travel



MAXIMISE USE OF THE PUBLIC TRANSPORT NETWORK

What is the aim?

Initiatives should **improve the quality of service and enhance the incentives** associated with using public transport.

What do we mean?

The different levers that control the user’s desire to choose public transport – such as price, comfort, convenience, travel time, information, accessibility, flexibility – should all be considered to come up with measures to attract people towards public transport for at least some of their trips.

On the following page we present just a few specific actions that local authorities can take now to maximise the use of public transport. These ideas centre on bus initiatives due to a focus on identifying near-term actions and the relative ease of instating or improving bus service in comparison to rail.

What exactly?	Potential partners	Benefits
Turn an existing route into a ‘super’ bus route (a high priority, high quality, ‘bus rapid transit’ type service during specific hours of demand) or provide a free bus shuttle within a popular commercial or tourist area	Service operators, major employers and businesses, commuters who are stuck in traffic (use data to detect and engage) along the bus route.	Potential to generate ridership along a strategic route (one with high level of congestion) and change perception of public transport in towns and cities where service is generally limited. Success of such a project would generate further demand for public transport and could potentially open up funding sources to improve bus service along other routes.
Discount off-peak travel on public transport	Bus and rail operators, employers.	Encourages people to consider making non-commute trips via public transport. Also encourages commuters to consider making their trip to/from work slightly off-peak – lessening crowding and stress on public transport during peak commute periods.
Bus-only streets or zones	Local businesses, bus operators, volunteer organisations.	Offers priority to bus service along key routes – enabling higher quality and competitive public transport service. Benefits town-centres by enabling density and improving air quality.

How could this be funded and delivered?

This action is relatively high cost with high impact. Changing the perception and practicality of using public transport should be a core focus for local authorities serving areas with substantial population or higher population growth. Central government funds or initiatives encouraging clean buses could be used to fund some of these improvements. The UK Department for Transport announced a £70m fund in February 2020 to support high-frequency ‘Superbus’ networks. Partnering with local businesses and employers along affected corridors could be a means to incentivise off-peak travel or generate funding for targeted improvements in bus service. These investments and initiatives would not be viable for all local authorities – local authorities who have congestion issues should strongly consider these measures along key corridors due to the high potential impact and benefits.



IDEA 7

SINGAPORE TRAVEL SMART REWARDS

Singapore, 2012-present

What?

Rewarding commuters who avoid travelling at peak times and across certain routes to relieve pressure on public transport.

How?

To understand commuters' existing travel patterns Singapore's LTA (Land Transport Authority) partnered with local employers and developed a travel planning tool open for all. This provided personalised travel plans maximising benefits for the individual and to the overall transport network. The more the person follows their personalised travel plan, the more rewards they get.

Additional incentives included off-peak discounts and monthly lucky draws based on the number of off-peak trips taken.

A marketing campaign ran alongside this at stations to inform commuter choices comparing off-peak cost savings to items such as a coffee¹⁷.

In only one year,

112,000

users signed up to the programme and started adapting their travel patterns to earn rewards

12%

increase in commuters travelling during the off-peak time in 2018¹⁸

There are currently

220

organisations and over 360,000 employees in the programme¹⁹

BWCABUS

Carmarthenshire and Ceredigion, UK, 2009-present

What?

Bwcabus is a demand responsive bus service connecting people to regional centres and bus routes.

How?

The service was developed in partnership between Carmarthenshire and Ceredigion County Council, the Wales Transport Research Centre, Welsh Government, Traveline Cymru, and bus operators Richards Bros and Morris Travel.

Passengers book their journey in advance over the phone and are collected from their nearest bus stop or their home if they have a disability. The service operates Monday – Saturday 7am-8pm. The Bwcabus service connects into local bus routes increasing ridership and allowing increased service provision. Since the launch the service has been expanded in Carmarthenshire and set up in rural parts of Pembrokeshire²⁰.

Bwcabus was initially funded by the Welsh Assembly Government, the European Convergence Fund and Carmarthenshire County Council.

51%

of users stated they **now use public transport more frequently**²¹

81%

of car owners stated they now **used their car less** since the introduction of Bwcabus

24%

are travelling to **new destinations** not previously available by public transport

IDEA 7 – CASE STUDY 1

Maximise use of the public transport network

WINNER OF \$1,500
TRAVEL SMART REWARDS
MONTHLY LUCKY DRAW

LEE SEUK JEE
OCTOBER 2017
Winner (General)

“This money came just in time. I will spend it on my kid’s tuition fees.”

IDEA 7 – CASE STUDY 2

Maximise use of the public transport network



MINIMISE IMPACT OF FREIGHT/ DELIVERIES

What is the aim?

Initiatives should **improve efficiencies relating to freight**, incentivising both the consumer and freight operators to make choices that will cut down trips and enable consolidation of goods and delivery.

What do we mean?

Local authorities should think about the behaviours, trends, and key factors influencing the demand for goods (and where these goods come from), as well as how these goods are delivered. Light Goods Vehicles (LGVs) are growing at a faster rate than any other type of vehicle in the UK associated with e-commerce, servicing and more²⁶. At present, there is vast potential for policy to play a more proactive role in influencing market demand to favour more sustainable options – while also reviewing transport and technological solutions for cleaner, more efficient trips.

On the following page we present just a few specific actions local authorities can take now to reduce the carbon impact of freight movements.

What exactly?	Potential partners	Benefits
Market local businesses that provide locally-sourced services and goods, enable and consolidate location of these businesses in central area	Business improvement districts, volunteer or advocacy groups, local businesses, small business grant funders.	Local purchasing and consumption would reduce traffic and emissions from the wider freight supply chain, boost local economy, help forge a local identity and community.
Actively regulate and manage door-to-door personal deliveries – establish pick-up areas within walkable distances in all dense zones within city/ town	Business improvement districts, couriers/parcel operators (who would lease parcel lockers if they are doing the final mile), local shops, landlords, developers.	Point-to-point specialised deliveries complicate optimising freight operations and cutting down freight trips. By managing the demand for such personalised trips, freight trips can be centralised and decreased overall.
Actively regulate and manage just-in-time deliveries	Landlords and developers.	'Just-in-time' deliveries complicate optimising freight operations and cutting down freight trips. By managing the volume of such specialised trips, freight trips can be centralised and decreased overall.
Consolidate deliveries and consider sustainable last-mile delivery solutions (e.g. cargo bikes) to final destination	Freight operators, logistics/freight forwarding companies, supply chain management/consulting firms.	Reduces LGV/Heavy Goods Vehicle (HGV) traffic and loading/unloading space requirements within town and city centres - cutting down emissions and congestion.



IDEA 8

How could this be funded and delivered?

Some of the actions listed above could be low cost with high impact. This would require local authorities to actively consider how they can use policy decisions to influence on-the-ground activity. Closely regulating certain types of 'purchasing and delivery behaviours' has the potential to significantly decrease trips and emissions due to freight.

MEACHERS GLOBAL LOGISTICS

Southampton, UK, 2012-present

What?

Southampton City Council (SCC) partnered with Meachers Global Logistics to develop The Sustainable Distribution Centre (SDC) to consolidate deliveries, reducing congestion and pollution across Southampton.

How?

The SDC offers services to both public and private sector to consolidate and therefore reduce the number of logistics trips around the city. A framework agreement for public bodies within a 20-mile radius of the SDC gave the operation critical mass needed for initial success. Key users include SCC, Southampton Hospital, Southampton University, Solent University and a range of other private and public companies²².

The SDC includes freight consolidation, shared storage solutions, reduction in HGV movements, out-of-hours utilisation and consolidated deliveries.

Funding for this was initially provided through the central government Local Sustainable Transport Fund to kick start the service but there was no commitment to funding from the Council following this.

Forecast to reduce HGVs travelling to city centre by up to

75%

(6,900 vehicles per year)

83,000
vehicle movements off the roads per year

£701k

operational cost savings for suppliers²³

33.4Mg/km

emissions total annual saving

IDEA 8 – CASE STUDY 1

Minimise impact of freight/deliveries



ZERO EMISSION DELIVERY (ZED)

Waltham Forest/multiple, UK, 2017-present

What?

ZED is a fast, convenient and zero-carbon alternative for last-mile deliveries.

How?

Waltham Forest Council partnered with ZED which uses bikes, trikes and electric van to courier packages between local businesses and their customers in the borough. ZED use a specifically designed technology platform to optimise delivery routes daily to ensure efficiency. ZED provides services to the Council including delivering library books to residents who are unable to leave the house.

To enhance benefits to the borough ZED employs local residents with knowledge of the area and offers a trial of their service worth £100 to local businesses²⁴.

Waltham Forest's partnership with ZED is funded by the Mayor's Air Quality Fund.

Saved an estimated

2,300kg

of CO₂ emissions in its first year (2017-2018)

Over

7,700km

cycled in its first year of operation (2017-2018)

Over

50,000

packages delivered over three years (2017-2020)

IDEA 8 – CASE STUDY 2

Minimise impact of freight/deliveries



ENCOURAGE CLEANER VEHICLES

What is the aim?

Initiatives should aim to **establish zero-emission vehicles as the norm** to ensure the increase in public transport or private vehicles does not lead to a corresponding increase in emissions.

What do we mean?

Maximum efforts to decrease demand would still imply having some vehicles on the road. To get to zero transport emissions part of the focus needs to be on a plan to get to zero-emissions for the entire public transport fleet for all local areas. Charging infrastructure, incentives/policy measures for fleet operators and private vehicle owners are all key elements of a route map to low-impact transport.

On the following page we present just a few specific actions local authorities can take now to ensure vehicles across all modes of transport meet zero-emission standards.

What exactly?	Potential partners	Benefits
Electric charging (or induction charging) infrastructure in tourist or central areas	Manufacturing/supplying businesses, parking operators/suppliers in tourist areas.	Such an initiative can simultaneously attract tourists and residents by making electric charging a special attraction.
Establish electric or zero-emission (potentially hydrogen) buses as a minimum standard	Manufacturing/supplying businesses, bus operators, researchers on scaling alternative fuels.	Combines the benefits of high-occupancy public transport with zero-emission fuels – making it an ideally low-impact mode of transport.
Timeline and route map for achieving zero-carbon fleet for public transport in local area		Establishes a plan with concrete steps, measurable targets, and tangible grasp on funding requirements to achieve zero-carbon fleet.

IDEA 9



How could this be funded and delivered?

This action is relatively high cost. Local authorities could potentially apply for grants for increasing the uptake of electric vehicles and electric buses. Authorities should seek to work with private sector suppliers seeking to expand their network or find places to trial technology. The UK Department for Transport announced a £50 million fund in February 2020 that local authorities can bid for to fund electric buses.

GNEWT ELECTRIC VEHICLE TRIAL

ARUP PROJECT

London, UK, 2017-2019

What?

Innovative two-and-a-half-year electric vehicle trial partnership between The Mayor of London and Gnewt Cargo, testing light goods vehicles delivery and logistics in London.

How?

The trial comprised of a fleet of electric vehicles (EVs) enabled to collect live telematics data using GPS with on-board diagnostics. The data tracked journeys, fuel consumption, vehicle and delivery performance information, and the impact on the driver. The insights from the data were used to inform the mayoral policies and strategies required to deploy EVs, tackling air pollution and reducing carbon footprint.

The study also reviewed different EV charger types (smart and non-smart), potential route optimisation, daily charger power demand patterns and the potential for vehicle to grid technology.

This was part of the Low Emission Freight and Logistics trial, which was funded by the Office for Low Emission Vehicles and Innovate UK.

Commercial freight makes up **30%** of all traffic in central London²⁵

Equivalent diesel vans use **5 times** more energy than the EVs trialled²⁶

Trial vehicles covered longer distances than smaller EVs and delivered **25-35% more parcels** per week



IDEA 9 – CASE STUDY 1
Encourage cleaner vehicles

WIRELESS CHARGING ELECTRIC BUS TRIAL

ARUP PROJECT

Milton Keynes, UK, 2014-2019

What?

Five-year wireless charging Electric Bus trial to demonstrate the ability of an electric bus fleet to operate to the level of a regular public service timetable. Matching the reliability and cost of a conventional diesel bus fleet.

How?

Milton Keynes Council encouraged and collaborated in developing the trial, alongside Mitsui-Arup joint venture Wrightbus and Arriva.

The trial involved replacing the entire diesel bus fleet, which operated one of the main bus routes in the city (Route 7) with eight electric buses.

It was (and still is) not possible to provide sufficient on-board battery storage to enable the buses to run all day without returning to the depot for interim re-charging. This project was therefore focused on buses charging using power transmitted from a primary coil buried in the road, which is picked up by a secondary coil on the bus. Just 10 minutes parked over a coil will replenish two thirds of the energy consumed by the bus's route.

The clean buses prevented **5 tonnes of particulates and noxious tailpipe emissions** from the city's streets and approximately

270 tonnes of CO₂ each year from the atmosphere²⁷

Smaller **150kWH lighter batteries**, operate throughout the day without any need to return to the depot for interim re-charge

2.9 million bus km logged, and data collected

IDEA 9 – CASE STUDY 2
Encourage cleaner vehicles





Time to
take action

This document centres on enabling immediate action in the transport sector, and guiding local authorities on how they can start on the right trajectory in response to the climate crisis. If implemented, ideas from this document have the potential to create change and break loose a focused dialogue on a targeted response towards achieving zero-carbon transport in the UK. These early initiatives engaging all departments within local government to partner with a variety of stakeholders, are critical to understand what works on the ground and what needs to be re-structured.

The interdependencies amongst the drivers of climate change, the complexities in understanding the ‘right’ solutions, and the need to take action now also present inevitable challenges. We risk being overly simplistic in our tactics and so narrowly focused that we fail to achieve consensus on action, or deliver something that overlooks or acts as a barrier against the wider needs of society. But this is why taking action on something we know will help, and has multiple benefits, is critical.

We are by no means outlining the full path to zero-carbon transport here. Such a route map would need to consider the differences in local government resources and challenges across the UK. A route map would also require thinking about interventions at the regional level – as transport networks largely operate on and are driven by dynamics taking place on a regional scale. Local and regional authorities would need to be empowered through the means to generate funds and rights to make impactful decisions which would cut-down current inefficiencies.

Central government’s Transport Decarbonisation Plan has a critical role to play in actively leading a partnership with all levels of government and bringing clarity to the roles of local and regional governments in implementing the plan to zero-carbon transport.

As this comprehensive plan develops, we outline what local government can do today, this year, to start to fuel a long-term strategy. **It’s time to take action and through our experience we know there is a lot more that we all can do now.**

At Arup, we have a record of developing and implementing strategies to decarbonise cities and regions, maximising the benefits of sustainable transport. Our technical expertise extends beyond planning and onto supporting the implementation of plans through all stages, including finance and delivery. We have the knowledge and experience to support local authorities in thinking through the concepts presented in this document and helping to deliver them as impactful actions.

Authors | Key Contacts



Stephen Bennett
Stephen.Bennett@arup.com



Ritu Garg
Ritu.Garg@arup.com

Research



Hayley Al-Siaidi



Liani Baglietto Castellares

Footnotes

- Inrix. (2020). Congestion Costs U.K. Nearly £8 Billion in 2018. [online] Available at: <https://inrix.com/press-releases/scorecard-2018-uk/> [Accessed 13 Feb. 2020].
- Public Health England (2019). Review of interventions to improve outdoor air quality and public health. [online] London: Public Health England, p.5. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/795185/Review_of_interventions_to_improve_air_quality.pdf [Accessed 13 Feb. 2020].
- Living Streets. 2019. What's The WOW Factor?. [online] Available at: <https://www.livingstreets.org.uk/news-and-blog/blog/whats-the-wow-factor> [Accessed 9 March 2020].
- Living Streets. 2019. Why Oxfordshire Wows. [online] Available at: <https://www.livingstreets.org.uk/about-us/our-work-in-action/why-oxfordshire-council-runs-wow> [Accessed 9 March 2020].
- British Telecommunications plc, 2006. Case Study BT Workstyle. [online] London, pp.1-6. Available at: https://www.bt.com/static/ff/media/pdf/campaigns/consumer_goods/bt%20workstyle_cs.pdf [Accessed 9 March 2020].
- British Telecommunications plc, 2007. Flexible Working – Can your company compete without it?. [online] London, pp.1-6. Available at: https://www.bt.com/static/ff/media/pdf/flex_working_wp_07.pdf [Accessed 9 March 2020].
- TheCityFix (2014). How ciclovías contribute to mobility and quality of life in Latin America and in cities worldwide. Available at: <https://thecityfix.com/blog/ciclovias-mobility-quality-life-latin-america-cities-worldwide-dario-hidalgo/>
- Lima Como Vamos (2012). Lima Opina en el Ciclodía. Available at: <https://www.iimacomovamos.org/lima-opina/ii-lima-opina-en-el-ciclodia/>
- StreetsBlogSF (2013) New Stats on the Health and Business Benefits of Sunday Streets. Available at: <https://sf.streetsblog.org/2013/06/14/new-stats-on-the-health-and-business-benefits-of-sunday-streets/>
- Open Streets & 880 Cities (2016) Open Streets and Local Economies. Available at: <https://www.880cities.org/images/openstreets-template/pdf/open-streets-local-economies.pdf>
- Plymouth.gov (2020). Welcome to Plympton. Available at: <https://www.plymouth.gov.uk/parkingandtravel/plymotion/welcomeplymotion>
- Intelligent Health (2020) Beat the Street. Available from: <https://www.beatthestreet.me/>
- Intelligent Health (2020) Best foot forward for Reading as Beat the Street returns! Available from: <http://www.intelligenthealth.co.uk/best-foot-forward-for-reading-as-beat-the-street-returns/>
- Camden Borough Council and Transport for London, 2017. Healthy School Streets - Opening Streets To Children. [online] London: Camden Borough Council, pp.1-16. Available at: <https://www.camden.gov.uk/documents/20142/0/Healthy+School+Streets+Initial+Report+Final.pdf> [Accessed 10 March 2020].
- Transport and Environment Committee, 2016. School Streets Pilot Project Evaluation. [online] Edinburgh: City of Edinburgh Council, pp.1-31. Available at: http://www.portobellocc.org/pccpn/wp-content/uploads/2016/08/Item_7_2_School_Streets_Pilot_Evaluation.pdf [Accessed 10 March 2020].
- Hackney Council. 2019. Hackney Council Launches Nationwide Blueprint To Ban Traffic Outside Schools. [online] Available at: <https://news.hackney.gov.uk/hackney-council-launches-nationwide-blueprint-to-ban-traffic-outside-schools/> [Accessed 10 March 2020].
- Land Transport Authority (2020) Travel Smart by Planning Journey. Available at: https://www.lta.gov.sg/content/ltagov/en/getting_around/public_transport/plan_your_journey.html#travel_smart_by_planning_your_journey
- Railway-News (2019) Singapore LTA to Introduce Travel Smart Rewards. Available at: <https://railway-news.com/singapore-lta-travel-smart-rewards-programme/>
- Land Transport Authority (2018) Factsheet: Commuters Can Travel Smarter with Travel Smart Information. Available at: <https://www.lta.gov.sg/content/ltagov/en/newsroom/2018/7/2/factsheet-commuters-can-travel-smarter-with-travel-smart-information.html>
- Bwcabus. 2020. Home Page - Bwcabus. [online] Available at: <https://www.bwcabus.traveline-cymru.info/> [Accessed 11 March 2020].
- Bwcabus, 2011. Bwcabus - Delivering A Public Transport Revolution In Rural Wales. [online] Bwcabus. Available at: <https://www.polisnetwork.morris-chapman.com/uploads/Modules/PublicDocuments/bwcabus-note.pdf> [Accessed 11 March 2020].
- Southampton.gov.uk. (2019). Case Study 2 - Meachers Global Logistics. [online] Available at: <https://www.southampton.gov.uk/environmental-issues/pollution/green-city/case-study-meachers.aspx> [Accessed 27 Feb. 2020].
- Trall, A. and Whittle, G. (2018). Future Public Sector Logistics Consolidation.
- ZED Waltham Forest. 2019. Local Authorities. [online] Available at: <https://zedwalthamforest.co.uk/local-authority/> [Accessed 9 March 2020].
- London City Hall. (2019). Electric delivery vehicle trial. [online] Available at: <https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/electric-delivery-vehicle-trial> [Accessed 26 Feb. 2020].
- Greater London Authority (2019). Final Data Analysis Report. Mayor of London/Gnewt Cargo Electric Vehicle Trial. [online] London: Greater London Authority, pp.1-28. Available at: https://airdrive-secure.s3-eu-west-1.amazonaws.com/london/dataset/low-emissions-project-diesel-vehicle-baseline/2020-01-20T08%3A30%3A39/Final%20Data%20Analysis%20Report.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAJJDIMAIVZJDICKHA%2F20200226%2F%2F%2F%2Faws4_request&X-Amz-Date=20200226T154821Z&X-Amz-Expires=300&X-Amz-Signature=6575ec67876104caa337b9242e1cd72d6d659d808204194f85ae210dcaa08e7d&X-Amz-SignedHeaders=host [Accessed 26 Feb. 2020].
- Fernandez, C. (2014). World's most demanding electric bus route launched in Milton Keynes. [online] Arup.com. Available at: <https://www.arup.com/news-and-events/worlds-most-demanding-electric-bus-route-launched-in-milton-keynes> [Accessed 28 Feb. 2020].
- Nottingham City Council. (2020). Workplace Parking Levy. [online] Available at: <https://www.nottinghamcity.gov.uk/information-for-residents/transport-parking-and-streets/parking-and-permits/workplace-parking-levy/> [Accessed 18 Feb. 2020].
- Nottingham City Council. (2019). Nottingham 2028. [online] Available at: <https://www.nottinghamcity.gov.uk/cn2028> [Accessed 18 Feb. 2020].
- Nottingham City Council (2019). Carbon Neutral Nottingham 2020 – 2028 Draft Plan. [online] Nottingham: Nottingham City Council, pp.1-53. Available at: [http://file:///C:/Users/hayley.al-siaidi/Downloads/Nottingham's%202028%20Action%20Plan%20\(1\).pdf](http://file:///C:/Users/hayley.al-siaidi/Downloads/Nottingham's%202028%20Action%20Plan%20(1).pdf) [Accessed 18 Feb. 2020].
- Fast Company (2019). What happened when Oslo decided to make its downtown basically car-free? Available at: <https://www.fastcompany.com/90294948/what-happened-when-oslo-decided-to-make-its-downtown-basically-car-free>
- Streetsblog USA (2020). Vision Zero! Norwegian Capital Completely Quashes Road Deaths. Available at: <https://usa.streetsblog.org/2020/01/03/vision-zero-norwegian-capital-completely-quashes-road-deaths/>
- ITDP (2011) Europe's Vibrant New Low Car(bon) Communities. Available at: <https://itdpdotorg.wpengine.com/wp-content/uploads/2014/07/16.-LowCarbonCommunities-Screen.pdf>
- Bath & North East Somerset Council (2017). Our plan to get Bath moving. Available at: <https://www.bathnes.gov.uk/our-plan-to-get-bath-moving#newdev>
- Transport for New Homes (2019). Transport for New Homes Award: Bath Riverside. Available at: <https://www.transportfornewhomes.org.uk/transport-for-new-homes-award-bath-riverside/>
- Bath Riverside Travel Plan (2019). Your Travel Choices. Available at: http://www.bathriversidetravelplan.co.uk/assets/bath-riverside_travel-choices_brochure.pdf

Arup is an independent firm of designers, planners, engineers, consultants and technical specialists. Together we help our clients solve their most complex challenges. We strive to find a better way and shape a better world.

April 2020

ARUP

arup.com