

The Bristol Method

how to reduce traffic and its impacts

In it for good

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Editors and contributors

Dr Jo Barnes

Air Quality Management Resource Centre, University of the West of England

Steve Crawshaw

Programme Co-ordinator (Air Environment), Bristol City Council

Professor Graham Parkhurst

Centre for Transport and Society, University of the West of England

Jon Toy

City Transport, Bristol City Council

Ben Robinson

City Transport, Bristol City Council

Dr Miriam Ricci

Centre for Transport and Society, University of the West of England

Dr Caroline Bartle

Centre for Transport and Society, University of the West of England

Dr Steve Melia

Centre for Transport and Society, University of the West of England

Dr Laurence Carmichael

WHO Collaborating Centre for Healthy Urban Environments, University of the West of England

Dr Adrian Davis

Independent Consultant on Health and Transport

Introduction

Bristol is a thriving city with a burgeoning population and employment. Between 2001 and 2011, the resident population grew by 10% to more than 428,000¹. At the same time the number of jobs has grown from 215,000 in 2001 to 236,000 in 2011 and both population and employment are forecast to continue to increase. Bristol already has among the highest rate of car ownership of the English Core Cities² and per capita car ownership is also increasing.

Congestion leaves Bristol with some of the lowest peak hour traffic speeds of major UK cities and air quality fails to meet national and EU standards throughout much of central Bristol. Many of the car journeys are short (in 2011, almost 44,000 people living in the Bristol Local Authority area commuted less than 5km to work by car). Relatively short trips often offer greater potential for transfer to sustainable modes.

While road transport can be understood to be beneficial from an economic perspective, high levels of traffic in urban areas results in several negative consequences for residents and visitors. Road traffic has negative impacts for public health in terms of increased air and noise pollution, traffic casualties and reducing the liveability of urban areas. The perpetuation of sedentary lifestyles caused by car dependence can lead to health impacts such as obesity and cardiovascular problems. Congestion caused by the current levels of road traffic using Bristol's constrained highway network results in significant economic costs due to delays and journey time reliability. The emissions of climate forcing pollutants in Bristol's urban area contribute to global climate change impacts.

Cities across Europe face difficulty in dealing with the impacts of road traffic. Many of the key policy 'levers' to influence traffic and emissions are not within the power of local authorities. For example, the use of diesel fuel is particularly associated with poor air quality, but taxation policies that influence the use of different fuels are usually set by national governments.

The UK's Local Air Quality Management regime has led to a good understanding of the extent and scale of the pollution problem, but has proved to be inadequate to deal with the challenge of solving it. Local authorities, including Bristol, are focussing efforts on enabling modal shift, cleaner buses, and encouraging walking and cycling. However, despite these efforts, it is likely that UK cities will continue to be in breach of EU air quality objectives for several years and traffic impacts will continue to harm public health.

This module focusses on the air quality impacts and the traffic reduction interventions which are being used to improve the current situation. In addition to improving air quality, these interventions will help to reduce the other negative impacts of road traffic which are described briefly overleaf.

¹ All population, employment and car ownership data quoted are from the 2001 Census and 2011 Census. ONS Crown Copyright Reserved,

² The eight Core Cities in England are Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle upon Tyne, Nottingham and Sheffield

Improving air quality

Understanding of the health impacts of pollution has improved in recent years. A 2013 study commissioned by Bristol City Council, using robust government figures on mortality and modelled concentrations of fine particles (PM_{2.5}), showed that 188 Bristol City residents' deaths could be attributed to air pollution in 2010, with 24 deaths attributable to local road transport emissions.

These deaths due to air pollution compare, on average, to nine people killed in road traffic collisions in Bristol each year. In addition to deaths, 52 additional hospital admissions for breathing difficulties and 42 for heart problems can be attributed to air pollution in 2010. The cost of the health effects of exposure to airborne particles in Bristol is estimated at around £83 million per year. This can be contrasted with the cost of road traffic accidents which is estimated at £40 million per annum.

Recent research from King's College in London has estimated that deaths in London from NO₂ are broadly equivalent in number to those from PM_{2.5}, so the actual mortality from both pollutants in Bristol may be double the number quoted in the 2013 BCC study.



pollution levels are above UK and European air quality standards for NO₂. Concentrations of PM₁₀ are below the standards, but can still cause health effects as there is no safe level for exposure to these particles. Both pollutants are mainly emitted by road traffic. Bristol declared an Air Quality Management Area (AQMA) in 2001 for NO₂ and PM₁₀ on a precautionary basis. An Air Quality Action Plan (AQAP) was published in 2004, which set out ambitious plans to reduce traffic emissions. Unfortunately some of the projects within the plan were not implemented due to a lack of funding and changing priorities. In 2006 a new Local Transport Plan was published for Bristol and the surrounding authorities (the West of England grouping). Air Quality was incorporated into this plan in line with government recommendations.

From 2006 to 2011 it became apparent that NO₂ in cities, including Bristol, was not declining as predicted, and in some years concentrations increased leading to expansion of the AQMA. In 2011 research indicated that this was primarily due to increased proportions of diesel vehicles which did not meet EU emissions limits when driven in real-world conditions. The ongoing challenge for Bristol, as with many UK local authorities, is to maintain a robust monitoring network in the face of budgetary cuts and the current revision of the Local Air Quality Management regime, and to come up with local solutions to a manifestly national road transport problem.

Air quality action plan

Data from Bristol's monitoring network has shown that

Case study: Measuring the Air Quality Impacts

Bristol City Council has monitored air pollution for several decades to help protect citizens' health. In the 1960s and 1970s industrial pollution was the focus. During the 1980s lead in petrol became a cause for concern. The Environment Act (1995) imposed a duty on local authorities to manage air quality strategically, partly in recognition of the increasing road traffic pollution problem.

The city's monitoring network adapted to these changes. High-specification analysers were installed to measure nitrogen dioxide (NO₂), small particles (PM₁₀) and ozone and national government installed a monitoring site in the city centre. In addition to the continuous analysers, Bristol City Council expanded its network of diffusion tubes (low-cost passive devices which measure NO₂ and benzene). By 2005 Bristol had 12 continuous analysers and a network of over 200 diffusion tubes funded by the council and central government grants: probably the most comprehensive monitoring network for a city of this size in the UK at that time. Bristol's comprehensive air quality monitoring sites are located near busy roads to capture data related to residential exposure to traffic pollution.

Monitoring air quality requires significant resource, including upfront costs, to cover the purchase of suitable instruments, and ongoing staff resource. Air quality monitoring in Bristol uses NO₂ diffusion tubes to give spatial coverage, and real-time chemiluminescence instruments to give accurate and high-quality data at 15-minute intervals. Equipment support services are contracted out, but in-house staff can be used for Local Site Operator (LSO) tasks, which include regular site visits to calibrate equipment, place and collect diffusion tubes and ratify data. Bristol also offers LSO support to neighbouring authorities on a chargeable basis and bids for LSO contracts for the national pollution monitoring network. Bristol, like many large UK cities, employs trained air quality professionals to run monitoring systems, liaise with transport colleagues to develop action plans, and write statutory reports. Bristol has chosen to maintain "ownership" of air quality by producing all of its statutory reporting in-house rather than contracting out to consultants.

Other benefits of reducing traffic

Although air quality is the primary lens through which this module is written, there are numerous other health benefits to reducing traffic, as well as improvements to wellbeing and community spirit.

Traffic Casualties

In 2013, 12 people were killed in road collisions in Bristol and 94 others were seriously injured. Apart from the obvious personal impact of these incidents, the economic cost of these collisions for Bristol is over £40 million. The risk of death or serious injury on Bristol's roads is not equally distributed. Those inside vehicles are significantly protected by the many safety features to ensure occupant protection. Yet year on year those who pose little risk to other road users disproportionately bear the brunt of the casualty burden. For example, in 2013, 55% of all killed and seriously injured casualties in Bristol were pedestrians and cyclists. Killed and seriously injured casualties for 2013 comprised 40 pedestrians, 19 cyclists, 31 motorcyclists and 16 motor vehicle occupants.

Removing barriers to active travel

Fear of injury also deters many people from making healthy and sustainable travel choices. Traffic speeds and volumes are inversely correlated to levels of walking and cycling. Interventions to cut traffic speeds and volumes promote walking and cycling and bring public health gains accentuated by critical mass effects. With more cyclists or walkers, safety increases due to their visibility and popularity, making drivers more conscious of vulnerable road users. Reducing the fear of being injured by reducing both the perception of risk and the incidence of injury, can also help reduce pollution, improve reliability of journeys, reduce delay, and support increasing levels of active travel.

Economic Costs

Congestion-related delays and lost business are estimated to cost the local economy of Bristol more than £600 million a year.

Climate change

The transport sector is responsible for 27% of energy consumed, accounting for 22% of Bristol's CO₂ emissions. The decrease in emissions in transport has been lower than for the non-domestic and domestic sectors. 94% of fuel consumed in the sector is by vehicles other than buses. As a result there is significant opportunity to reduce emissions particularly from passenger cars through reducing the number of trips and encouraging modal shift to public transport, cycling and walking.

Bristol is playing its part in reducing emissions of climate forcing gases from the transport sector by adopting transport policies that prioritise sustainable transport modes and reduce car dependence. Specific policies that are being implemented are:

- A Metro – Bus system costing £265m which will include 10km of new cycle network, 3 new routes and 50 new hybrid drive vehicles
- A cycle strategy which will invest £7m year on year to deliver a high quality "8 – 80" cycle network across the city region
- Urban Traffic Control and management of the highway network.
- Conventional public transport improvements.

Encouraging use of electric vehicles

Increasing awareness of climate change and rising fuel and oil prices and the need for sustainable transport systems with lower emissions have prompted most developed countries to step up the research, demonstration and deployment of transport systems that use more energy-efficient and less fossil-fuel-dependent vehicles

In this context, the promotion of electric vehicles (EVs) is seen as one of the most effective ways to radically improve the sustainability of the transport system, with particular benefits for local air quality. EVs do though need to be powered by low carbon electricity and to be part of an efficient mobility strategy. Source West has taken the lead in promoting EVs in Bristol and surrounding areas. Its main activities are summarised below.



Growth of Bristol's regional electro mobility programme

- 

2011
Bristol utilised Section 106 funding to install charge points in public car parks.
- 

2012 - 2015
Sub-regional funding received from Local Sustainable Transport Fund (LSTF). The Sustainability & Climate Change Service, part of Bristol Futures, works closely with transport in 5 local authorities to create the Source West network of over 200 charge points in business and public access sites.
- 

2012 - 2015
The Sustainability & Climate Change Service leads the UK pilot for the EU Commission's ICT4EVEU electro mobility pilot.
- 

2013 - 2015
The Sustainability & Climate Change Service installs 15 rapid chargers across the source West region through OLEV funding (£750k).
- 2013 - 2015**
The Sustainability & Climate Change Service works with the Bristol Workplace Programmes to install charge points for private Bristol City Council EV pool car use. Additional OLEV funding (£21k) utilised.

Source West promotes the introduction of electric vehicles (EVs) into the South West including Bristol City, Bath and North East Somerset, South Gloucestershire, North Somerset and Gloucestershire. It is funded by Bristol City Council through the UK's Local Sustainable Transport Fund (LSTF). Source West's approach is unique compared to other regional networks in the UK in that it uses a range of suppliers and funding streams which will create a low - cost and sustainable network.

Source West provides information about EV ownership and the region's expanding recharging network and offers free access to standard local charging points to individuals and businesses in the region who purchase an EV from the government's approved list. The Source West network comprises over 200 EV charge points located in businesses and public access sites across the five local authority areas.

Source West has been supported by the European Commission's ICT for Electric Vehicle Enhancing the User Experience (ICT 4 EVEU) project which assessed the deployment of new digital and communications technologies for EVs in several pilots across Europe. The Bristol ICT 4 EVEU pilot focused on the integration of commuters in the urban area of Bristol and with a high movement from locations nearby

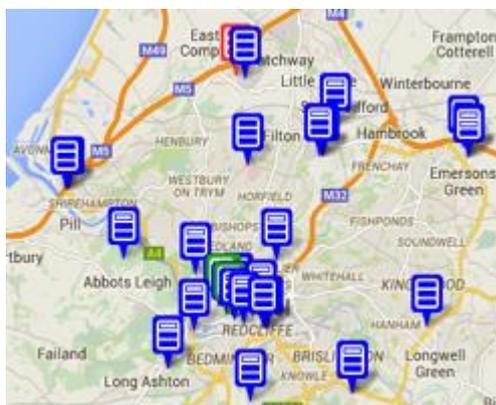
Through funding from the Office for Low Emission Vehicles (OLEV) and Charge Your Car (installers), Source West has introduced 15 rapid chargers. Rapid chargers enable compatible electric vehicles to be 80% charged in 20 to 30 minutes. Rapid chargers are being introduced across the UK to enable longer journeys to be covered by electric vehicles.

Source West members receive

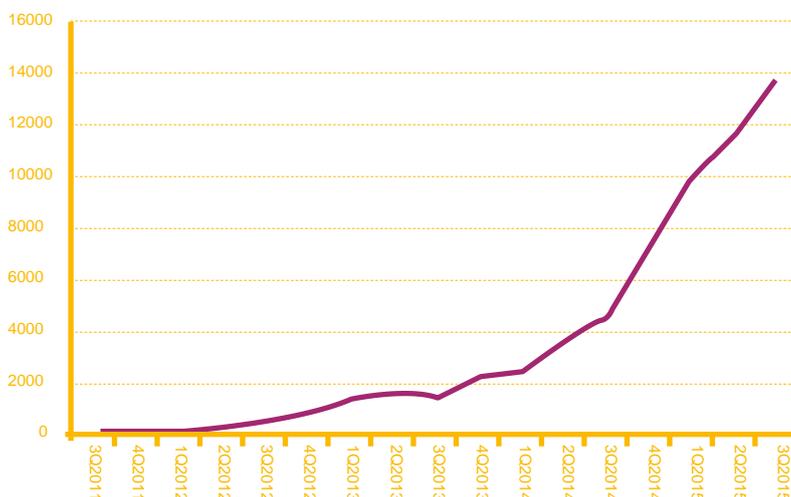
- A 'free' RFID (radio frequency identify) card giving access to Source West charging points in public car parks and in other cities signed up to the 'source' brand. Parking fees are paid by the vehicle user but refuelling is free.
- Access to intelligent communications with the charging network via a smart phone which enables booking and reservation of charging points. Drivers have the freedom to roam across charging networks with a single card.
- Subsidy towards the cost and installation of radio-linked charge points for both home and work. To qualify for this subsidy individuals and companies must move to a 'green' electricity supplier
- Access to a national & European network of over 15,000 charging units.



Source West charging points



Kwh per quarter



Encouraging alternatives to car ownership

Bristol was one of the first British cities to establish a car club or car-sharing scheme. Bristol now has around 100 on-street bays and there is potential for considerable expansion.

The early schemes were originally the initiative of residents' organisations. Soon after, support was given to help establish a car club network in Bristol as part of the EC-funded CIVITAS VIVALDI project. In 2011, a framework agreement involving car sharing operators was established to enable Bristol City Council to invest funds collected from property developers in order to expand the network. This approach was complex and in recent times the preferred mechanism has been a more straightforward one, involving developers working directly with car sharing operators to deliver new facilities.

There are currently three car-sharing operators in Bristol: City Car Club, Zipcar and Co-Wheels. Each operator has pursued a somewhat different approach to the market. City Car Club, which is the largest operator in Bristol, has emphasised working with Bristol City Council to allocate on-street bays in the inner city neighbourhoods surrounding the city centre. Streetcar has a business model which combines securing access to private off-street parking for some bays with on-street bays. Co-Wheels is a social enterprise rather than a private business. Its focus has mainly been on making car sharing available within large employers, particularly in the public sector, although this is combined innovatively with allowing Co-Wheels members who are not employees of the host organisation to use the vehicles outside business hours.

Car-sharing schemes in Bristol attract users from a range of profiles including young, environmentally-concerned, well-educated, relatively high-income households and low income households which would otherwise not be able to afford access to a car. The demand for car clubs in low-income areas may be partly explained using spatial-statistical analysis of 'gentrified' neighbourhoods; car club users tend to be well-educated individuals in relatively low-paid professions who choose to move into dense suburbs fringing the city centre (where there are relatively low accommodation costs), rather than the 'traditional' residents of those areas.

Factors that have been found locally to be important in promoting car sharing are:

- providing clusters of car-share vehicles in particular areas
- the immediate physical location (i.e. parked in area perceived to be secure)
- a sense of 'ownership' by the community.

Parking policy is also important for creating the conditions for successful car sharing. Bristol's parking strategy promotes a maximum provision of residential parking ranging from one space per one-bedroom flat to 1.5 spaces for houses of three or more bedrooms. However, lower provision levels than this are encouraged in the central area, including car-free housing in some cases.

Bristol City Council follows a formal consultation process before installing new dedicated car-sharing bays, which involves local councillors and the legal department and can take up to nine months. The relationship between car-sharing development and parking controls in Bristol provides some useful lessons. Car sharing initially spread in areas where there was parking pressure due to dense residential development but no controls. Notably, in the city centre itself, car sharing arrived later because dedicated parking bays were more complicated to secure in administrative terms and where parking was charged, there would be a loss in parking revenue.

More recently, Bristol has introduced a number of residents' parking schemes (RPS) in the suburbs immediately around the city centre, in which the majority of parking spaces are for permit holders only. This policy may encourage car-sharing as permits are limited and charged. New car club bays can be introduced as part of regular RPS scheme reviews.

Discouraging commuters from driving: residents parking programme

By the end of 2015, Bristol City Council plans to have in place an inner ring of 15 Residents' Parking Schemes (RPS) in neighbourhoods around the city centre controlled parking zone (CPZ) (see image).

Of these 15 schemes, 12 will have been taken from planning to implementation in less than three years, following the successful introduction of the first three RPS in 2011 and 2012. The RPS programme is designed to be self-financing with construction and operating costs funded by pay and display and permit income.

RPS is part of the West of England sub-regional transport strategy, which includes investment in bus, rail, park and ride and walking and cycling, behaviour change programmes, and the roll out of Bristol-wide 20 mph speed limits.

The objectives of the RPS programme are two-fold:

01. In local neighbourhoods, to remove all day parking by commuters and manage unsafe and obstructive parking in order to improve liveability and free up spaces for residents, visitors, customers and essential business vehicles.

02. To support city-wide strategies to manage congestion and reduce emissions caused by high levels of car commuting and to help to stimulate enhanced public transport services and more cycling and walking.

Of the 106,000 people working within the proposed RPS areas and the City Centre CPZ in 2011, more than 46,700 travelled by car. By 2013, Bristol was the last Core City in the UK without significant RPS coverage and very large numbers of these commuter vehicles parked in residential streets.



How did Bristol do it?

In the RPS areas, all parking places on the roads are either reserved for permit holders or designated for short stay visitors (pay and display) or allocated as specific provision for disabled people, for loading or car club vehicles. RPS also enables a systematic review of locations where parking is unsafe or obstructive and needs to be prohibited.

The approach was to introduce all the RPS areas quickly, to minimise displacement of commuters from one area to another. The 15 RPS areas are home to 71,000 residents and 44,000 jobs (Source: 2011 Census). A further 62,000 people work in the encircled CPZ. Continual engagement to inform and consult with residents, businesses and community groups has been essential. Communities were consulted on the design details of each scheme, but were not given the option to opt out altogether. The schemes were delivered in-house by Bristol City Council.





Leadership

Parking evokes very strong opinions. Implementing a programme of this scale required sustained conviction and resolve by political leaders and senior officers.

Managing opposition

Negative views about RPS were strongest during the statutory consultation and construction. Most opposition to RPS dissipated rapidly once schemes became operational and people experienced the benefits. Programming the more controversial pre-implementation phase to avoid local elections is advisable.

Robust evidence that RPS is successful and popular elsewhere, and that businesses thrive under the scheme is valuable to reassure concerned stakeholders in the planning stage. Opposition passes but a small minority of implacably opposed people can continue to make a lot of noise. Before and after monitoring of physical effects and user perceptions is very helpful in responding to negative campaigning.

It is important to make the user experience as smooth as possible in terms of flow of information, responses to design requests and processing permit applications. Bristol is committed to consulting on design reviews of each RPS six months after implementation, and then annually, to enable designs to be adapted. This is helpful in managing late requests for changes during scheme implementation.

Engaging communities

A clear description of the RPS objectives and benefits and the alternative travel options for commuters is essential from the outset. Investing staff time to refine the designs through informal consultation early in the process pays dividends in terms of public acceptance. This needs to be supported by a consistent design rationale and explanations for why some design requests are not deliverable. A very ambitious early programme included an additional eight ‘outer areas’, which were withdrawn in June 2013 in the face of vociferous public opposition.

Consistency of approach

The different RPS areas in Bristol are diverse in terms of demographics and urban character. Some flexibility is important to adapt designs to local parking needs and physical constraints and to avoid perceptions of a “one size fits all” approach. However, adaptations should avoid changes which would create inequity between RPS areas or make the schemes complex to administer. Permit and pay and display costs should be standardised in all areas.

What worked well

The RPS are transforming the neighbourhoods, increasing availability of parking spaces for residents, reducing circulating traffic and greatly reducing pavement parking. There is early evidence of significant modal shift and there are increasing requests for RPS in neighbourhoods beyond the 15 RPS areas.



Summary of engagement on the Bristol RPS programme

- 30 drop-in sessions and events with residents and businesses to explain the RPS objectives and refine the designs.
- More than 250 meetings with individual businesses, schools and community groups and ongoing liaison with major employers and organisations representing business interests.
- Dedicated staff on hand for three years to assist residents and organisations with advice and design requests.
- Engagement with faith groups and organisations representing disability, gender, older people and black and minority ethnic interests.
- A ‘check and sign’ service to help with permit applications in one area with low levels of English literacy.

Travel advice and support service

The Council provided a free travel support service, to help commuters adapt to the parking constraints. The advisors have approached and offered support to 1,325 businesses in RPS areas, and provided intensive engagement with 122 businesses and grant funding worth £234k (enabling projects totalling over £0.5 million) for businesses in Bristol in 2014 and 2015.



Before RPS in Clifton Village



After RPS in Clifton Village

Encouraging uptake of public transport and active travel

Personalised Travel Planning (PTP) is a targeted marketing technique involving the provision of travel information and advice to individuals, with the aim of encouraging them to make more environmentally sustainable travel choices.

Through one-to-one conversations between individuals and trained field officers – on the doorstep, by telephone, at community events or at work – people are encouraged to think about how they currently travel for each of the trips they make, and to consider how they might switch from car-driving to using public transport, walking, cycling or car-sharing for some of their trips. Gifts and incentives such as free bus tickets, pedometers, water bottles and free cycle repairs might also be offered.

PTP has been offered free to residents in different parts of Bristol since 2002. By 2006, over 7000 households had participated in projects run in partnership by the City Council, Sustrans, and Steer Davies Gleave. Surveys showed that the number of car driver trips fell by between 9% and 12% following these projects.

Since 2012, the LSTF has been funding a team of travel advisors to provide PTP to employees, residents in new housing developments and communities across Bristol and the wider West of England. The 'Sustainable Travel Field Team' has run a stall at over a thousand events, workplaces and educational establishments, offering route planning and personal travel advice, services such as loan bikes, electric pool bikes, 'Dr Bike' cycle repairs, cycle training, public transport taster tickets and car share initiatives. Over 8,000 individuals have benefitted from these services.

A survey carried out among a sample of people who were assisted by the travel advisers in 2013 suggested that 26% of people had made changes to the way they travelled as a result. The greatest changes were increases in cycling, and reductions in car use.

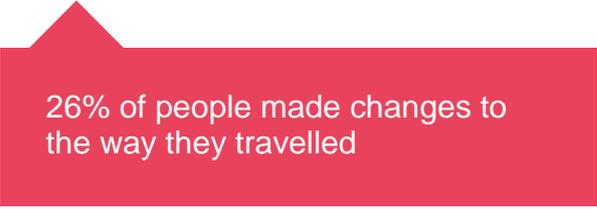
Among the events carried out with Bristol employers, Cycle Champions were enlisted to promote initiatives such as the online 'Big Commuting Challenge', winter commuting promotions and a lift-share week promoting car sharing. Business emergency repair cycle kits have been rolled out to workplaces. Bristol Workplace Travel Network meetings were set up and links to major

employer networks in the North Fringe and the Portside area have been established. An online travel plan toolkit for businesses was developed for the Temple Quarter Enterprise Zone.

During 2014, the team worked closely with North Bristol NHS Trust to help hospital staff find alternatives to the car for their commute, in particular to facilitate the move from Frenchay Hospital, which was closed as part of the redevelopment of the Southmead Hospital, located 7 km away. Staff could take advantage of free personalised travel advice and options such as free loan bikes and bus taster tickets. Hospital staff could also have their bikes serviced free of charge. Over 140 staff received one-to-one 30-minute long PTP sessions, which proved to be successful especially with staff who had previously tended to travel by car.

Success factors included having a flexible team available to talk to people, and a wide range of services to offer. Following up people afterwards meant that there was good evidence that some switching from car driving to more sustainable types of travel was occurring.

Challenges include the need to manage periods of intensive demand and having a user-friendly and reliable booking system in place. 'Dr Bike' cycle repair services in businesses saw a number of repeat customers without evidence of any increased in the level of cycling.



26% of people made changes to the way they travelled

Reducing freight impacts: Bristol Bath Urban Freight Consolidation Centre

Freight transport and distribution underpin the social and economic development of urban areas, but also create undesirable environmental effects. Urban freight movements increase congestion, due to limiting flow when unloading freight vehicles and reducing the available road capacity by increasing vehicle numbers. Freight traffic uses relatively large vehicles and so is an important contributor to pollution and creates perceptions of danger amongst pedestrian and cycle users. Disturbance due to noise may be a consequence of deliveries made during the night or early morning. Taken together, these effects reduce the quality of life for people that live in and visit cities.

For all these reasons, the Urban Freight Consolidation Centre (UFCC) concept emerged to reduce the negative impacts caused by freight transport in city centres, whilst ensuring efficient freight distribution. UFCCs relieve congestion through a process which involves the goods destined for the city centre being delivered to a remotely-located UFCC where they are consolidated into a single delivery which is made by a single, well-filled vehicle. In this way, the number of heavy goods vehicles (HGVs) circulating in the urban area is cut and as a result energy consumption is reduced and fewer pollutants emitted.

The reduction in the number of HGVs in the city centre increases pedestrian and cyclist safety, which, added to the reduction in air pollution, means an increase in quality of life for citizens. The participating retailers also take advantage from the UFCC, because it can provide them with high value services in addition to the delivery service, e.g. improved staff productivity and safety, the provision of pre-retailing services and recycling of packaging. Suppliers can also be clear beneficiaries from UFCC schemes because they can reduce the number of vehicles they need to deliver to the city centre. Thus, they can save time and money due to the UFCC scheme.

The Bristol-Bath Urban Freight Consolidation Centre (BBUFCC) began operation in 2002 with support from the European Commission-funded Civitas VIVALDI project, to serve the Broadmead, and later Cabot Circus shopping centres in Bristol city centre. In 2011, the logistics service provided by the BBUFCC was extended with support from the Civitas RENAISSANCE project to cover the neighbouring city centre of Bath.

The BBUFCC offers value-added services, such as checking consignments for breakages on behalf of the

recipient and alerting of any problems, and makes many of the deliveries using 9-tonne electric lorries.

An evaluation of the deliveries to Bristol City Centre from the BBUFCC between January 2011 and May 2012 showed that for each 100 HGV deliveries to UFCC, only 26 consolidated distribution trips were necessary, so 74% of the delivery movements were avoided altogether and the others made with a smaller, cleaner vehicle. Calculating the total emissions avoided is not straightforward as deliveries made to one city centre are generally part of a complex chain. However, considering just the traffic avoided in the urban area, a cost-benefit analysis for deliveries to Bath city centre from the BBUFCC showed a clear benefit for the freight operators in terms of fuel costs avoided, as well as a health benefit to the wider public in terms of reduced emissions.

Looking to the future, the BBUFCC is a service valued by its more than 100 customers, who have proved to be very loyal. However, encouraging wider participation has required significant efforts with limited results, whilst the operation of the UFCC continues to require significant subsidy. One explanation for difficulty in recruitment is that most of the financial benefits accrue to the logistics companies, which are able to deliver to the consolidation centre just off the motorway and avoid entering the busy city centres, whereas the recipients of deliveries pay an additional charge to use the UFCC. So, they are only attracted to use the service if the cost is justified by the additional benefits, such as being able to time the delivery to suit the business needs.

Reducing city centre vehicle emissions: Bristol's Low Emission Zone (LEZ)

One way that emissions from road vehicles can be reduced in city centres is through the introduction of Low Emission Zones (LEZs). LEZs can be highly technological, using Automatic Number Plate Recognition (ANPR) and automated penalties, as in London, or very low-tech, simply using signage and windscreen stickers, as in some EU cities, e.g. in Denmark.

LEZs can also be used to selectively restrict vehicles based on their Euro standard, or simply by vehicle type, e.g. Heavy Duty Vehicles, greater than 3.5 tonnes. Furthermore, LEZs can be time-specific, i.e. restricting all or specific vehicle types at peak periods when measured concentrations of NO₂ are highest. Consultation and stakeholder engagement are key to the successful implementation of a LEZ.

Bristol Mayor, George Ferguson, who has been an advocate for air quality has committed to introducing a LEZ in Bristol if re-elected in 2016.

A report commissioned by Bristol City Council was carried out by Transport Research Laboratory (TRL) and aimed to understand the potential impact of implementing traffic-focussed policy measures to reduce traffic emissions and improve air quality. Previous work carried out in 2006 was revisited and built upon with 10 different measures being tested in order to determine the effectiveness of each measure at improving air quality impacts whilst considering the associated costs involved with implementing the scenarios.

The air quality impacts of the various scenarios were tested at four different locations around Bristol which represented a variety of different roads with varying vehicle compositions. This work built upon the understanding of the local impacts of low emission strategies and zones.

Following this report, a more detailed business case study was commissioned. Results indicate that a LEZ is viable in Bristol but will require significant initial capital setup costs. In addition, there are risks associated with ongoing operational revenue costs which would be subsidised by funds generated from non-compliance fines that may fluctuate, so creating uncertainty in future funding, and particularly so if the LEZ is effectively enforced. The City Council is investigating what funding options are available to pilot the concept in the city to allow us to better understand the operational issues and costs.



Traffic Reduction through City Planning

The process of delivering the strategic vision for Bristol's future development requires clear planning and meticulous attention to detail. Bristol City Council has created a suite of plans which, alongside national planning policy, are aimed at directing decisions on planning applications in the city.

These include the Bristol Local Plan, the Neighbourhood Development Plans and the Bristol Central Area Plan (all of which can be viewed in full at:

<http://www.bristol.gov.uk/page/planning-and-building-regulations/bristol-local-plan>).

Transport is a key aspect of city planning. In order to ensure that the ambitious levels of economic growth proposed can be fully realised, investment is required in all modes of transport but particularly those such as walking, cycling and public transport, that allow people to travel more sustainably to, from and within the city centre.

Planners are therefore encouraged to find ways of improving links between different transport hubs, and of discouraging car use by, for instance, limiting the number of parking spaces available in city centres. In its Bristol Centre Area Plan, the council makes clear that development in the Old City neighbourhood will be encouraged only where it would not increase the levels of general traffic entering the neighbourhood. Similarly, the development of sites adjacent to Temple Meads railway station will be expected to deliver improved public transport interchange facilities and new and enhanced walking and cycle routes.

meet or exceed the minimum standards for secure cycle parking. Indeed, the Council has set out maximum car parking standards and minimum cycle parking standards.

Bristol City Council views walking as 'the glue that binds all other modes of transport together' providing the final links between those other modes and the homes, businesses and facilities in and around the city centre. Enhancing the walking environment through improvements to the public realm e.g. Bristol Arena, creates a better experience of the city centre for all users, including people with reduced mobility, and increases the appeal of the city centre as a place to live and as a destination for business and tourism. Greater encouragement for walking also helps to improve the health and wellbeing of Bristol's citizens.

All development in Bristol City Centre is now expected to

Integrating Health into Planning: the Bristol Health and Planning Protocol

In April 2013, the responsibility for public health in England was transferred from the National Health Service (NHS) to local government. Well before that, the Director of Public Health in Bristol and NHS Bristol started to engage with a wide range of city development processes overseen by Bristol City Council (BCC), including land use planning, transport planning and other policies that required a spatial or city approach, such as walking and cycling, food systems, peak oil and climate change.

Both Public Health and Bristol City Council were supported actively by the World Health Organisation (WHO) Collaborating Centre for Healthy Urban Environments, based at the University of the West of England (UWE), in providing conceptual and methodological tools, in particular for land-use and transport planning, including the Health Map shown here. The map shows the determinants for a green and healthy capital, including transport modes and economic, social or leisure activities requiring transport use.

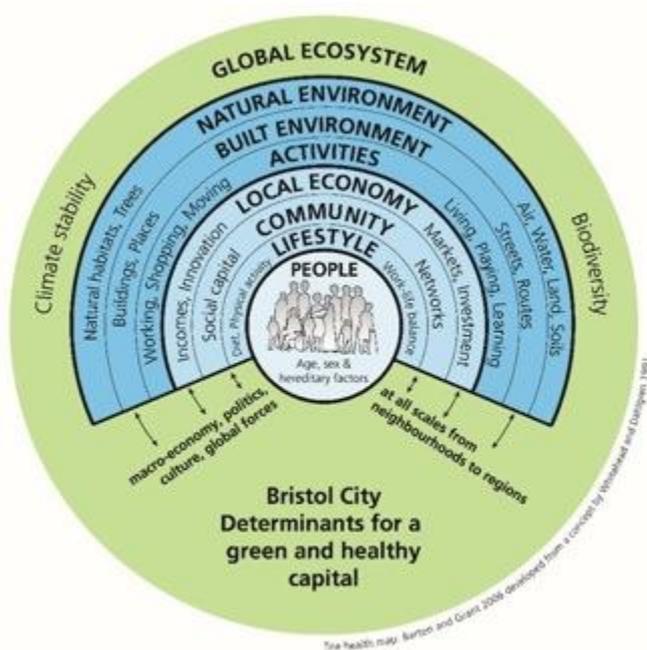
initially to support WHO Europe's healthy urban planning initiative to integrate the health agenda with that of sustainable development. Included amongst these objectives were many linked to sustainable transport, including good air quality and lower noise levels, climate stability and reduction of emissions, access to social and economic activities, road safety and healthy exercise, such that active travel could provide.

Both the Health Map and the 12 key health objectives for planners were used to support a novel initiative of desk-based **Health Impact Assessment** (HIA) for planning applications in Bristol. This HIA model or 'Bristol protocol' as it was known was an agreement between NHS Bristol and Bristol City Council to ensure that the health impact of large planning applications would be considered by a specialist 'healthy planner'.

Based on research by a UWE Masters' student, it was agreed by Bristol City Council that the following categories of development would be routinely referred to NHS Bristol for consultation due to their potential impact on health:

Major residential (10 or more dwellings) and non-residential developments involving 1,000m² of floor space and above

- All major transport and highway infrastructure projects
- Proposals that would result in the loss of public open space
- All applications for the establishment of hot food takeaways uses



The WHO CC had also developed the **12 key health objectives for planners** (Barton and Tsourou, 2000),

NHS Bristol would also be involved in pre-application discussions on all "super major" development proposals

(100+ homes or 10,000+ sq. m of floor-space) and major developments in order to a) influence the shape of schemes before they are worked up into costed planning proposals submitted for consent, and b) define the information required to determine the application (Hewitt, 2011).

An audit of planning applications referred to NHS Bristol in the first year of the protocol (Carmichael, Grant and Hewitt, 2013) showed that within a year, the processes set up through the protocol were working, resources had been allocated and the referral process was in place. So what is the substance of public health's comments on planning applications?

- Public health tended to encourage measures or change in design to promote active travel and the importance of sustainable transport planning. Comments emphasised the link between transport planning and physical health (active travel, walking, cycling) and safe environments (secured cycle parking). They also highlighted BCC's access and sustainable transport policies.
- Furthermore they demonstrated the co-benefits between tackling global warming and promoting healthy urban principles (reduction in car emissions, enhanced public transport, reduction in car parking spaces, in particular in inner city locations, to encourage take up of alternative modes of transport).



An example is the planning application for the North Fringe to Hengrove Bus Rapid Transit (BRT) scheme. NHS Bristol made some comments on specific urban design aspects of the scheme (e.g. design of bus stops, improved signage, landscaping), its direct effectiveness as a mode of transport (more stops along the route) but also on the need to integrate the bus service with the entire system of public and active travel transport.

One of the recommendations from the audit was that BCC should adopt development management policy DM14 on the health impacts of development as soon as possible and that Bristol Planning Policy should review cycle and car parking standards and residential space standards so that they better support delivery of health outcomes; this recommendation has since been taken up and DM14 has been adopted.

Raising awareness about public health

From a public health perspective, how people live in a city and how healthy and happy they are depends on a wide variety of factors including: their urban environment; their access to employment, services, travel and transport; proximity and access to green space; and on the community around them.

In advance of the integration of public health with local authorities, Bristol City Council decided to fund experts in public health in order to inform transport policy decisions with a view to improving public health outcomes. One of these public health specialists, Adrian Davies, was appointed to the council's transport planning team. He was in post for seven years, sitting amongst his council colleagues, enabling close relationships to form and projects to develop with strong public health inputs. Three key areas of influence have been 20mph speed limits, reducing road danger and providing regular one page summaries of the relationships between health and transport

20 mph speed limits

The public health specialist worked with politicians and officers on the promotion and evaluation of 20mph policies and zones. This enabled decisions to be supported by evidence and research, which helped to secure the support of key decision makers like senior council officers and politicians.

Road danger

The public health specialist is the transport lead for the council's work stream on reducing road danger through a Safe Systems Approach to Road Safety plan. Reducing public perceptions of road danger is a key element to achieving high levels of active travel.

One of the most successful contributions the public health specialist made to the transport department was the provision of easy-to-read evidence-based information for transport and other urban planning specialists to enable greater understanding and articulation of the health impacts of road transport. These reports are short, de-jargonised summaries of academic studies on the relationships between health and transport. One of the most visible manifestations of this translational work is the 'Essential Evidence on a Page' series. Begun in 2009, it involves the selection of topical transport issues from aspects of sustainable transport or helpful concepts, taking robust peer-reviewed papers, and then distilling key findings into a one-page³.

³ www.travelwest.info/evidence

Raising awareness about air quality: Air Quality Masterclass and other activities

One of the key barriers to managing and reducing air pollution is communicating the impacts of what is largely an invisible problem to the general public and to policy makers in related disciplines (e.g. transport and land-use planning and public health). Activities that seek to raise awareness of air pollution, its sources and effects can help to raise the profile of the problem and engender policy and behavioural changes to reduce its impact on health.

In October 2014, Bristol City Council hosted an international Masterclass on urban air quality in the run up to Bristol's year as 'Green Capital of Europe 2015'. Bristol was asked by the current winners of the award, Copenhagen, to host an event to bring together policymakers, air quality experts, academics and practitioners to identify and explore the current challenges. The event included an interactive session, which informed a collective report on the experiences and opportunities for air quality management in European cities. The Air Quality Management Resource Centre at the University of the West of England (UWE) booked high-profile speakers from across Europe and the event was opened by the Mayors of Bristol and Copenhagen and chaired by air quality researchers from UWE. Topics included:

- EU Policy on air quality,
- Health impact of poor air quality,
- Community perception of air pollution,
- Interventions to improve air quality and
- Case studies from other European cities and former Green Capital cities.

Proceedings, videos of the presentations and a summary report are available on the council's website: <http://www.bristol.gov.uk/page/environment/green-capital-masterclass>. The discussions and presentations from the masterclass are helping to inform policy at Bristol City Council and would be of similar value to other local authorities and cities in the UK and across the EU. In particular the presentations by Dr. Ian Mudway and Alan Andrews of ClientEarth have proved to be influential for decision makers.

As well as the Air Quality Masterclass, Bristol City Council is committed to public engagement on environmental issues and disseminates information on air quality through the following channels:

- Real-time "live" data driven website (<http://www.bristol.airqualitydata.com/>)
- Bristol City Council website (<http://www.bristol.gov.uk/page/air-quality-bristol>)
- National data.gov.uk website (<http://data.gov.uk/>)
- Piloting air quality data on local open data platform (Socrata) (<https://opendata.bristol.gov.uk/>)

Specific initiatives, e.g. consultation on Air Quality Action Plan or Air Quality Management Area changes, including questionnaires, focus groups and a web presence.

Bristol City Council's websites provide real-time data from all of the continuous analysers and provide easy ways for citizens to access current and historic information on air quality, including FAQ's and simple guides on pollution issues.

Researchers at the University of the West of England are also active proponents of air quality issues regularly providing media interviews and contributing to documentaries to help promote knowledge of the impacts of road transport in particular.

In July 2015, researchers from UWE participated in the Soapbox Science challenge (http://soapboxscience.org/?page_id=1509) in Millennium Square in Bristol. The event, which attracted huge interest, sought to capture the attention of passers-by through the use of props, activities and just plain public-speaking about scientific research, including air quality.

Bristol Bright Night (<http://www.bnhc.org.uk/bristol-bright-night/>) brought science to the public at a range of venues across Bristol in October 2014, including

UWE's giant floor map of Bristol's Air Quality Management Area to enable people to identify whether their homes and schools were affected. This event, which is being repeated in October 2015, sparked questions from parents and schoolchildren about what is air pollution, where it comes from and how we can help to reduce it.

Schools engagement in air pollution is a valuable educational opportunity to instil knowledge and understanding at a young age. UWE has been collaborating with Oasis Brightstowe Academy in Shirehampton, Bristol, getting students to participate in a monitoring survey that assessed their exposure to air pollution using different modes of transport. The students found the experience fascinating and it attracted a lot of media attention leading to further awareness-raising.

local planning groups to help raise public awareness of air pollution.

Public and media recognition of air quality issues is one thing, however, ownership of the problem and the application of political pressure to do something about it is the ultimate goal.



Bristol City Council and UWE researchers have also engaged with residents' groups, civic societies and

Conclusions

As a Green Capital in Europe, Bristol recognises the adverse effects that arise from high traffic levels and congestion. Not least amongst these is the impact on health from poor air quality. Our Mayor has made air quality a key priority and the growing evidence of the damage caused to people's health and the current scandal of diesel emissions has pushed this issue ever further up the political agenda.

Bristol's responses to this problem are both traditional and innovative; as well as investing in high quality public transport and segregated cycle routes, the city has introduced intelligent charging points for the next generation of personal transport – electric cars. Improving health and quality of life by restraining traffic is embedded in strategic planning policy, and bold interventions such as 20 mph and residents parking zones have made these policies real across the city.

Of course there is much more to do in order to deliver a truly sustainable city, but the Bristol Method has set the city on the trajectory towards becoming one of the greenest cities in Europe.

ABOUT BRISTOL 2015

European Green Capital is a prestigious annual award designed to promote and reward the efforts of cities to improve the environment. Bristol is the first ever UK city to win the award.

European Green Capital is run by The European Commission, recognising that Europe's urban societies face many environmental challenges – and that sustainable, low-carbon living is vital to the future of our cities and our people.

The award was first won by Stockholm in 2010. Since then, Hamburg, Vitoria-Gasteiz, Nantes and Copenhagen have carried the torch. Bristol will hand over to Ljubljana at the end of the year.

THE BRISTOL METHOD

The Bristol Method is a knowledge-transfer programme aimed at helping people in other cities understand and apply the lessons that Bristol has learned in becoming a more sustainable city, not just in 2015 but in the last decade.

Each module of the Bristol Method is presented as an easy-to-digest 'how to' guide on a particular topic, which use Bristol's experiences as a case study. The modules contain generic advice and recommendations that each reader can tailor to their own circumstances.

The Bristol Method modules are published on the Bristol 2015 website at www.bristol2015.co.uk/method

CONTACT

hello@bristol2015.co.uk

+44 (0)117 379 0115

Bristol 2015 Ltd
Units 5-6
1 Canon's Road
Bristol BS1 5TX

www.bristol2015.co.uk

