What can we do to clean up our air?

Travel behaviour and sustainable transport, self-help and community-based strategies for clean air, how international research can inform local actions

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A talk suggesting actions that citizens can take on air quality, by an academic researcher and Bishopston resident.

Introduction

I begin with an observation that I hope isn't too controversial! In Bishopston, as in many other places, we have a problem with too many cars in too little space. We have a problem with air pollution from moving or idling motor vehicles (and, surprisingly perhaps, exposure to air pollution can be higher inside cars than on the street). And we have a problem with pavement parking, which can be a deterrent to walking, especially for people with mobility difficulties, or pushing prams, or shepherding small children.

We have a relatively high rate of car ownership. According to the 2011 census, Bishopston and Ashley Down ward has a ratio of 1.20 vehicles per household, higher than the average in Bristol (1.04) and in England as a whole (1.16) – and many of our streets are Victorian and were simply not designed for cars. A lot of our traffic is 'local' as opposed to passing through. A recent survey to understand traffic issues in the roads between the junctions of Ashley Down and Gloucester Road found that 19% of traffic entering the area was passing through, suggesting that 80% was 'local traffic'.

One could argue that this is simply a reflection of the way in which society in general has become car-centric to the extent that it is harder to organise your life if you don't have a car; for some it may be genuinely impossible. 'Top-down' measures to restrain car use, such as parking controls, tend to be unpopular, and recent experience in Bristol has highlighted the risks of being seen as 'anti-car' if you are a politician seeking re-election.

Therefore, in seeking to reduce air pollution from motor traffic, a realistic aim in the immediate term is to facilitate and encourage people to use other ways of getting about whenever they can, and to increase the efficiency of those car journeys which really are difficult to avoid. That is not to say that more radical approaches are undesirable; indeed a more top-down approach which forces, rather than merely encourages us to reduce our car-use, is likely to be necessary if we are to tackle air pollution in any serious way in the longer term.

However, in this talk I'd like to focus on actions we can take ourselves, now, as local residents. In so doing I will draw on some of the international research evidence relating to activities and measures to encourage environmentally sustainable travel.

We do have the advantage, in this part of Bristol, of a reasonable choice of transport modes for at least some destinations, whether it's walking to local shops, cycling on off-road paths to some parts of the city, or having the option of travelling by bus, which are regular for radial trips in and out of the city, if not for orbital ones.

This means that there is some opportunity to use local, community-based actions to help shift some car trips to other modes, as indeed the Bishopston Society has already identified in its "Clean Air Bishopston" project.

The research evidence

Firstly, what does the research evidence tell us about what works with regard to community-based sustainable travel and transport?

Most of the examples I'll offer are drawn from a literature review undertaken by colleagues and myself in the Centre for Transport and Society at UWE as part of the EU 'EVIDENCE' project. This involved a review of over 350 studies from around the world on the impacts of sustainable transport measures in urban environments. The purpose of the research was to help politicians and transport practitioners understand the economic return on investment that can be achieved through increasing expenditure on sustainable transport.

Whilst the brief was to look at the *economic* benefits of sustainable transport, rather than the environmental and health benefits directly, these areas are closely interwoven. For example, one of the ways in which economic benefits are calculated is by monetising the health benefits accruing from improved air quality. Arguably, an assessment of health impacts should always be included in appraisals of transport schemes.

The key messages from the review were grouped in 22 transport areas. I cannot mention them all here, but the summary reports and reviews of the different types of measure are available on the project website - http://evidence-project.eu/.

There are five areas of particular relevance to tonight's discussion:

1. Enabling car travel while avoiding the least sustainable uses of the car. Examples include: car clubs, car sharing, 'eco-driving', and the potential for electric vehicles to improve air quality.
2. Increasing the use of alternative transport modes. Examples include: walking, cycling and bike-share schemes, and demand-responsive bus services.
3. Packages of measures to encourage sustainable travel. Examples include so-called 'travel plans' centred around schools and workplaces.
4. Personalised travel information. Examples include the provision and sharing of one-to-one information to help individuals make sustainable transport choices.
5. Use of transport telematics. Examples include: real-time information and e-ticketing – e.g. using and promoting awareness of internet technologies to facilitate bus travel, or to find a parking space.

Most of the examples are positive measures designed to incentivise people to travel more sustainably. However, as I alluded to in my introduction, the evidence is clear that dangling a carrot

in front of a donkey won't entice it on to a cycle path unless there's also a stick being waved behind it. In other words, incentives need to be used in conjunction with 'push factors', such as taxation, regulation, fuel pricing, changes to the physical road layout, or restrictions on parking. This is why the lobbying of government, councils, and transport operators needs to happen at the same time as the community-based measures which we can undertake as residents.

The 'push factor' I want to pick up on here is that evidence is unanimous on the importance of parking management as a way of managing car travel demand in urban areas. Parking issues have been found to exert a strong influence on the decisions people make about how to travel. The traditional way of doing this is through parking charges and restricting the availability of spaces.

For example, we found evidence of the importance of parking to travel behaviour change from a recent study of commute mode share in the Bristol North Fringe. At employment sites where car-use has fallen, parking restraints were found to be the chief explanatory factor, although positive incentives to encourage employees to use alternatives to the car had made this process smoother.

Parking is a very sensitive issue among both retailers and residents in Bishopston, but the evidence suggests we do need to bite the bullet of restricting parking in some form if we're serious about reducing car traffic.

Five behaviour changes we can make

Moving on now to the five areas I identified where we can work on the 'carrots' rather than the 'sticks':-

1. **Car clubs, car sharing, parking management, and the potential for electric vehicles to improve air quality**

   Car clubs

   - There is strong evidence of positive effects of car clubs on the distance travelled, car ownership, the incidence of driving alone and the numbers of vehicles on the streets. Free-floating schemes seem to have additional important advantages for larger urban areas (related to parking and one-way journeys), although evidence here is limited at present.
   - It was found that car club users reduced their overall mileage by joining the schemes. This may be due to outcomes such as reduced car ownership and more selective car use in general. Car club members tend to minimise their use of the car club vehicle as they have to pay for each individual journey. This is contrast to private vehicle use, which can encourage owners to maximise their mileage vehicle in order to get the best value from the investment of buying, taxing and servicing their car.

   Electric vehicles

   - In general, the reviewed studies agree that electric vehicles reduce emissions related to fuel consumption in road transport. Positive effects are reported for CO_2 and local air pollutants (Hydrocarbons (HC), Particulate matter (PM), Carbon monoxide (CO) and Nitrogen oxides (NOx). Whilst this is good news for local air quality, there are a few caveats:

- Firstly, significant market penetration of electric vehicles will be required before observable benefits in air quality will be noticed.
- Secondly, the overall environmental impact of electric vehicles is largely determined by the way that the electricity is generated. The environmental benefits are limited in a country where electricity generation relies heavily on fossil sources.
- Another important issue is that 9% of all UK PM_{10} emissions are created by tyre and brake wear, and road abrasion (the total transport contribution to UK PM_{10} emissions is 17%) – electric vehicles will not necessary solve this problem. Whilst we have seen huge reductions in some air pollutant emissions from road transport over the past 25 years (e.g. carbon monoxide, nitrogen oxides), levels of particulates from tyres and brakes have slightly increased. Emissions resulting from the resuspension of particles caused by the turbulence of passing vehicles have also increased.

This is not to say that we shouldn't welcome the move towards electric vehicles, just that they aren't a universal panacea for our air quality problems.

Car-sharing (where people offer or accept lifts)

Compared with car clubs, the evidence is less clear on the extent to which car-sharing schemes reduce total vehicle miles travelled, as some people who lift-share may switch from public transport rather than from driving a car.

- Car-share schemes work particularly well when organised within a workplace or group of workplaces, whether these are organised informally among colleagues or use an online pairing service (Lift share being the first one of its type). New apps are being developed to facilitate lift sharing – for example the 'Join my journey' tool being piloted in Bristol.
- Marketing is also of vital importance in enabling the success of car-share schemes. It can offer strong messages such as the potential for trip makers to save money. It is important, however, that other incentives be in place, e.g. priority parking, subsidised parking costs, and use of high occupancy vehicle lanes.

Eco-driving (fuel-efficient driving) courses – offered by the Energy Saving Trust for example

- The evaluation of a nationwide Dutch programme provides found some substantial reductions in emissions and positive effects on other issues like road safety, traffic noise nuisance and driver stress.

2. Walking, cycling, bike-share schemes, and demand-responsive bus services.

Walking

There is some evidence to indicate that levels of walking can increase at an individual and collective level through personal and community interventions, as well as through changes to walking environment. It can be argued that an infrastructure suitable for walking needs to be in place before undertaking any interventions aimed at behavioural changes.

- Examples of collective action include: local walking groups to encourage active lifestyles; walking buses; walk to school events.

- A recent project led by Bristol university, iWalk, aims to translate delivery of inclusive walking, an important public health ambition, into day-to-day transport practices.

Cycling

The first point is that we can be very confident that appropriate infrastructure provision for cycle traffic is a necessary condition for increasing levels of cycling. The evidence suggests that comprehensive networks of routes for cycle traffic are required. However, promotional activities, events and information are important in encouraging people to use the infrastructure, especially under-represented groups (which includes women).

This is perhaps where we, as local residents, can particularly help. Activities can include:

- Developing and distributing convenient information such as destination-centred cycle maps. Research shows that a 'bottom-up' map design involving 'real users' authenticates the information in the eyes of prospective cyclists. Informal, word of mouth information can be very powerful. This can include 'bike buddying', whereby existing cyclists advise people on good cycling routes.
- Organising cycling training for both adults and children by linking into existing schemes such as Bikeability or training offered by Lifecycle UK.
- Competitions such as the annual Big Commuter Challenge organised by our local councils in conjunction with employers.
- Promotional events such as Cycle to Work days. An example which was robustly evaluated was a Cycle to Work Day in Victoria, Australia. A survey found:
    - 17% of respondents had cycled to work for the first time on Ride to Work Day, of whom 27% were still cycling to work 5 months later.
    - Female 'first-timers' were more likely than male counterparts men to be cycling to work 5 months later.

Social psychological factors have also been found to contribute to cycling levels; e.g. individuals are more likely to cycle if other family members cycle, and if there is a perception that a journey is both possible and easy by bike.

Falling costs and wider availability of electric bikes hold considerable potential for widening access to cycling, especially with the hills involved in Bristol.

Bike-sharing schemes

These are schemes that provide access to cycles in and across a city for short hire periods. The original schemes such as Boris Bikes in London required docking stations, but recently, innovative, dockless bike share schemes have been introduced, with Bristol being the first city in the UK for one such scheme to be launched (YoBike).

Bike-share may also extend to electric as well as pedal powered bikes.

- Evidence of the impact of bike sharing is limited, but suggests that it can increase cycling levels in a city. However, the ability of bike sharing to attract trips previously made by

private vehicles remains a key challenge, with bike sharing predominantly replacing walking and public transport. This means that the impact on air quality might not be huge, especially when the effect of using motorised fleets for bike maintenance and re-distribution is accounted for.

- However, bike sharing can contribute towards raising awareness and 'normalising' cycling generally, contributing to increasing road safety for cyclists, which in turn can lead to more cycling.

Demand responsive buses (DRT)

DRT is a non-private transport mode offering flexible routes and timings in response to changing passenger demand. They can be thought of as a taxi-bus, intelligently routed by real-time and predicted demand. The aim combines the convenience of point-to-point journeys with the environmental and cost benefits of shared use. There is currently a lack of research evidence on these services.

At UWE we're involved in the MODLE project with a company called Esoterix (alongside many other partners). MODLE stands for Mobility on Demand Laboratory Environment. It seeks to introduce innovative on-demand bus services in the North Bristol and Avonmouth area. The aim is to provide connections to scheduled rail or bus services as well as transport for journeys which are not well served by traditional public transport.

3. Packages of measures to encourage sustainable travel (e.g. so-called travel plans centred around organisations such as a school or workplaces).

Travel plans comprise a set of voluntary travel behaviour change measures for the individuals involved. This means, for example, 're-framing individual travel choices' with measures such as: improving bus, cycling and walking routes that serve the site; improving on-site facilities (e.g. for cycling); and offering better information about non-car modes, as well as discounts, promotional offers and financial incentives to make alternatives to solo driving more attractive.

Disincentives for solo driving such as parking restraints, or 'push factors' such as traffic congestion, are likely to improve the chances of success of travel plan measures in terms of reducing car-use.

- The evidence suggests that single-occupancy commute trips to employers with Travel Plans could be reduced by between 4% and 18%, depending on the intensity of measures, and external 'push factors' such as levels of traffic congestion in surrounding areas.
- For schools, measures might additionally include: pedestrian and cycle training for children; 'walking buses', special school buses; and activities as part of the curriculum to teach the benefits of sustainable transport.

4. Personalised travel information

Personalised travel planning (PTP) is a targeted marketing technique involving the provision of travel advice to individuals, with the aim of encouraging them to make more sustainable travel choices. It involves directly contacting people with the offer of information, assistance,

incentives and motivation, to enable them to alter their travel choices voluntarily. An example used in Bristol is the Council's TravelWest information stands at community events.

- Evidence worldwide suggests that PTP projects are successful in reducing both the number of car driver trips and car-driver mode share. Reduction in car driver trips is typically between 8% and 12%, whilst car-driver mode share has typically fallen by around 5-7%.
- PTP can also serve as a useful means of promoting improvements to infrastructure and services such as better bus services and cycle paths.
- PTP is an area where we can think creatively about sharing travel knowledge ourselves within our locality, without necessarily relying on the councils' Travel West teams.

Community based social marketing – the role of pledges and other commitments

'Community-based social marketing' approaches to PTP have shown above average reductions in the number of car trips. One example is the 'In Motion' programme run in Seattle. A core component of In Motion was inviting participants to pledge to reduce car alone trips; they received rewards for meeting their pledge in the form of weekly travel and local business vouchers.

Local action teams create partnerships with local businesses and develop slogans tailored to individual communities.

- Participants were invited to pledge to reduce car alone trips and can receive 'Count Me In' signs to put up in front of their homes.
- The initial pledge was a primary motivator for behaviour change; timely feedback on their performance against the pledge supported continued engagement.
- Reductions in car alone trips by pledging participants was between 24% and 50%.

Again, this approach leans on lessons from social psychology about how we are influenced by people within our 'in-groups' –family, neighbours, colleagues etc. Even though, culturally, we like to see ourselves as 'rational decision-makers', weighing up all the facts objectively, and we tend to underestimate the extent to which we are influenced by what other people like us are doing.

Just seeing that others are cycling, walking etc. can work better at inducing behaviour change than using, for example, pro-environmental messages, which can be seen as 'preaching'. It's helpful to present examples of people engaging in these behaviours already and who are positive about them.

5. Transport telematics (e.g. real-time information, e-ticketing)

This concerns the use of new technologies such as the UK bus checker app to facilitate bus travel, or online journey planners to plan trips which require more than one mode of transport, or to find a parking space using sensors and apps.

Online journey planners have been around for some time, but change is happening very quickly with the multitude of apps available now on smart phones. Real-time information on bus services which tends to be highly valued by bus users.

- Here, the research shows that real time travel information can be most valuable to users when uncertainty is highest (e.g. for buses more than trains, and for more congested cities).
- However, the reliance on smartphones to access these services exclude those who cannot access the technology, or who find it difficult to use. There is a lower penetration of smart phones amongst the older age groups. This is one area where we could try within our community to ensure that knowledge is shared, so it isn't just the most technologically literate who benefit.

Parking information

Telematics can also be used to help drivers to find a parking space, hence reducing the time spent 'cruising' for a space, and consequently cutting emission. This can include:

- Smart parking systems
- On-street parking sensors

- Evidence from North America that on average 30% of urban traffic is cruising for a parking spot at any one time. Example of a successful intervention is in San Francisco (USA), where sensors in on-street parking bays provided real time information to drivers on occupancy rates and dynamic fees. This led to dramatic improvements in parking availability, reductions in cruising time and distanced travelled by car.
- Current research in Bristol to reduce cruising time includes 'ParkUs' – an app being developed by Toshiba Research Europe, Bristol, and tested by UWE as part of the EU REPLICATE programme (with Bristol City Council etc.). This uses crowd-sourced information from other drivers to find out where spaces are available, removing the need for costly on-street sensors.

Summing up

I've talked about, firstly: less unsustainable forms of car-travel: car clubs, car sharing, eco-driving, electric cars; secondly, alternative transport modes - walking, cycling and bike-share schemes, and demand-responsive bus services; thirdly, packages of measures to encourage sustainable travel; fourthly, personalised travel information, and finally transport telematics.

I'd like to end with a few discussion points on the kind of self-help actions which we can undertake as a community:-

- Firstly, as individuals, try not to think of the car always as the default option. Try and use other options if they are possible, then spread the word and encourage others.
- If organising a local event or activity, suggest alternatives to single occupancy car as the default option to those interested in attending.
- Perhaps within community and social groups, set goals and pledges to reduce their car use. Encourage 'small steps', e.g. initially using alternative modes on some days, rather than every day.

- Spread the word about positive developments in local transport – for example, it's normal to be negative about buses, but let's share the positives when they do happen.
- Keep up to date with the developments in real-time information and apps which can improve the experience of using public transport. Tell others about them, and help others to benefit even if they don't use a smart phone (e.g. ring someone up and give them a real-time travel update!).

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More information

The above article is an extended and referenced version of the talk given by the author at The Bishopston Society's public meeting on 3rd October 2017.

A report of the meeting, with links, can be found via "Clean Air Experts shine light on 2010 vision", our meeting report, at http://bishopstonsociety.org.uk/news/our-news/954-agm2017.

Subsequent and earlier coverage of air pollution and air quality can be found using the search facility on the front page of our web site at http://bishopstonsociety.org.uk.

Caroline Bartle (right) with Alan Morris and Fi Hance (our other speakers) and Dick Farrow (TBS meeting chair)

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