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Sustainable urban transport – the role of walking and cycling

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Walking and cycling are both underutilised transport modes in most UK urban areas. Among other benefits, they do not directly produce pollutants at point of use, they generate limited noise and they require less space than motor vehicles. Walking and cycling importantly provide a good source of regular exercise. The link between active travel and health has been studied extensively and is generally accepted. However, most research focuses on walking and cycling for private transport, either for leisure or for more functional reasons. The use of walking and cycling as a means of freight transport appears vastly underresearched, and the potential is unclear. This overview paper argues that it is possible to put in place packages of measures that can significantly improve both levels of walking and cycling. This may mean fundamentally changing the existing power relationships that exist between different transport modes, provision of a greater proportion of funds towards active modes of transport and consideration of novel ways of financing to encourage change.

1. Introduction

This paper seeks to provide an introduction to this special edition on active travel and to some of the key literature and ideas in this area which consider the potential role of walking and cycling in meeting our urban transport needs and how these modes might be further developed, both in quantity and in the quality of the experience for those who use them. Transport has a wide, extensive and varied impact on health and the environment and hence is a key sector in terms of future long-term sustainability. As a sector, among other impacts, it is a major contributor to emissions of greenhouse gases, road crashes are a major cause of death and injury around the world, local air pollutants from vehicle exhausts result in many premature deaths and ill health and many lives are blighted by transport noise. If current trends continue across the globe, the problems look set to worsen. The task of addressing these kinds of issues in a way that makes a meaningful change towards a more environmentally and socially sustainable future is a huge one – an example of this is the scale of change required over a relatively short time period if the transport sector is to meet its part in the UK 2050 targets for reduction of greenhouse gas emissions (Banister and Hickman, 2013; Department for Energy and Climate Change, 2008). There is no one solution or magic bullet, and many of the measures that might be considered and that are potentially effective may not be widely popular and may have consequences in terms of impacts on the economy and on lifestyles and behaviour. While technology might have a role to play in ameliorating some of these problems, this is unlikely to ever be a whole solution, and many now recognise a need for large changes in the way we use and consume energy for transport (Anable and Bristow, 2007; Banister and Hickman, 2013; Tight *et al*., 2005).

Walking and cycling are two modes that provide the opportunity to create a more sustainable transport system in our urban areas and provide, in part, a potential solution to many of the problems highlighted above. They are very different modes in many ways, and indeed, there is further considerable variability within pedestrians and cyclists themselves, with, among other things, a wide range of motivations, abilities and confidence levels. However, the two modes complement each other nicely in relation to urban transport, as together they provide a means to cover the kinds of distances required for most trips in urban areas. Walking and cycling are both underutilised transport modes in most UK urban areas (and indeed in many parts of the world), and both are, to some extent, marginalised in favour of motorised modes in terms of provision, priority and planning. Among other benefits, walking and cycling do not directly produce pollutants at point of use, they generate limited noise, require less space and arguably safety benefits could also be expected once a critical mass of walking and cycling had been achieved (Jacobsen, 2003). Walking and cycling importantly provide a good source of regular exercise. The link between active travel and health has been studied extensively and is generally accepted (for example, see Hinde and Dixon, 2005; Ogilvie *et al*., 2004; Richardson *et al*., 2005). In England, figures show an increase in levels of obesity over the period 1993 to 2013 from 13·2 to 26·0% for men and from 16·4 to 23·8% for women. The figures also show a rise in levels of child obesity (Health and Social Care Information Centre, 2015). UK recommendations on physical activity levels for adults (19–64 years) recommend 150 min of moderate physical activity per week and suggest that activities such as cycling or fast walking are ideal means of achieving this (Bull and the Expert Working Groups, 2010).

Generally, in Britain (and in many other places), there has been a long-term decline in levels of walking and especially cycling. If we consider trends in walking and cycling over the period between 1995/7 and 2013 (Department for Transport, 2014), this shows a general decline in the number of walk and cycle trips in

Britain over this relatively short period, although a resurgence since 2005 in the distance cycled. The national figures naturally mask a degree of variability between different urban areas, with some places showing recent improvements, particularly in cycling (London is a good example). At an international level, genuine comparative figures are hard to find in a way that makes comparisons meaningful, perhaps providing a strong argument for greater standardisation in the collection of this type of data for active travel modes (see Sauter *et al*. (2015) for a discussion). Pucher and Buehler (2008) managed to compare the proportions of walking and cycling trips between six countries (USA, Germany, Netherlands, France, UK and Denmark) as far as was possible over the period from the mid 1970s until 2008/9. This showed a range of trips by active travel modes from 46% (Netherlands) to 12% (USA) in the most recent year. Of the six countries, the UK and France were showing significant decline in the proportion of walking and cycling trips over the period, while the others showed a more stable overall position with some positive trends in the most recent years, especially for walking – a clear indication that it is possible to bring about positive changes in the use of these modes if the necessary conditions for change are in place.

Given the potential benefits of walking and cycling to the urban environment and health especially, it seems reasonable to try to provide for growth in these modes, especially cycling given the typically low levels in most places. There is a growing body of research that has looked at the effectiveness of different measures to promote these modes, much of which seems to focus around relatively small scale changes or incremental changes to urban transport systems. Much less research has considered more fundamental large-scale changes to urban transport systems to create a much greater dependence on active travel. Work by Tight *et al*. (2011, 2012) and Timms *et al*. (2014), using visioning techniques, imagined how cities and urban life in the UK could change by the year 2030 if walking and cycling played a much more fundamental role in urban transport than is currently the case. They explored three alternative futures with walking and cycling mode share ranging from best European practice to around 80% of trips within the urban area. Their work considered the means by which these futures might be achieved and also explored with different stakeholder groups the implications of such changes on lifestyle and the future viability of urban areas. Pucher and Buehler (2008) considered a real situation and examined the reasons for the growth in cycling levels in the Netherlands, Germany and Denmark since the 1970s. Up to that point, these countries were experiencing declining cycling levels, but through a combination of measures and drivers managed a dramatic reversal of the trends. They appear to have achieved this by making cycling seem safe and convenient through provision of high standards of infrastructure, but also through appropriate taxation of vehicle use and parking restrictions, land use changes (particularly promotion of mixed use developments) and active promotion of cycling and educational measures.

A further study of nine North American cities (Pucher *et al*., 2011) examined the effectiveness of a combination of measures that were used including infrastructure provision such as improved bike lanes and paths, traffic calming and parking, as well as promotional measures, bike-transit integration, sharing schemes and training programmes. Each city achieved at least a doubling of cycling levels (albeit from a low base), with one (Portland) experiencing a sixfold increase. In the UK, the Sustainable Travel Towns initiative showed it was possible to change walking and cycling behaviour substantially through a combination of measures promoting those modes and through provision of personal travel planning in schools, in workplaces and to individuals (Sloman *et al*., 2010). In the three towns involved (Darlington, Peterborough and Worcester), walking trips increased by 10–13% and cycling trips increased 26–30% (although this range was perhaps on the high side, as one of the towns also received further funding as a Cycling Demonstration Town in the same period). Subsequent research by Goodman *et al*. (2013) examining the effectiveness of the interventions in the UK Cycling Demonstration Towns and the Cycling Cities and Towns programme showed an increase in cycling to work reported in the national census from 5·8% in 2001 to 6·8% in 2011, a significant increase when compared against various comparison groups.

Research suggests that for significant change to occur, an integrated approach such as these is likely to have the most effect. Indeed, it has been suggested that changing one element alone will not be enough to bring about change – for example, see Pooley *et al*. (2010), who concluded that infrastructure was a necessary part of change, but on its own was not enough to bring about a major change in behaviour and in cycling levels and culture. Jones (2012) reached a similar conclusion looking at the effect of the National Cycle Network in the UK, a network of car free trails and paths.

From the literature, key elements of an integrated policy to significantly change walking and cycling levels in urban areas have variously been defined (for example, see Boarnet *et al*., 2011; Forsyth and Krizek, 2010; Pucher *et al*., 2010; Rietveld and Daniel, 2004; Wardman *et al*., 2007). These include changes to land use, provision of dedicated infrastructure (including the recent widespread growth in cycle hire schemes around the world; for example, see Fishman *et al*., 2013), development of supportive public transport systems, managing demand for motorised transport, measures to change attitudes; some consideration of the needs of freight transportation and the general coherence and consistency of policy affecting all these areas.

In relation to land use, there has been a lot of work that has looked at the effects of urban density (for example, see a recent review by Udell *et al*., 2014). Bartholomew and Ewing (2008) showed using a meta-analysis that various compact growth scenarios applied to US metropolitan areas could potentially reduce motorised traffic by 17% by 2050. Boarnet *et al*. (2011) showed that compact areas and smart growth, designed with pedestrians in mind, can significantly increase levels of walking.

Newman and Kenworthy (1989) looked at data from cities around the world and showed that urban densities influence use of non-motorised modes of travel with higher levels in denser cities. Distance from home to the urban centre is often critical given the location of jobs and services in the centre (Larsen *et al*., 2009; Pont *et al*., 2009; Southworth, 2005; Winters *et al*., 2010). Land use mix is also shown to be important with greater variety being associated with higher levels of non-motorised vehicle use (Stead and Marshall, 2001).

Forsyth *et al*. (2008) suggested that it is possible to design an environment with walking in mind, but that the relationships between walking levels, physical activity and physical design are not straightforward. Retrofitting existing environments is particularly difficult due to the limited scale of change it is possible to make given the largely fixed features of the existing environments.

Caulfield (2014) showed that substantial increases in infrastructure provision specifically for cyclists, in particular segregated cycle lanes, can have the effect of increasing cycling levels on the journey to work, most notably for certain groups such as females. Other studies have also shown the beneficial effects of walking and cycling infrastructure (Hatfield and Murphy, 2007; Jaakkola, 2012; Jones and Thoreau, 2007; Spierings, 2013; Wardman *et al*, 2007; Zhang and Chang, 2014). More recently, Ogilvie *et al*. (2016) have undertaken a longitudinal cohort study specifically looking at the effects of a new piece of high-quality local infrastructure, the Cambridgeshire Guided Busway. This included an extensive traffic free path for cyclists and pedestrians. Results showed that the provision of the infrastructure led to a reduction in car travel and a movement towards greater use of active travel modes for commuting.

Ewing and Cervero (2010) show that proximity of residence to transit stops can encourage walking. Other studies have shown the need for well thought out connections between the walking and transit networks to be important (Curtis, 2005; Porta and Scheurer, 2006). Cahill *et al*. (1996) shows that as transit declines in an area, so do walking and cycling.

Noland and Kunreuther (1995) look at the potential for procycling policies against the policies that make car use more difficult. The former are seen as consisting of shorter-term options, while the latter are longer-term and potentially more difficult and unpopular to implement. There are strong arguments for greater restrictions on car use from a whole range of perspectives – safety (WHO, 2009), environment (Burr *et al*., 2004; Committee on the Medical Effects of Air Pollutants, 2010; Royal College of Physicians, 2016) social exclusion and the development of a more inclusive society (Hine, 2012; Lucas, 2006; Mullen *et al*., 2014). A recent review (Clayton and Parkin, 2016) has explored inclusivity in cycling, specifically looking at disability and the particular needs of different groups in terms of equipment and infrastructure provision.

Improving attitudes towards walking and cycling could result in increased use of those modes. Generally, attitudes towards cycling appear to be rather more polarised than those towards walking. Anable (2005) segmented the population into six groups with different views towards transport concluding that optimising the potential to change attitudes and behaviours needed to tailor measures to encompass these different views. Similarly, Gatersleben and Appleton (2007) identify the importance of taking account of the full range of different motivations for travel, in particular the mix of distances and the complexity of different trip requirements. Various studies identify the difficulties of breaking habits and positive feelings towards car use (Domarchi *et al*., 2008; Gardner and Abraham, 2007; Hinde and Dixon, 2005). The importance of more wide-scale societal change is identified by a few authors, in particular the idea that change in transport activity is not necessarily driven only by change in transport, but that other elements of our lives also influence our transport behaviours. Pooley *et al*. (2013) provide a discussion of some of these elements such as flexible hours of work to make it easier to fit walking and cycling into household routines and the provision of appropriate household storage space for walking- and cycling-related equipment.

Most research focuses on walking and cycling for private transport, either for leisure or for more functional reasons. The use of walking and cycling as a means of freight transport appears vastly underresearched, and the potential is unclear. On a practical level, there are now a whole range of companies that offer delivery of various commodities by bicycle and some evidence of businesses that rely on this mode for delivery. There is also a lot of work on design of bicycles for various purposes and perhaps most tellingly an annual international cargo bicycle festival (http://www.cargobikefestival.com/).

The evidence shows that it is possible to put in place packages of measures that can significantly improve both levels of walking and cycling and the quality of the experience. The potential benefits from this are considerable. The difficulty is overcoming the many barriers, both real and perceived. Examples from around the world indicate what is possible – the figures cited earlier indicate the recent position in a number of countries, while cities such as Münster in Germany in 2013 had a staggering 60·8% of trips by walking and cycling (Bruns, 2014). Such places arguably serve as a benchmark for the future. We need to think carefully about the future of our cities and urban areas and the kinds of transport systems we wish to see. Without the vision and an appropriate dialogue with the various stakeholders involved, including the public, it is unlikely that such futures will be achieved. We need to build up an understanding of how such change may be brought about in the least disruptive and most manageable way. This may mean fundamentally changing the existing power relationships that exist between different transport modes (one possibility might be consideration of the rules of presumed liability, which differ from country to country, but which in some countries encourage a greater sense of responsibility on the vehicle that poses the greatest

risk), provision of a greater proportion of funds towards active modes of transport and consideration of novel ways of financing to encourage change (for example, see Tight and Rajé, 2014).

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