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Car-Free Urban Areas: A Radical Solution to the Last Mile Problem or a Step Too Far?

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This paper suggests an alternative and, arguably, more comprehensive definition of the last mile as a personal travel concept. This characterization of the last mile is used as a catalyst for discussion of a radical urban car-free vision to explore how such urban areas might operate in practice. A range of international examples of places where substantial change in urban transport has occurred are included to illustrate the potential for change, how this has been brought about and how close different areas are to achieving very different urban transport futures. The overwhelming argument is that such urban areas can work and in the context of the last mile concept provide a neat solution to many of the associated issues and problems. It is shown that a number of urban areas appear to be moving towards such car-free futures and others might be expected to follow once the benefits become clearer.

The concept of the last/first mile is open to wide interpretation, in part depending on the context in which it is used. In this paper we interpret the scope of the definition to include not just the last (or first) mile of a trip, rather urban sector(s) of an interurban journey, along with trips which are wholly in the urban area. Such trips take place in generally complicated transport environments with relatively high levels of junctions, signals, and other possible causes of congestion and delay; they can be exposed to high levels of pollution and noise and are places where many different modes compete for the same spaces. Experiencing contemporary urban space is associated with overcoming such disbenefits to take advantage of the benefits of the city/urban area. These areas are within 'the last mile' – a concept that is less about a specific mile and more to do with a spatial concept characterizing the final stage of a journey to the urban area (or the initial stage on an outbound trip) and also those journeys purely within the urban area. This complex urban space requires the transport system to enable mobility and accessibility for freight and people to multiple destinations both within and beyond the centre. Yet, it is also a space where such movement leads to increasingly challenging competition between the car and other modes with attendant economic, environmental and social impacts. The dominance of motorized transport has meant that in urban areas land use has facilitated such modes, public space has been lost to parking and facilitation of motorized traffic, and accidents, emissions and environmental impacts have increased. Transport infrastructure in this 'last mile' has tended to ignore the needs of the pedestrian and cyclist.

An aspirational way of thinking about the last mile is to look at radically different futures. This paper explores ideas around the last mile in terms of personal travel by using a vision of rebalanced, less congested, urban public space in a more sustainable

future which promotes equity and wellbeing. The Visions 2030 project (Tight e*t al.*, 2011) developed a number of radical transport visions for UK urban areas for the year 2030. The focus here is on the vision which represents the nearest to a utopian car-free urban future, where walking, cycling and substantially enhanced public transport cater for most urban travel needs. This vision is described further in the following sections along with a discussion of how the vision might be expected to impact on the last mile problem.

This paper provides a background to the ideas of the Visions 2030 project in the next section and in more detail on one specific vision in the third. The fourth section considers real cities and urban areas and explores how they perform against the visions in respect of their focus on sustainable transport and how this performance is changing over time. There follows a discussion focusing on how more sustainable transport futures might contribute to the last/first mile problem, and a sixth section concludes the paper.

Background

The last (first) mile concept appears to apply in different ways and raise different issues for different groups of road users. In passenger transport, in general, the last (first) mile problem is the term used to describe the inefficiencies and challenges around the need to travel at the end or beginning of a journey to access public transport or to go home. For private vehicle users and freight it refers to the increased complexities of the urban environment and to some extent the likelihood of delays and congestion. For walking and cycling there are arguably fewer issues, though in the urban area such users are typically exposed to higher pollution levels and noise and, given the traffic levels and density of roads, to greater frequencies of delay.

With a quarter of carbon emissions attributed to urban transport (Knott, 2015), non-car-based solutions can help contribute to healthier, greener and more vibrant cities. Some solutions to the last mile problem include cycling (if routes are safe and parking is readily available at the interchange, otherwise bike share schemes offer greater flexibility and efficiency), walking (if routes are relatively direct and through areas that are not adjacent to fast-moving traffic or along dark alleys, for example) and feeder bus services which operate with short headways to minimize inconvenient wait times and are supplemented by live, digital information on the vehicle's time of arrival. It is in the context of provision of safe, efficient and convenient access choices to public transport and a subsequent reduction in vehicle miles travelled and greenhouse gas emissions (Lesh, 2013) that this paper looks at a utopian vision arising from the Visions 2030 project.

In the UK (and indeed many other places), walking, cycling and public transport can be effective last mile solutions. The issue at the moment is both the quality and quantity of provision for these modes. There is arguably a need for considerable improvement in the scale and quality of provision for walking and cycling and of public transport if these modes are to take on a serious role in meeting urban transport needs. Change in the level of provision for these modes does happen and indeed there are many excellent examples of provision for both modes. However, new provision is often piecemeal and very localized, often responding to a very specific problem and rarely seeming to be part of a longer term plan. If we are to progress towards a fundamentally different kind of urban transport across our urban areas, focused more on sustainable modes, we need to consider major changes to the ways in which we plan and use our urban environments, with more emphasis on longer term thinking and developments which are consistent with a long-term goal of change. Two distinct approaches can be made for thinking about such change: firstly by looking at the past experience of 'best practice cities' and

secondly by creating speculative visions of future cities. These two approaches, which are synthesized in later sections of this paper, are now dealt with in turn.

Contemporary cities are energy intensive. Production, consumption and other systems that sustain urban life are dependent on coal, gas and oil (Psarikidou and Urry, 2014). The link between use of fossil fuels and climate change is now established (IPCC, 2014) and there is recognition of the need for a change in energy consumption to lessen negative environmental impacts (Berners-Lee and Clark, 2013; Cooper *et al*., 2009). Mobility over the past century has a history of dependence on fossil fuels resulting in transport playing a key role in production of emissions. Alongside this is increasing awareness of the relationship between transport and detrimental environmental, social and health effects (Royal College of Physicians, 2016; Urry, 2013*a*, 2013*b*; Geels *et al*., 2011; Little, 2010). Some cities now appear to be seeing a transition towards more sustainable forms of transport with initiatives to promote less dependence on private transport and provide infrastructure which offers viable alternatives.

Various lists of cities exist with respect to 'best practice' concerning sustainable urban transport. For example, Khayesi and Amekudzi (2011) list Curitiba, Bogotá, Munich, Freiburg, Zurich, Paris, London, Singapore, Gothenburg, Amsterdam, Groningen, Copenhagen and Portland, whilst Geels (2012) adds Manchester and Oxford. It is notable that only four of these cities lie outside Western Europe: the question as to whether this is because Western Europe is currently more advanced in sustainable transport in reality, or whether it is due to the authors' geographical bias, is beyond the scope of the present paper. In general, the academic literature concerning 'best practice cities' with respect to sustainable transport is growing rapidly. Reviews of such practice are frequently made from a multi-city perspective (see for example Pucher and Buehler, 2008, 2009; Pucher *et al*., 2010; and Buehler *et al*., 2016). While such multi-city perspectives are clearly useful for comparative purposes, they often cannot capture the important detail that is provided by 'single-city' analyses (i.e. analyses that concentrate upon only one city), particularly concerning historical trajectories. Three cities in the above list from three different continents (Freiburg, Curitiba and Singapore) have been of particular interest to sustainable transport researchers, generating the following single-city journal articles: on Freiburg (FitzRoy and Smith, 1998; Ryan and Throgmorton, 2003; Buehler and Pucher, 2011; Kronsell, 2013; and Freytag et al, 2014); on Curitiba (Rabinovitch, 1996; Smith and Raemakers, 1998; Taniguchi, 2001; Duarte *et al*., 2011; Khayesi and Amekudzi, 2011; Miranda and de Silva, 2012; Macedo, 2013; and Mercier *et al*., 2015); and on Singapore (Willoughby, 2001; May, 2004; Lam and Toan, 2006; Richmond, 2008; Han, 2010; and Haque *et al*., 2013).

With respect to the latter approach mentioned above, the Visions 2030 project used a visioning approach to try to stimulate thinking about alternative futures where urban transport was much less car focused and more dependent on walking and cycling than it is currently. It also explored possible pathways by which such futures might be achieved – i.e. how might we move from where we are at the present to alternative versions of 2030. The visioning approach seems useful in the context of thinking about long-term futures as it permits thinking about major change both in terms of infrastructure and provision and of changes to existing policy direction, as well as creating the opportunity for aspirational thinking which sidesteps the short-term barriers which often stifle adequate consideration of new ideas.

The Visions 2030 project developed three visions for the year 2030 based on an imaginary UK city, initially similar in size and form to somewhere like Nottingham in the English Midlands (with a population of around 310,000 in 2013), though it was felt that the ideas could be applied to a range of

sizes of city from around 100,000 population to perhaps 1 million. The project deliberately did not look at the largest cities, though work has been undertaken for some large cities in Europe exploring how car use is declining, especially in the city centres (see Buehler *et al*., 2016 which examined change in five cities – Munich, Berlin, Hamburg, Vienna and Zurich).

Vision 1 was a best practice future which assumed UK urban areas within the size range were able to adopt and implement aspects of best practice for walking and cycling by 2030, drawing mainly from wider European experience. This vision was compelling and relatively easy to justify as there were many examples of places where it existed and worked – indeed there are a few urban areas within the UK which already exhibit many aspects of this vision (Cambridge perhaps being the best example). Vision 2 went further – a utopian vision where public transport, walking and cycling provided for most urban transport needs and which involved a radical change in current practices, way of life and transport consumption patterns. Vision 2 was critically different to Vision 1 in the sense that at the time of development it appeared to be beyond the achievements of most urban areas and hence a more aspirational future (though we revisit this in the fourth section). Vision 3 was different again, described as a dystopian future, it considered a world where there had been major problems in the period up to 2030 – possibly conflict or environmental issues – which had resulted in shortages of fuel. As a result society had shown a level of resilience by choosing to react to the challenge by redesigning the focus of urban transport, with considerably more emphasis on low fuel-dependent transport such as walking and cycling.

Table 1 provides an overview of the approximate mode shares (of personal transport) of the different visions along with baseline 2014 figures for urban areas in England. The figures are trip stages, taking some account of walk trips at either end of public transport and other trips (though not walk stages under 50 yards (~46 m) or off the public highway). Each of the futures assumes that these mode shares become the minimum standard across all appropriately sized urban areas. The mode shares are indicative of three possible futures. They are not intended to be an accurate representation and may vary across different parts of each urban area. Rather they were intended to provide a notional sense of what each urban area might be like using an indicator which is understandable to all. There are, of course, many alternative futures which could have been considered – three were chosen here as they represented very distinctively different kinds of future.

The next section considers in more detail Vision 2 which will be the focus of the remainder of the discussion in this paper. The focus on this vision is because it is the one which has the most potential to address issues relating to the last/first mile problem as defined in this paper. The vision involves a radical and universal reorganization and rebalancing of transport in urban areas to create a more equitable and less damaging system which improves travel reliability and reduces delays on congested roads.

Table 1. Approximate mode split for personal transport (trip stages) for 2014 (England) and the three 2030 Visions.

	*Current situation (2014)**	*2030 Vision 1*	*2030 Vision 2*	*2030 Vision 3*
Walk	22%	32%	37%	40%
Cycle	2%	13%	23%	40%
Public Transport	10%	25%	35%	15%
Car	64%	30%	5%	5%

**Source*: Current situation – Department for Transport (2015).

Vision 2

In this vision, there is a substantive difference in transport behaviour in urban areas compared to now: walking, cycling and public transport mode shares are much higher than in Vision 1 and the current situation (see table 1), accompanied by lower car use (so that it is now a minority mode across the whole urban area). The background for this transport vision is a society that puts far greater emphasis on social sustainability than in the present day, involving high levels of egalitarianism, social inclusion and social justice. The changes have largely been stimulated from the bottom up, driven by attitudinal changes from a growing recognition of the major environmental, health and social issues associated with motorized transport.

Figure 1 gives a sense of how five parts of the city might look in this vision in 2030 compared to a baseline of 2010. There are many alternative pathways by which this vision could have been achieved. Here one possibility is described. Car use in urban areas has been largely curtailed through personal choice, the positive appeal of significantly enhanced alternative modes of travel, and through supportive government actions. Most people do not own or use a car and the principal private car users are those with mobility difficulties who cannot realistically use 'active' modes and a small number of people whose mode of transport needs to be prompt (doctors making home visits may be an example). Where practicable all these car users make use of car pooling and integrate car use with the enhanced public transport network (for an extensive discussion of these issues see Shaheen and Chan (2016, this issue) and Ohnemus and Perl (2016, this issue). Car design takes on board latest technological developments, for example to support automatic speed reduction and carbon emission reduction.

The norm is for school children to walk or cycle to school, and generally parents chose local schools for their children as required by government policy. Small-scale technological developments are commonly used by pedestrians, such as electronic navigation for people who benefit from additional support; pedometers and accelerometers available free from health centres; and careful use of surveillance. Technological developments that have increased take-up of cycling include efficient electric bicycles and electronic navigation.

Public transport is generally of a higher quality, reliability and frequency than in the present day, so that it fulfils many of the transport needs previously fulfilled by the car. Short trips in urban areas are undertaken on foot or bicycle with easy access to public transport interchanges, while longer trips within the urban areas are typically undertaken on public transport. Door-to-door public transport provides access to high standard dial-a-ride systems.

Land-use patterns in urban areas support the infrastructure for improved public transport though the distribution of space on the road network has changed with a greater focus on walking and cycling. Essentially much of the structure of urban areas remains very similar to the present day, though there has been some densification in places and people choose to coordinate their activities in smaller spatial areas than previously for convenience. Easily accessible transport interchanges are provided in neighbourhoods within close proximity to most residences and there is increased use of streets as social spaces for children and others. In many places the public transport routes are deliberately segregated from the walking and cycling networks. However, within residential neighbourhoods smaller public transport vehicles will share road space with pedestrians and cyclists.

Much of the freight is transported from distribution centres by a fleet of small electric vans, which would be segregated from the walking/cycling network where possible.

The city is much more 'civilized', insofar as it operates on a model of greater sociability and accessibility, neighbours typically assist

	The Current Situation	*The Current Situation*
An older Victorian Street built initially for very different traffic requirements to now and which has adapted slowly to changing circumstance. It is constrained for space by the building line, houses were designed before the need for parking was considered, the streetscape is cluttered and mixed uses are difficult to accommodate. Noise, safety and local air pollution are all issues which impact on travellers and residents.		
A more modern estate towards the edge of town. Essentially a residential estate, perhaps run down with the range of social problems which can characterize such areas. Space is plentiful and hence, unlike the Victorian street, there is room to construct a more walking and cycling friendly environment. There is a large primary school on the left hand side of the road and hence some distinctively time-bounded pedestrian issues.		
A suburban shopping area containing mid-range shops and a small supermarket. In part a through route for both traffic and pedestrians, in part a destination in its own right. It is an area which has many problems, in particular safety issues for pedestrians, problems of parking and a complicated traffic mix, with public service vehicles and freight deliveries common.		
An edge of town location where the urban fabric meets open space. Beyond the city ring road there are now business parks and out of town shopping centres. Traffic on the ring road is heavy and pedestrian and bicycle access between the residential zones of the city and the facilities outside the ring road is difficult – most such access is by car.		
A suburban rail interchange, an important link between the outer neighbourhoods of the city and the city centre. Access to and from the station on foot can be difficult due to conflicts with traffic. There are limited facilities at the station for bicycle parking. In Vision 2 it functions as a neighbourhood public transport interchange.		

Figure 1. Five urban locations as they might appear in Vision 2 in 2030 compared to 2014.

with helping each other to move around, thus reducing isolation; there is respect for other passengers using public transport; road safety is significantly improved; noise and pollution from traffic is reduced; and levels of public health across the population are substantially enhanced.

As some non-urban transport trips, where a trip starts or ends in an urban area, are of relevance to this discussion, it is worthwhile saying a little about how these might happen in Vision 2. Given the social changes underlying Vision 2, it would be likely that transport along heavily used interurban corridors, now dominated by motorway car traffic, would in this vision be dominated by public transport (for longer journeys) and cycling (for shorter journeys). On the other hand, the car mode, albeit with more car sharing and car pooling, would still be expected to play a role in relatively inaccessible rural areas. To facilitate journeys from such locations to/from the city, car parks would need to be constructed at the city limits or at points along the aforementioned heavily used transport corridors (with interchanges so as to reach the city by public transport).

Movement Towards Car-Free Urban Areas

This section examines change in a number of real urban areas within the size range considered for Vision 2 and which are seemingly moving towards the kinds of mode shares described in Vision 2. When Vision 2 was initially developed it was felt to be aspirational and unlikely to be achieved in the foreseeable future given the large scale of change required, even in the best practice European cities. There were no examples which could be used to show it was possible. What is becoming clear now is that this is changing and that, while Vision 2 does not yet exist in reality, there are some urban areas which are getting close and appear to be moving away from the typical levels of car dependence which exist in most places. The following examples seek to illustrate this.

A selection of Vision 2 sized cities, which are displaying increased movement away from car travel, is shown in table 2. These are chosen to represent the sort of change that is taking place and are not meant to be a comprehensive compilation of all such urban areas. Also, it should be noted that the figures provided are from different sources. Therefore, figures were obtained by a variety of survey methods, which suggests that some caution should be applied to any comparisons. This is in line with the EU advice that '… unfortunately there are no reliable single international or European statistical reports showing modal share of bicycle use per country, related to all journeys' (European Parliament, 2010).

To explore some of the factors that can influence sustainable transport change, the cities listed above are examined further below.

The case of Ferrara in northern Italy is of particular interest as it has achieved Dutch levels of cycling and surpassed the Vision 2 proportion of cycling trips of 23 per cent by 6 per cent, in a country where cycling is reported to make up only 4 per cent of the national mode share (European Parliament, 2010). This growth has been associated with a group of initiatives and policies which enable and encourage cycling. These include provision of bike parking, discounts for cyclists in local shops and establishment of an office to promote cycling (*Ibid*.). These measures build on a history and culture of cycling linked to the geography of the city. It is a mono-centric city with a compact urban structure and outlying villages within 5 km of the centre (Cycle Logistics Federation, nd). In addition, for the first half of the twentieth century, the bicycle was 'the only vehicle available for journeys between homes and fields or factories' which led to the development of a cycling culture in Ferrara where cycling is 'regarded as a usual means of transport' (*Ibid*.).

Although it has not reached similar cycling levels to Ferrara, Seville provides another

Table 2. Mode split for selected cities.

City	*Population (at 2nd timepoint)*	*1st timepoint*	*2nd timepoint*	*Change*
Ferrara, Italy *Source*: EPOMM Modal Split Tool City Survey	135,000	*2008* Car 56% Public transport 5% Walk 12% Cycle 27%	*2013* Car 42% Public transport 14% Walk 15% Cycle 29%	Car –14% Public transport +9% Walk +3% Cycle +2%
Donostia-San Sebastián, Spain *Source*: EPOMM Modal Split Tool City Survey	186,185	*2006* Car 29% Public transport 25% Walk 43% Cycle 3%	*2011* Car 28% Public transport 19% Walk 49% Cycle 4%	Car –1% Public transport –6% Walk +6% Cycle +1%
Seville, Spain *Source*: (2007: EPOMM Modal Split Tool City Survey) (2011: Marqués *et al.*, 2014)	702,355	*2007* Car 53% Public transport 14% Walk 31% Cycle 2%	*2011* Car 35% Public transport 22% Walk 37% Cycle 6%	Car -18% Public transport +8% Walk +6% Cycle +4%
Bologna, Italy *Source*: EPOMM Modal Split Tool City Survey	373,026	*2001* Car 62% Public transport 19% Walk 15% Cycle 5%	*2007* Car 46% Public transport 26% Walk 21% Cycle 7%	Car –16% Public transport +7% Walk +6% Cycle +2%

example of how sustainable transport change may take place. Utilitarian cycling in the city has risen from negligible levels, through promotional activities and infrastructure provision, to an important component of the modal split (Marqués *et al*., 2014). For many years campaigners fought to have cycle lanes installed in the city (Walker, 2015) but it was only when the political environment was receptive to the idea that infrastructure investment began to take place. Seventy five miles (120 km) of segregated cycle lanes have been installed which has led to the average number of bikes used daily in the city rising from just over 6,000 to more than 70,000 (*Ibid*.) or 6 per cent of all trips being by bike in 2011. This growth suggests parallels with the induced traffic effect usually associated with road building: if dedicated, comprehensive and relevant cycling infrastructure is provided, cyclists will use it.

Donostia-San Sebastien and Bologna show different pathways to change. The former has seen a slight decline in car use over the period covered and a large increase in walking. Public transport use over the period also has seen a decline.

> For about 20 years now Donostia-San Sebastian has been applying integrated policies favouring pedestrians, cyclists and public transport. By reducing on-street parking and returning the public space to pedestrians the city managed to become an even more attractive place to be. A major achievement of the mobility policy is the establishment of a pedestrian network that makes most of the city reachable on foot through promenades, vertical transport aids and a pedestrian axis. (Civitas, 2013)

More recently the city has built in measures designed to increase public transport usage and reduce car use, including high-quality bus corridors, a business district bus service and advanced park-and-ride. Initial results

suggest a reduction of around 2,500 cars per day to the city centre and an increase in public transport usage.

Bologna shows a different pattern and pathway to change, experiencing a significant reduction in car use in the city, along with significant growth in walk and public transport trips, perhaps in part indicative of the crucial link between these two modes. Again a series of measures has been implemented in the city to develop the public transport system and to create liveable places in which to walk and cycle.

In these cities a range of factors appears to be stimulating change in transport. Aspects of cultural, geographic, campaigning, political and infrastructure features have all influenced and enabled sustainable transport change. Other authors have explored the importance of various factors in change (e.g. Dudley, 2013; Gillett, 2012; May *et al*., 2011). Gillett (2012) suggests that policy windows may be relevant to successful introduction of change. Dudley (2013, pp. 1139–1140) discusses this idea further with reference to the work of John Kingdon who introduced the concept:

> … one of the principal concepts that inextricably links a physical dimension of time to the success and failure of ideas is that of the policy window. Thus, Kingdon argues that, while many ideas float around in a type of policy primeval soup, the ones that last, as in a natural selection model, meet some criteria whereby some ideas survive and prosper, and some proposals are taken more seriously than others (Kingdon 1995: 117)… Kingdon emphasizes that policy windows open infrequently, and do not stay open for long, but that basically a window opens because of change in the political stream, such as a change in administration or a shift in national mood, or it opens because a new problem captures the attention of government officials.

In the case of Seville in particular, such a policy window would appear to have opened and enabled provision for cycling to be introduced. May *et al*. (2011, p.1429) highlight 'the importance of leadership for policy change and implementation, and addressing the more transformative aspects of intervening in a system. Leadership can draw on a variety of "knowledge cultures", which can all share in collective decision-making and possible actions for the future. These knowledge cultures include those applying at individual, community, specialist, organizational and holistic dimensions'. The role of leadership in effecting transport change is also taken up by Gillett (2012) who, reflecting on other authors' findings, underlines, as an example, the importance of the impetus and leadership provided by the Mayor of London, Ken Livingstone, in introducing the congestion charge. With regard to the cities described in table 2, leadership appears as an important factor in influencing policy to build on cultural, geographic and campaigning bases to develop infrastructure change that enables sustainable mobility.

Looking specifically at walking and cycling trips as a proportion of overall mode share, the European Platform on Mobility Management's database was used to ascertain which urban areas have reached or surpassed the Vision 2 levels of walking and cycling (37 per cent and 23 per cent respectively). Table 3 shows the two places that have attained the greatest proportion of walking trips above the Vision 2 level and table 4 illustrates the two that have done the same for cycling. Note that the same caveats about the viability as indicated in relation to data in table 2 also need to be considered here.

It is interesting to note from both tables 3 and 4 that the locations which perform best in terms of cycling very often perform less well in terms of walking and *vice versa*. It is not immediately clear why this is so for each different place, but it could relate to the focus of investment in a particular mode, to historical cultural associations or to the difficulty of more fundamentally reducing dependence on the car below a threshold level.

One of the most successful cities in achieving a comprehensive mode shift towards less carbon-dependent travel overall is Münster in Germany. It is a medium-sized city which

Table 3. Progress towards Vision 2 levels of walking and cycling: top 2 European urban areas where walk >36% mode share.

City	*Population*	*Walk (%)*	*Diff from V2 (%)*	*Cycle (%)*	*Diff from V2 (%)*	*Car (%)*	*Diff from V2 (%)*
Vitoria-Gasteiz, Spain (2014)	240000	54	+17	13	–10	24	+19
Jena, Germany (2008)	110000	39	+2	10	–13	35	+30

Source: European Platform on Mobility Management (2016) Modal Split Tool.

Table 4. Progress towards Vision 2 levels of walking and cycling: top 2 European urban areas where cycle >22% mode share.

City	*Population*	*Walk (%)*	*Diff from V2 (%)*	*Cycle (%)*	*Diff from V2 (%)*	*Car (%)*	*Diff from V2 (%)*
Houten, Netherlands (2008)	48000	23	–14	44	+21	31	+26
Eindhoven, Netherlands (2014)	220790	13	–24	40	+17	42	+37

Source: European Platform on Mobility Management (2016) Modal Split Tool.

Table 5. Mode split Münster 2001–2013 compared to the 2030 Vision 2.

	Münster 2001	*Münster 2007*	*Münster 2013*	*2030 Vision 2*
Walk	13.4%	15.7	21.7	37%
Cycle	35.2%	37.6	39.1	23%
Public Transport	10.9%	10.4	10.2	35%
Car	40.5%	36.3	29.0	5%

Source: Bruns, 2014.

has achieved major changes over a relatively short time frame from a reasonably sustainable base. Table 5 illustrates the travel mode change that has been achieved in the city and relates the mode share to the projected utopian Vision 2 2030 modal split described earlier.

The figures show that overall the walking and cycling mode share slightly exceeds that for Vision 2 – much of this has been gained by the very high levels of cycling (the cycling mode share exceeds the utopian vision by 16 per cent), though there has also been a steady increase in walking since 2001 accompanied by a decline of 11.5 per cent in the car mode share. To truly achieve Vision 2 Münster would need to achieve even greater car use reductions than it has achieved to date, though if it were to continue at the current rate of change this could be possible in a 20 year period. It remains to be seen if such future change can be achieved. For a highly developed, wealthy city such as Münster there may be further barriers to such change given the high levels of car ownership which still exist – in 2006 this was 665 cars per 1,000 inhabitants (Stadt Münster, 2009). Some of the car trips currently happening in Münster are inevitably parts of longer distance inter-urban trips, which may prove more difficult

to transfer than trips solely within the urban area given the distances involved and lack of suitable alternative modes. Persuading motorists to interchange between the private car and walk/cycle/public transport at the boundary of the urban area will not be straightforward and requires significant infrastructure investment and provision to make it possible. Having said this, recent car parking policy in Münster is to use the ring road around the town centre as a parking belt for those motorists unable to drive to their destinations in the centre – it also talks about the use of 'transferiums' at the edges of the town to cater for visitors and regional commuters (Fietsberaad, 2009).

Münster is within the size range of the city imagined in Vision 2, with a population of just over 300,000 in 2014. Within the city there are 560 km of cycle lanes, good bicycle parking, cycle paths along virtually all main roads, and exclusive cycle use of the 'ring road' around the central city. The entire central shopping city is closed to private traffic. Walk and cycle levels appear to remain high even in cold and snowy winter conditions.

To place the figures for Münster in context, table 6 shows the 2013 mode split for the city in relation to other major German cities and Vision 2.

With change happening, as illustrated in modal split data for urban areas, particularly Münster, but also the other cities considered here, there is some evidence of movement away from a focus on car-based travel. Nevertheless, further substantial transport behaviour and infrastructure change is required to achieve the levels illustrated in the utopian vision described earlier.

Discussion and Conclusions

Vision 2 of a rebalanced, less car dominated, urban public space in a more sustainable future which promotes equity and well-being, provides a means to explore how greater dependence on sustainable modes of transport in urban areas can help to address the challenges of the so-called last mile and the potential of walking and cycling, in particular, to help mitigate these by providing viable solutions to personal, urban mobility.

There is evidence from what is currently happening in cities and urban areas that change in transport patterns is taking place and that some highly innovative locations are moving towards a situation akin to Vision 2, though there is still more work required to bring down the car mode share yet further. In terms of car travel, UITP (2015) reports that the urban sprawl of the second half of the twentieth century has started to decline. Data collected for the Mobility in Cities Database for 1995, 2001 and 2012 shows that urban density in developed cities studied dropped between 1995 and 2001 but has now risen again to the 1995 levels, suggesting less sprawl and shorter trip distances. For example, urban density increased in Vienna, London, Oslo and Prague between 1995 and 2012, while UITP indicate that the motorization rate decreased in Vienna, London, Paris and Geneva between 2001 and 2012, marking a reversal of trend in all four cities. In London, Paris and Geneva, the motorization rate was actually lower in 2012 than in 1995. For instance it fell to 307 cars per 1,000 inhabitants in London. These cities implemented a range of traffic restriction

Table 6. Mode split Münster and other German cities compared to utopian 2030 vision.

	Germany 2013	*Major cities Germany 2013*	*Münster 2013*	*2030 Vision*
Walk	23.7%	27.2	21.7	37%
Cycle	10.0%	9.8	39.1	23%
Public Transport	8.5%	14.7	10.2	35%
Car	57.8%	48.2	29.0	5%

Source: Bruns, 2014.

measures in the past ten years (such as congestion charging in London or parking restrictions in Paris). In this context, distances travelled by private car per person decreased by more than 30 per cent in Vienna, Paris, London, Oslo, and Prague between 1995 and 2012' (*Ibid*., pp. 5–6). There has also been a decrease in the average distance travelled by car (both as driver and passenger) in the developed cities UITP examined. They report that there has been a consistent downward trend in distances travelled by city residents by car since 1995 from 4,700 kilometres annually in 1995 to 3800 in 2012 (*Ibid*.). Similar findings have been shown by Buehler *et al*. (2016) in a number of large European cities.

If other urban areas are to experience the type of transport change and associated movement towards Vision 2 described earlier, the key factors that have influenced increased walking and cycling may be of interest to other places seeking to move in a similar direction. Transport change has been linked to legislation and enforcement, economic interventions, persuasion and holistic or integrated approaches (Avineri and Goodwin, 2010). By examining some of the cities on the Copenhagenize Index 2015,[1] the main factors influencing levels of urban cycling become clearer. It is suggested that to be bike-friendly 'You need serious advocacy, bike facilities, social acceptance, and a general perception that cycling is safe' (http://www.wired.com/2015/06/copenhagenize-worlds-most-bike-friendly-cities/) with infrastructure being described as the 'key'. In Copenhagen itself, continued investment in cycling infrastructure and political will have enabled the urban area to return to the top of the index after falling to second (behind Amsterdam) in the two previous indices. These two influencing factors are repeated for other cycling urban areas in the top 20 on the index (e.g. Barcelona, where bikes are described as having been unseen around 8 years ago to the current success of its bike share scheme and frequently used cycling infrastructure [http://www.wired.com/2015/06/copenhagenize-worlds-most-bike-friendly-cities/]). In contrast, Dublin had a surge in political will and infrastructure investment which appeared to peak about 5 years ago but has now slipped down the index from 10th in 2013 to 15th in 2015. This is linked to less apparent political support which then undermines strategy development and infrastructure investment. In general, in all cities it is important to take advantage of situations which create 'open policy windows' for change, in line with the concept introduced by John Kingdon, as described in the extensive quote given above by Dudley (2013), and which is also featured prominently by Khayesi and Amekudzi (2011) in their description of change in Curitiba.

Despite evidence of progress towards Vision 2 in some places, especially in relation to the walking and cycling mode share, it is unclear how far it is possible to go in that direction and whether such change might happen on a more widespread basis. Nevertheless, such changes have clear implications for the last/first mile problem for personal transport in urban areas as they move towards becoming much more liveable places. Issues typically associated with the first/last mile, such as congestion, lack of space, pollution and journey time unreliability, will become much less prominent as a result of the envisaged reduction in motor vehicles. Walking and cycling have an important role in achieving more lively and accessible urban spaces and are a major influence on liveability, providing greater 'freedom of choice in terms of mobility' (Søholt, 2014, quoted in Bramley, 2014).

NOTE

1. An index of the world's most bike-friendly cities. Available at http://copenhagenize.eu/.

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