Rethinking habitual travel patterns – what might 'flexi-mobility' mean for sustainable transport policies?

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Abstract

Personal travel is responsible for a significant proportion of both global carbon emissions and energy use but is often held to be particularly difficult to reduce through changing behaviour rather than through technological adaptation. This is because most travel is considered to be a 'habitual' behaviour which is relatively fixed and possesses a great deal of inertia. The "Unlocking Low Carbon Travel" project has spent 3-years undertaking an extensive programme of work in the UK looking at people's everyday lives and the role that travel plays in these. The research included: following over 30 families in longitudinal socio-ethnographic studies; carrying out a major national quantitative survey; studying a range of short-term disruptions to travel such as flooding, winter weather and fuel shortages; and interviews and workshops with policy stakeholders and citizens.

Our work has identified that there is a much greater degree of variability, and therefore flexibility, in how people travel than is often held. However, people often become locked into complex travel arrangements due to the demands put on them through the expectations of everyday life. This variability is masked by standard approaches to collecting data on travel, such as the UK National Travel Survey which asks questions such as "How do you usually travel to work?" or even "When you cycled in the last 12 months, where did you usually cycle?". This line of questioning not only reflects common assumptions about lack of flexibility in people's travel, but also goes on to reinforce these views by generalised reporting of these that doesn't account for the other ways and means of travel that people might use.

Having uncovered this greater potential for what we term 'flexi-mobility', we explore whether it is a resource that could be cultivated and developed in order to help unlock new possibilities for transitions to more sustainable patterns of travel and mobility. The concept opens up possibilities for sustainable transport policies, accepting the need for better coordination from a range of actors, rather than the current trend towards individualisation of responsibility for travel and its impacts.

Introduction

Mobility provides enormous social benefits. Each year it is estimated that around 800 billion vehicle kilometres are travelled in the UK (DfT, 2014). Travel forms part of the vital social and economic benefits which support everyone's quality of life. It is essential that the benefits of mobility are preserved into the future. However, the UK, like many developed and developing nations, faces a challenge of accommodating this demand for movement, not least because of a growing population. Moreover, a heavy reliance on car based mobility brings some very significant downsides. With respect to global environmental consequences, transport contributes over 22 % of global CO_2 emissions (IEA, 2013), a major greenhouse gas. The UK is committed to cutting its carbon emissions by 80 % by 2050, but, to date, the transport sector has and will make a slow and uncertain contribution to these targets based on current trajectories (CCC, 2014). With respect to local environmental concerns, 15 (20 %) of UK's urban areas will not meet European air quality standards for nitrogen dioxide by 2020, 10 years after the origi-

nal deadline[1]. With respect to the economy, 89 % of lost time on UK roads is in urban areas (Eddington, 2006). Without action, the growth of cities will be stifled by deteriorating accessibility. Our networks are unreliable and the impacts of failures in small parts of the network seem to knock on over a wide area today. And with respect to health, one quarter of the UK population is defined medically as obese, and around 30 % of the population do not even get 30 minutes 'moderate exercise' a week (British Heart Foundation, 2012). With 98 % of the sector dependent on fossil fuels, targets for the penetration of electric vehicles consistently falling short and biofuels penetration uncertain due to sustainability concerns, the transport sector remains one of the greatest obstacles to energy diversification.

Thus, it seems that whether you argue the case from an environmental, energy, economic, social inclusion or health angle there is a compelling case to tackle the urban transport problem. Whilst improved technology will continue to get more out of existing infrastructure and vehicles, and will provide better information to travelers, it is only part of the solution. Significant infrastructure investment will also contribute, but it is accepted that we cannot rely on technology alone or build our way out of the problems we face (Schwanen et al., 2013). Yet, it is easy to forget that there are still significant proportions of households that have no access to a car, particularly in urban areas. Some by choice. In the UK, 27 % of households live without a car (DfT, 2014). Of the 42.2 % that have access to one car, many household members are without access to a car for much of the week. For some people, getting around without a car is a way of life. For others, the car is central to most trips that are made (Mattioli, 2014).

In this paper, however, we contend that the dichotomy between car and non-car is a false one. Based on three years of an extensive programme of empirical work looking at people's everyday lives and the role that travel plays in these[2], this paper builds upon the core finding that even the most car dependent of people get around by other means at some point in their lives. Even those who regularly commute to work by car sometimes do things differently, whether it is for a one off occasion, or because the car is being serviced or because it is nicer to cycle in the summer than the winter. Our results suggest that, in order to develop a coherent strategy for travelling less by car, transport policy should be looking to cultivate this multimodality so that everyone is able and willing to travel a bit less by car where they can across their lives. As well as looking at what transport policies should be applied, it is also necessary to look beyond transport at a range of issues surrounding working practices, schooling and leisure. Travel patterns are not just defined by whether or not car use is desirable, but by a series of complex and interconnected activities and constraints. This holistic approach to thinking about travel behavior change we term 'flexi-mobility'.

This paper sets out the new approach by firstly setting the context for trends in mobility within wider economic and social changes taking place. The following section briefly outlines the methods used in this study before summarising that evidence in a set of five key areas of variability, flexibility and change in everyday travel patterns. The discussion section sets out the flexi-mobility framework, discusses why we currently see less flexi-mobility that we would like and presents the potential implications for this on policy design.

Background: recognising change

Our economy and society are changing rapidly. Large-scale forces such as globalisation continue to change how economies function, determining which kinds of economic activities are in greater or lesser demand than before. Technological change, such as the almost-universal adoption of smartphones and tablets, makes new means of working possible, and enables people to stay in touch with each other wherever they are. At the same time, long-established demographic trends, such as the ageing of the population, present new challenges for government and society itself.

How society and the economy are organised determines what mobility needs are at any point in time. As social- and economic change continues, so the kinds of mobility, and which places we need access to, changes too. For example, as the economy continues to restructure in response to global demand, so the location of jobs changes and people need to travel to new places for employment. Many people also have busier lives than ever before, juggling work, continuing education, caring and other responsibilities so that the traditional ideas of a 9-to-5 'working' day and the simple radial 'commuting' journey are consigned to history (Wajcman, 2014).

Populations continue to become more diverse. In London, the proportion of black and minority ethnic groups has risen from 29 % to 40 % between 2001 and 2011 (ONS 2011), trends seen in parts of other cities too. Young people are staying in education longer, and rather than seeking a job for life are increasingly likely to build 'portfolio' careers involving many more different jobs in different places than their parents' generation would have done. This means that they are more likely to rent rather than buy a home in their 20s and 30s, and for many people building a successful career means spending at least some time in London, where they learn to meet nearly all of their mobility needs using public transport (Berrington and Mikolai, 2014).

At the other end of the life course, people are working and living longer. For many people, keeping mobile is a crucially important part of maintaining a healthy life for longer because mobility enables them to remain connected to their family and other social networks. And, at whatever age, concerns about obesity and general wellbeing mean that people are increasingly encouraged to walk and cycle as part of their everyday lives, rather than just as special 'leisure' pursuits.

Perhaps the most profound change to how we communicate and access the services we need in recent years has been brought about by the widespread adoption of internet and, more recently, mobile devices. Many people now have access to a smartphone, and many people use these to remain connected to their social networks whilst on the move. Such is the power of these technologies that some economic activities have been completely transformed in a short period of time: shopping, for example, has been revolutionised by the internet, with the internet accounting for more than half of sales in whole

1. http://uk-air.defra.gov.uk/library/no2ten/.

2. EPSRC/RCUK Energy Programme funded project "Disruption: Unlocking Low Carbon Travel". See Acknowledgements.

retail sectors such as books, music and travel (ONS, 2013 ONS, 2014). Grocery shopping practices are changing with fewer people doing large weekly shops with more on-line shopping and smaller local or top up shops (DfT, 2013; ONS, 2014, Roby, 2014; Waitrose, 2014) and now the major supermarket chains are completely revising their business model and location of their stores to adapt to innovations such as 'click and collect' and the growth in home deliveries. As technology and electronic infrastructure improves further we can expect the roll-out of web-enabled technology to continue apace: there is already significant interest in the idea of the 'smart city' in which sensor- and communications innovations are used to tell us more about what's happening around us in real time so we can make more informed decisions about how, where and when to travel.

The transport sector itself is not immune from these changes. For example, ever better technology and systems make the 'shared economy' for mobility (car clubs, bike hire, taxi-share) more possible for more people. There is some evidence that the economic and social trends outlined above mean that people are already using their cars less – the notion of 'peak car' – and that as these trends continue so the privately owned car will be a less important aspect of our mobility provision in future (Goodwin & Van Dender 2013). Taking all of these trends together, it seems certain that the mobility demands of the future will look quite different to those of today. Given that these trends are happening, often in an unguided manner, can they be harnessed so that they facilitate, rather than frustrate, change towards a better, healthier, more inclusive and more resilient lower carbon mobility system?

Despite this evidence, including recent 'peak car' trends emerging in developed cities and countries globally, travel behaviour has tended to be seen as quite difficult to change and a significant body of research work has focused on the difficulties of changing travel habits (Gärling & Axhausen, 2003). This is partly because it is often viewed as fixed and 'habitual' (Schwanen et al., 2012) and locked into regular daily or weekly cycles, but also because it relies on fixed and large-scale infrastructures that limit what choices are actually possible.

It is accepted that habits are an important feature of how we make our choices in many parts of our life including how we travel. Looking at a city level, the ring road might always be busy between 8am and 9am and the 07:45 train might always be jam packed. However, does that mean everything is the same every day? Standard approaches to collecting data on mobility patterns tends to ask questions which reinforce this common interpretation about lack of flexibility, such as the UK National Travel Survey (NTS) which asks questions such as "How do you usually travel to work?" or even "When you cycled in the last 12 months, where did you usually cycle?" In addition, there is very little longitudinal panel survey data and almost nothing about what an individual does over a period longer than one week. The reporting of statistics using aggregate trends in mode use or journey distance also reinforce the idea that travel patterns are relatively stable as the underlying churn in behaviour is often erased (Goodwin, 2009). Therefore, we know very little about how variable current travel behaviour is and how flexible it might be to all kinds of disruption – whether short term, long term, planned, unplanned – including deliberate attempts by policy to 'disrupt' it to achieve transitions in patterns of demand.

The 'Disruption' project on which this paper is based took as its central premise that travel behaviour may not be as habitual as is often assumed (Chatterton et al., 2015). The research was based around the contention that disruptions, defined as 'periods of time where systems cease to work as commonly expected and which have a discernible temporary or longer lasting impact on mobility' (drawing on the work of Graham (2010)), provide a useful lens through which to study travel behaviour as 'they make visible the assumptions around which travel patterns are based' (Marsden and Docherty, 2013, p.51). In addition, the project set out the contention that, if the experiences of individuals actually incorporates greater flexibility than infrastructure is currently design for, then individual capacity to cope with disruption may be greater than is typically assumed and, likewise, opportunities to drive a little less will be missed. Perceptions and realities of the need to drive as the default option will be reinforced.

The following sections synthesise the results of the myriad of empirical studies that made up this research programme to bring the findings together in a proposition for a new approach to thinking about travel behaviour change.

Methodology

In order to test the contentions set out above, data was collected through a series of interconnected studies. These studies had different, though related, objectives and had different types of disruption as their focus. They also used a mixture of qualitative and quantitative methods although common questions were used across studies where appropriate. The studies can be grouped as shown in Table 1. Some further information on each of these data collection exercises is presented alongside the results in the following section.

Results: the potential for change

The research did indeed show that the focus on stability and habit masks some important issues of variability, flexibility and change. In this section, the evidence is synthesised on the variability of travel patterns for individuals, the contexts in which this happens and the willingness (or otherwise) of travellers to do things differently. This forms the basis for the design of the flexi-mobility approach.

THERE IS MORE VARIABILITY IN TRAVEL PATTERNS THAN IS ACKNOWLEDGED

There is more variability in travel patterns than is acknowledged. People have patterns of things that they do and usual ways of doing these things. However, they do not always do them in the same way, at the same time, in the same places, with the same people or using the same modes. The data we collect in transport has hidden this.

Our results of several waves of surveys before, during and after the London Olympics showed that only 24 % of London commuters report making the same journey in the same way every day (including timing, mode, route choice). 46 % said they tried to make the same journey in the same way but would vary if needed. 27 % varied their journey sometimes and 4 % often. Similarly, in our local authority case study of a major office consolidation using quantitative and qualitative methods, 20 % of respondents did not know how many days they would be work-

Table 1. Data collected during the Disruption project.

Focus	Method	Sample etc.	References (so far)
Everyday mobility and disruption (How is disruption experienced in everyday life? How does it impact on mobility? What are people's coping strategies and capacity to adapt?	Ethnographic/ qualitative	Longitudinal qualitative study with 22 families in two locations Lancaster and Brighton (Nov 2011–March 2014)	Doughty & Murray (2014)
	Questionnaire (on-line)	On-line panel questionnaire (6 x Travel to work areas: Aberdeen, Liverpool, London, Reading and Bracknell, Yeovil and Chard, York (n=2,700) (Aug/Sep 2013)	Anable and Budd (2013)
Response to specific disruptions: (floods, winter weather, fuel strike, Olympic Games, office re-location)	In-depth interviews	50 in-depth household interviews with people affected by floods in York (N=50) (2011/12)	Ferreira et al., (2014)
	Questionnaire (paper, self completion)	Questionnaire with motorists affected by fuel strike (Aberdeen + Leeds) (n=263) (2012)	
	Questionnaire (on-line)	Questionnaire about recent winter weather disruption (6 x affected areas: Hampshire, Kent, Surrey, Norfolk, S Wales, W Yorkshire) (n=2,417) (Jan 2012)	
	Questionnaire (on-line)	Questionnaire of people affected by flooding in the Thames and Severn valleys – (N=1,000, Feb 2014)	
	Questionnaire (household travel survey) paper & on-line)	Household travel surveys before, during and after Olympic Games (during 2012 and final wave in 2014)	Parkes et al., (2014)
	Questionnaire + in-depth interviews	York City Council Office relocation questionnaire (n=261) + interviews (Summer 2013)	

ing in the main office during the following week. 30 % were not completely sure they would stick to the plan they had. In the six-area questionnaire survey, when asked about what causes disruption to people's travel patterns, events attributed directly to the transport system account for less than half of events freely reported by participants. The most frequently reported disruption (freely reported by nearly a quarter of respondents) came from the actions (e.g. illness, changing of plans at the last minute) of family, friends, colleagues, pets or other people.

In summary, our work suggests that people are constantly negotiating their mobility practices, often in relation to changing external conditions. Travel behaviour is, therefore, not just a matter of individual choice.

THERE IS A WILLINGNESS AND ACCEPTANCE OF THE NEED TO DO THINGS DIFFERENTLY SOME OF THE TIME

There is a willingness and acceptance of the need to do things differently SOME of the time. Our evidence shows us that people will sometimes do things differently anyway (for a change, because of the weather etc.). Our evidence also shows that people often need to adapt because of changing demands in a particular week or because of the transport system. Our evidence suggests that facilitating and managing change has positive impacts on people such as leading to new awareness of travel choices, discovering lower cost and quicker options. However, these changes can be difficult for some.

In the six area questionnaire survey, respondents were asked to recall the last time specific journeys were made. 28 % of respondents thought it would have been 'very easy' to have travelled at a different time of the day; 23 % to have used a different mode and 17 % to have postponed their trip. During the Olympics, 54 % of people surveyed made at least one change to their journey to work. Whilst this was a special event, outside of the Olympics these people reported many reasons why they sometimes change their journeys anyway. The largest proportions (around 50 %) were to avoid delays. However, between 10 and 30 % of people also reported making changes to reduce stress, because they felt like a change to routine, to avoid bad weather, overcrowding or high temperatures on the Underground.

People respond in a wide range of ways which go far beyond deciding what mode to use and which route to take. Retiming of journeys was a significant response in a whole range of circumstances. In the Olympics 28 % of respondents retimed their journeys, the most popular response. In the office consolidation study, 27 % of people said that their departure times to and from work had become more variable. In a survey of disruption from the 2012 winter weather, almost 50 % of people retimed their journeys to or from work with similar proportions of people postponing activities to known future dates. The importance of temporal flexibility has been understated in travel behaviour studies to date.

The capacity and willingness to change is not evenly spread across the population. Nor is it static across the life course (Clark et al., 2014). In particular, work and caring responsibilities structure the flexibility which individuals have. This tells us that the search for solutions to facilitate people to do things dif-

ferently also needs to look at structural issues as well as individual preferences. These changes can send powerful signals. For instance, when the City of York Council consolidated its offices into one site, it encouraged greater home working and flexible working. Around one quarter of the workplace was flexing start times more and a similar proportion stopped coming in to the office every day of the week. The changes generated more positive feedback than negative.

THE CAPACITY FOR FLEXIBILITY VARIES SIGNIFICANTLY ACROSS DIFFERENT SOCIAL GROUPS, FAMILY STRUCTURES AND LIFE STAGES

Whilst we see variability in travel across the population and many examples of change, people have different resources, capabilities and contexts which strongly influence degrees of flexibility.

Across many of our data collection exercises, caring responsibilities proved to be very important in structuring travel. For example, in the six-area questionnaire study, households with children are almost twice as likely as childless households to say they are 'always and often' disrupted for at least one of their regular journeys (22 % vs 12 %). People who don't have children or other caring responsibilities and are physically able, and have higher control over their own time, report being more able to deal with disruption and be flexible e.g. students/young people, older people, feel more able to deal with disruption. Men report feeling more control and acceptance for disruption and higher coping capacity. Gender differences are partly related to the continued emphasis of women to take the primary caring role in the household.

Having a good social network helps people cope with variability e.g. nearby family and friends, and good relationships with other parents or neighbours, is especially important for people with children. The availability of smartphones to stay in touch and ask for help/check alternatives etc. is now a key feature in people's 'mobility kit'.[3] Communication allows people to cope better with disruption across all modes of transport. In our qualitative research we discovered the phone can be a proxy for the importance of the support networks that can be called upon to reorganise and reallocate tasks across people's social networks.

In the office consolidation study, 18 % of respondents indicated that their spouse or partner also changed travel behaviour as a result of their changing work practices. But the role of the workplace goes beyond just whether or not flexibility is encouraged. The role of organisational norms (e.g. presenteeism) was important as was the organisation of work across teams and the availability of space to work remotely, the provision of support and the storage of materials all matter.

During periods of disruption, the importance of the journey home from work becomes clear. This is particularly the case for those with children where the risk of lateness is a key concern but applies more generally. Evenings can have complex journey patterns and it seems that the focus in policy on the journey to work may be missing important influences on why people travel as they do. For instance, even if it is a theoretical possibility for the morning commute, public transport is not an option if a car is necessary to enable caring, sporting and shopping commitments to be carried out on the way home from work.

3. In London 83 % of Black and Minority Ethnic Groups and 75 % of white Londoners aged 16–64 have a smartphone. The numbers for over 65s however are 18 % and 16 % respectively. (TfL, 2012.)

SKILLS AND RESOURCES ARE IMPORTANT TO PEOPLE'S ABILITY TO VARY THEIR TRAVEL

There is a wealth of evidence to support the idea that being able to map transport options to the complex lifestyles and structural constraints we identify requires skill and resources. Importantly, our research shows that:

- these skills are developed and valued across a wide social spectrum;
- possessing these skills provides additional adaptability; and
- these skills can be cultivated.
- Doing things differently, some of the time, is inevitable and learning to do it is beneficial.

In our large scale survey of six areas in the UK, the most multimodal people are the best at coping with transport system disruptions. People who have a lower use of public transport (in terms of the proportion of their travel undertaken by public transport) appear to have a lower coping capacity than people who use it for a higher proportion of their journeys. This suggests that the use of public transport builds up coping capacity. Likewise, during the Olympics disruption, Transport for London encouraged people to change how they travelled. Those that took a different mode of transport were far more likely to already change modes sometimes in any case (57 % of switchers regularly switch compared with 12 % who did not).

Whilst the transport system is clearly an important resource, time emerges as similarly important. The ability of people to flex and vary their ways of doing things can be significantly constrained by start and end times of activities, some of which they may have little control over. Fixed work times and school pick ups still structure the day for many.

Interestingly, during our studies of large scale disruptions, these norms shift, allowing new ways of doing things to emerge even if just for the short run. For instance, the workplace does not normally see the commute as their responsibility, however at moments of major disruption there is a slight shift in this mindset. Information may be provided about alternative travel options or where the problems exist, alternative ways of working accepted or even 'duvet days'. Organisations attempt to mitigate the effects of disruption by making plans to deal with a variety of foreseen disruptions. These include how to manage a disruption to staff commuting to work or concerns about large scale absence due to illness. Measures include facilitating anywhere working or shifting operations to non-disrupted sites are used. In longer-term workplace reorganisations, it is clear that working from home for some is possible. However, effective home working policy requires coordination amongst teams, the availability of high speed broadband, thought about telephony requirements, computing facilities and space. It requires a deliberate strategy.

THERE ARE IMPORTANT DIFFERENCES ACROSS LOCATIONS

The importance of local context is not new in transport studies. However, in the context of advocating 'flexi-mobility' the ability to do things differently some of the time depends, in part, on the availability and quality of alternatives and what is seen to be 'normal'. It is, for example, easier for people to consider cycling where the infrastructure exists, where other people do it and it is seen to be safe (Pooley et al., 2013).

In our studies, geographical differences were evident in the degree to which people considered themselves adaptable in the face of disruption and the way in which different mode users experienced it. For instance, our evidence from the UK-wide questionnaire which contrasted 6 communities with different levels of urbanity/rurality (see Table 1), suggests that car owners in rural communities often experience *less* disruption than non-car owners. Here it is public transport users that can suffer the most, with communities often losing their bus service for several days during extreme weather. In built up areas, on the other hand, car owners experience *more* disruption than non car owners and when networks are disrupted continued reliance on the car can lead to extremely long journey times. Responses to this included cycling, walking, doing things more locally and postponing activities. So it is not simply the case that a car insulates people from disruption as the value of the car tends to be location specific.

Whilst levels of disruption are different in different locations, it is not the level of disruption per –se that appears to be related to people's attitudes to disruption and self reported ability to adapt. For instance, in our sample, respondents in both London and Reading (a commuter town within 50 miles of London) reported relatively high levels of disruption. However, Londoners are much less negative about disruption, report fewer barriers to dealing with it (finding information, flexible travel tickets) and report considerably greater coping capacity than any other location. Yeovil and Chard (a large rural region in the south-west of England) and York (a compact historical city) can be also be compared on the basis that they both report relatively *low* levels of disruption. Yoevil and Chard residents report the highest negative emotional response to disruption (anger, vulnerability, worry), greater obstacles to dealing with it and much lower coping capacity. The more positive experiences in York can be attributed to greater provision of a mix of transport modes as it has, for the UK, a strong cycling tradition and good Park and Ride and the lower levels of travel disruption are reported despite having a constrained traffic network around a historic city centre.

Local mobility cultures have a strong influence on what happens too. In places where the car dominates the environment and where getting in the car is 'what people do', then lower levels of flexibility can be seen. Similarly, where cultures of active travel exist and being seen out and about being active are part of the way of doing things then this adds to the potential to change.

These findings lead to a conclusion that mobility cultures can be developed and influenced rather than being a property of a place.

Discussion

THE CONCEPT OF 'FLEXI-MOBILITY'

Looking across the range of findings presented above it is suggested that:

1. Variability in how we travel is a feature of daily life.
2. Society is changing in ways which make this variability an increasing feature or possibility, partly through new opportunities emerging through technology.
3. Most people are able to adapt when faced with a need to change, at least in the short run. This provides opportunities to think more expansively about how to change behaviour.
4. The capacity to be more adaptive can be built up at both the individual and systemic levels through deliberate interventions that pull and push people into new experiences that bring social learning, challenge perceptions and disrupt habits. Travel behaviour is not solely a matter of individual choice.
5. Time is a key resource to enable this adaptability. However, it is not time *per-se* that always has value, but the ability to control, budget, share, reallocate and flex time. This changes the range of points of potential policy intervention and the actors involved in facilitating change.

In summary, we see no immovable barriers to making travelling in a more diverse way a part of how we live. This 'flexi-mobility' is a vision for a system that celebrates variability and responsiveness and supports a more diverse set of travel practices and where it is normal and easier to use a range of different modes of mobility at different times in going about everyday life. It is a state in which the car co-exists with low carbon mobility and in which low carbon travel is less exceptional and more likely to be used in place of the car from time-to-time.

Our evidence suggests that flexi-mobility is enabled by arrangements in five interrelated domains.

1. ***Systems***: Transport infrastructures and services matter. Non-car modes need to provide a convenient, cheap, safe and comfortable option. High cost single trips on public transport for example militate against an occasional switch. Flexi-mobility also requires connection to a host of other systems, from education, to health, employment to shopping which affect everyday life. For example, the organisation and quality of school transport, and wrap around school care influence the potential for flexibility for parents. In a flexi-mobile society, all systems (not just the transport system) are organised in a way that encourages everyday mobility to be achieved using different modes at different times.
2. ***Time***: The timing of practices in everyday life, and temporal relationships between practices, need to be organised and steered in ways that promote flexi-mobility. For instance, working hours are flexible so that start times can be delayed or finish times brought forward to allow travel in daylight hours.
3. ***Competency***: We recognise that getting around by different forms of transport, taking new routes, or working in different ways requires skills and experience. These need to be nurtured, particularly over the transition to early adulthood but across the life course.
4. ***Social norms***: The expectations of others need to create possibilities for and the acceptance of flexi-mobility. This can be through workplace culture, deliberate transport interventions, rewarding behaviours and a consistency of approach to encouraging change.
5. ***Spatiality***: The geography of society and everyday practices needs to better facilitate flexi-mobility. Land-use and service

planning should work with not against the promotion of alternative ways of doing things.

Critically, fleximobility does not imply equal ability or capability to change. However, a system which is less car oriented for everyone should also work better for those people currently struggling to get around.

Figure 1 sets out an overall conceptual diagram showing these domains of flexi-mobility. Each of the five domains are shown as inter-related and co-evolving. Infrastructure and services ('the system') is depicted as an integral enabler of both the other domains and of flexi-mobility itself. However, competency is both central and co-dependent on each of the other domains.

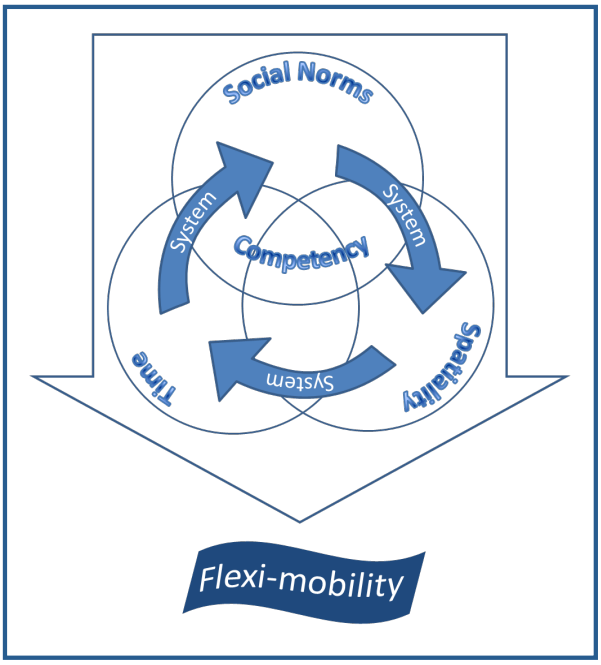

Figure 1. The domains of flexi-mobility.

WHY WE DON'T SEE MORE 'FLEXI-MOBILITY'

We started with the contention that there is more flexibility in travel behaviour than is often detected by traditional methods of data collection. We have indeed detected flexibility. However, this research has also contributed to our understanding of why people are not or cannot be *more* flexible and therefore have certain routines and move in the way that they do. Before offering recommendations on the types of policy interventions we would like to see continued, developed or stopped to promote flexi-mobility we have identified the following reasons why we do not see more flexi-mobility now.

1. It is more expensive to be flexi-mobile. There are a range of pricing structures or costs which make it more expensive to be multi-modal. These include lock-in to transport season tickets, sunk costs of car ownership, non-transferable tickets between operators and modes, workplace car parking permits and printing costs if you work at home.
2. Some people have little or no control over their schedule. This can relate to the type of enterprise people are in, the status of their work (role in organisation) and attitudes and norms relating to needing to be present in the office. Beyond work, planning can be constrained by a range of factors, such as school hours and healthcare. Not all of this needs to be as rigid as is currently the case.
3. Some people live in places where activities can only be done by car. This is a long-term issue and, for some places (e.g. rural areas), more intractable. But, it is possible to stop making this worse (retail parks, housing expansion in hard to serve locations, etc.) and stop cutting services to places do not now become car only.
4. Being flexi-mobile tends to be harder if you have caring responsibilities. For example, having to get children to and from school, before and after school activities, caring for parents and grand-parenting. These responsibilities are more likely to fall to women still so opportunity to intervene across genders needs to be considered.
5. There is also a tendency for gender imbalances in the capacity to be flexi-mobile. There are some well understood issues of experienced and perceived risk in using parts of the transport system which differ across genders as well as issues relating to norms and perceptions (e.g. around cultures of cycling, or walking after dark). (Beecroft & Pangbourne, 2014; European Union, 2014.)
6. The system is designed largely for the independent physically fit (male) adult. The built environment is designed to assume you can cope with getting around as a physically fit (male) adult. The design of infrastructure such as luggage racks and stairs; the operation of the system such as platform changes, crowded platforms, not gritting pavements; and getting around with wheelchairs, push chairs and bikes is all challenging.
7. Transport policy is designed around an outdated understanding of the journey *to* work and *for* work. These are not the journeys that always matter most to people. If the journey *from* work is indeed more important than that to work then the focus of interventions may well have the wrong balance. In addition, 2 million people in the UK do not have a 'usual' place of work but this is given little thought.
8. It is more difficult to use certain modes at some times (and easier at others). People shift from the London Underground in the summer, cycle and walk more when the weather is good, avoid walking at night, put bikes away for the winter etc. Our transport policies do little to recognise this.
9. Major trip attractors do not give sufficient thought to how people access their premises or services. There are examples of core hours that encourage more peak travel, scheduling of opening times and availability of appointments that limit flexibility. There are fewer 'works transport services' and still insufficient attention to the relationship between travel at work and to and from work.
10. Not everyone has the competences to be flexi-mobile. Knowledge, skills, experience, familiarity and access to technology, fear, cultural traditions and disability all make a difference to our ability to be more flexi-mobile. Yet we invest comparatively little in making sure people are able to capitalise on the opportunities available.

11. The physical infrastructure in many places is dominated by the car. Whilst not specific to 'flexi-mobility' the nature of the built environment is clearly important in shaping what people are prepared to do but also in sending messages about what is seen to be 'normal'.

In the next section we identify a policy approach and highlight an initial bank of policies that we feel would form part of a coherent package approach to delivering flexi-mobility.

ACHIEVING 'FLEXI-MOBILITY'

Our proposition is that transport policy should aim to develop the conditions where it is normal to travel by different means for different activities some of the time. Achieving this will involve building on many of the initiatives that already encourage this type of behaviour (e.g. safe routes to school, London's Oyster card ticketing system, workplace travel planning). However, in addition to investment in specific elements of the transport system, it also involves challenging the policies and practices which give rise to the problems leading to in-flexibility as listed above such as expensive turn up and go fares; investments which lock-in use of one specific mode such as annual parking permits or rail tickets; and operational or practical limits to flexibility such as inadequate cycle parking, unreasonable restrictions on carriage of bikes on trains.

There is also a need to be creative. This study shows that people can cope with change and variability. This means there are opportunities to develop a step-wise change in the conditions which support flexi-mobility and to expand the range of proposed solutions and technological choices considered within transport policy. This means addressing opportunities across the year, the development of special events and tapping in to changing working practices.

The final part of what makes the basket of policies we propose distinct is that we look for developments of policies across the board. The vision of flexi-mobility applies right across both the life course and the system, not just targeting one (or more) specific behaviour(s). A single policy cannot be 'flexi-mobile', it is the system level integration that can achieve this. It means, for example, training people with the competencies they need and nurturing that. It means planning for and encouraging different levels of flexibility that might be afforded at different times in our lives.

Table 2 outlines indicative policies for the different domains which are necessary to promote flexi-mobility. The policies need to be grounded in each local context. The next stage is to identify these policies in these contexts.

In addition, the policies outlined above which are aimed at enabling greater flexibility also need to be reinforced with:

- **Sound spatial policy:** Planning decisions which encourage localisation and growth of cities without sprawl and which locate development alongside well served public transport corridors will all work to make flexi-mobility easier. Rural areas will clearly never have the same level of fixed route public transport as our cities. Here, development should be supported through the provision of Demand Responsive Public Transport, car clubs and car sharing.
- **Getting the basics right:** Similar to the discussion on land-use, there is also still a need to focus on getting the basics right. This includes good quality waiting facilities, information systems that work, trained staff on public transport, good road and pathway maintenance. Bad experiences matter and they stick. Smart ticketing will not revolutionise a poor customer experience. There will also be a continued need to investment in new infrastructure to tackle crowding and unreliability. However, we would suggest that, in a future city where flexi-mobility is at the heart of the thinking underpinning transport planning then different types of infrastructure might be at the top of the priority list than we see today.
- **Supporting a move to a pay as you go system for all modes:** All of the above measures will move us towards a system where people are better able, more capable and more familiar with how to flex their travel behaviour. That would, in and of itself be positive by fostering greater coping capacity at the individual and system levels. However, to have a truly flexi-mobile system, all modes need to be treated equally and this would suggest a shift to pay-as-you-go travel for all modes. This would include removing Vehicle Excise Duty and fuel duty and moving to per mile fees across the day and pay as you go drive insurance.

Conclusion

In this paper, we set out a new approach to changing travel behaviour that has emerged from a multi-method, longitudinal study of behaviour of individuals and organisations. We have drawn together data from a range of different approaches, each studying in different ways, how people travel and how they respond to change. Some of these relate to everyday life, some to specific and rare events such as the London Olympics and others to some of the, often unseen, changes such as office consolidations which are happening all the time and which can significantly impact on how, how much and when people travel.

The combined results have led to the development of a concept that we have termed 'Flexi-mobility' that recognises widespread variation in how we all travel and provides a new framework to think about opportunities for interventions. The central premise of this new approach contends that, in order to develop a coherent and practicable strategy for travelling less by car but at the same time enabling the use of a mixture of modes, our transport policy should be cultivating pre-existing multi-modality so that everyone is able and willing to travel a bit less by car where we can across our lives. As well as looking at what transport policies should be applied, it is also necessary to look beyond transport at a range of issues surrounding working practices, schooling and leisure. Our travel is not just defined by whether or not we want to use a car but by a series of complex and interconnected activities and constraints.

This new approach is set against big changes that are happening anyway in our transport and energy systems and across wider society. Looking ahead, there is an anticipation of a significant move towards electric vehicles which will, even if no policy change happens, radically change how and how much we pay for travel. Left unchecked, an increase in sunk costs of ownership and a reduction in per mile use costs could lock us in to ever greater demand for travel by car (Haan et al., 2007). However, the debate on road pricing is challenging. We sug-

Table 2: Example policies for each flexi-mobility domain.

Policy domain	Example policy areas
Creating greater time flexibility	
A group of policies which reduce the requirements to travel by car because of the time of travel or the time pressures of connected journeys. Policies also address the extent to which trips are 'necessary' for all journeys.	• Extending the availability of childcare around schools to reduce need to make complex journeys school-work-childcare-home journeys. • Improving the quality of home to school transport to reduce the increasing home-school-work car trip chains. • Improving early morning and evening public transport services to key employment sites to make public transport a feasible option. • Increasing the rights to promote and uptake flexible working to reduce the numbers of trips necessary to work or to allow better co-ordination with available transport.
Creating new social norms across the system	
This set of policies sets out initiatives that should be in place if using a range of modes is to be experienced as normal rather than 'more difficult'. The list largely builds on what could be seen as ' good practice', but which is not found consistently anywhere.	• Mobility proficiency training for all children - including compulsory cycling proficiency. This begins the process of building up the capacity for flexible travel through life. • A single easy to use, easy to understand payment system that works across all transport options, linking car users into a wider transport network rather than separating them out. • Contactless payment that works across all transport modes. • Free workplace parking on 10 % of working days for those people who give up their yearly parking permits to recognise that sometimes it is necessary to come in by car. Pharmaceutical company GSK has limited parking on site so they have a rota where you are only able to park on site 4 weeks out of 5. In the 4 weeks people are able to park they do not use the alternative modes they used during that one week, they make a temporary change for that one week as they are able to plan to 'work' around it. • Improved provision for combining bicycle and public transport travel to overcome resort to car, or social exclusion, where either end of a journey is some distance from public transport.
Shifting the debate	
The policies set out above will provide mutually reinforcing signals to travellers about what types of travel behaviours are being promoted (the longer-term vision). There are a series of further significant policy shifts which which would be necessary to accelerate a shift to flexi-mobility. Our work shows that people are capable of coping with such change. However, to be acceptable they must be part of a clearer long-term vision.	First, we note that there are very few policies which deliberately adapt to or seek to use the natural seasonal trends in travel patterns that are evident. Some suggestions include: • Seasonal reallocation of road space to non-motorised transport including temporary road closures, pedestrianisation and cycle lanes (this has been successfully demonstrated in the New York City Interim Plaza programme). • Incentives for mode shift to non-motorised transport to be offered intensively in the spring and early summer, capitalising on lighter days and better weather making the change more attractive. There is already significant evidence of an upswing in cycling and walking during good weather in the summer months (Liu et al., 2014). • Differentiated fuel duty or variable road user charges in winter (lower) and summer (higher) recognising the greater reliance on motorised travel in the winter. This would need to be delivered at a national level. Second, are moments of change which are deliberately staged, where people accept that something different is happening: • The Olympics and Tour de France (which started in Britain in 2014) are two high profile events which encouraged places to think differently about how to manage their transport. However, there are more regular ways of changing the debate or specific opportunities which can be a major focus for action. For example, a *monthly* car free day for part of the city (rather than annual events such as European Car Free Day or SkyRide) which recognises the benefits of a diverse range of ways of getting around town. • Introduce quality public transport days where additional provision is put on. This could be through enhanced park and ride, around the Christmas period or be targeted to stimulating new users in particular areas. • Provide incentives and stimulus for flexi-mobility as part of house moves, job changes and other key life-course moments. • Provide additional incentives to use new infrastructure at the time it is launched or after a maintenance upgrade (as applied around the Cambridge Guided Busway).

gest that approaching the question of changing the way we pay for travel without providing the necessary scaffolding, capacity development and experience in doing things differently seems a very high risk strategy. Flexi-mobility could create the conditions under which such a change might be developed over time. Done well, the individual impacts of flexi-mobility will be relatively small, incremental, manageable and largely beneficial. The aggregate impacts are potentially significant, contributing to all of our objectives for a healthy, prosperous and sustainable nation.

References

Anable, J, and Budd, T. (2014) *Work Package 1 Questionnaire Survey – Descriptive Statistics*. Disruption Project Working Paper.

Beecroft, M. and Pangbourne, K. (2014) Future prospects for personal security in travel by public transport. *Transportation Planning and Technology*, 38 (1), 131–148.

Berrington, A. and Mikolai, J. (2014) *Young adults' licence holding and driving behaviour in the UK*. RAC Foundation.

British Heart Foundation (2012) Physical Activity Statistics 2012.

Chatterton, T., Anable, J., Cass, N., Doughty, K., Faulconbridge, J., Marsden, G., Mullen, C, Roby, H., Williams, D. (2015) *Flexi-mobility: helping local authorities unlock low carbon travel?* University Transport Study Group (UTSG) 47th Annual Conference, London, January 2015.

Clark, B., Chatterjee, K., Melia, S. (2014). *Stability and change in commuting mode. The role of life events and spatial context*. Life Transitions and Travel Behaviour Working Paper.

DfT (2014). *National Travel Survey: England 2013.* London: Department for Transport.

Doughty, K., & Murray, L. (2014). Discourses of Mobility: Institutions, Everyday Lives and Embodiment. *Mobilities*, 1–20.

Eddington, R. (2006) The Eddington Transport Study: main report, transport's role in sustaining the UK's productivity and competitiveness. Department for Transport/ONS.

European Union (2014) *She Moves: Women's issues in Transportation*. Luxembourg: Office for Official Publications of the European Union.

Ferreira, A., Marsden, G. and Shires, J. (2014) *Report on York Floods 2012. Transport resilience to surface water flooding*. Institute for Transport Studies, Leeds.

Gärling, T and Axhausen, K. (2003) Introduction: habitual travel choice. *Transportation*. 30 (1), 1–11.

Goodwin, P., & Van Dender, K. (2013). 'Peak Car' – Themes and Issues. *Transport Reviews.* 33 (3), 243–254.

Graham, S. (2010) When infrastructures fail. In *Disrupted cities. When infrastructure fails* Ed S Graham (Routledge, London) pp 1–26.

Hann, P., Peters, A. and Schulz, R.W. (2007) Reducing energy consumption in road transport through hybrid vehicles: investigation of rebound effects, and possible effects of tax rebates. *Journal of Cleaner Production*. 15 (11), 1076–1084.

International Energy Agency (IEA) (2013) *CO_2 Emissions from Fuel Combustion – Highlights, 2013*. Ed. International Energy Agency, Paris.

Liu, C., Susilo, Y.O. and Karlström, A. (2014) Examining the impact of weather variability on non-commuters daily activity-travel patterns in different regions of Sweden. *Journal of Transport Geography*, 39, 36–48.

Marsden, G. and Docherty, I. (2013) Insights on disruptions as opportunities for transport policy change, *Transportation Research Part A*, 51, 46–55.

Mattioli, G. (2014) Where Sustainable Transport and Social Exclusion Meet: Households Without Cars and Car Dependence in Great Britain. *Journal of Environmental Policy & Planning*, 16:3, 379–400.

Office for National Statistics (ONS) (2011) Census: Aggregate data (England and Wales) [computer file]. UK Data Service Census Support.

Office for National Statistics (ONS) (2013) Internet Access – Households and Individuals, 2013. ONS Statistical Bulletin.

Office for National Statistics (ONS) (2014) Overview of internet retail sales in 2014. Online publication.

Parkes, S., Marsden, G. and Jopsen, A. (2014) *The longevity of behaviour change: a case study of the London 2012 Olympic and Paralympic Games*. hEART 2014 -3rd Symposium of the European Association for Research in Transportation, Leeds, 10–12 September 2014

Pooley, C.G., Horton, D., Scheldeman G., Mullen C.A., Jones T., Tight, M., Jopson, A., Strano E., Chisholm, A. (2013) Policies for promoting walking and cycling in England: a view from the street. *Transport Policy*, 27, 66–72.

Roby, H. (2015) *'Click and Collect': How will this affect travel practices?* University Transport Study Group (UTSG) 47th Annual Conference, London, January 2015.

Schwanan, T., Banister, D., Anable, J. (2012) Rethinking habits and their role in behaviour change: the case of low-carbon mobility. *Journal of Transport Geography*. 24, pp. 522–523.

Transport for London (TfL) (2012) Understanding the travel needs of London's diverse communities. April 2012.

Waitrose. (2014). *The Waitrose Food and Drink Report 2014.*

Wajcman, J. (2014) *Pressed for time: the acceleration of life in digital capitalism*. University of Chicago Press.

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