Chapter 8

Technology Fix Versus Behaviour Change

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Introduction

The lifeblood of societies both economically and socially throughout the ages has been access – the ability for us as human beings to reach people, goods, services and opportunities. Overwhelmingly, achieving access has involved movement – the transcending of distance. As societies across the world have developed and continue to do so, movement has tended to increase in speed. As we travel faster as societies we seem to spend no less time travelling and consequently we travel further (Metz, 2008). There has emerged a perpetuation of motorised mobility dependence – as individuals we buy into such mobility with the promise of the independence and new reach in terms of access that it affords us. Collectively, however this affects other things – patterns of land use change in response to this such that we appear to need to cover greater distances to reach the things we desire or need and thus are dependent upon our cars. In westernised societies especially, this perpetuation has been permitted and indeed supported. We have been prepared to expand our transport systems to accommodate motorised mobility, affordability of motorised mobility has allowed its growth and there has generally been an abundant supply of energy to fuel the system of motorised mobility and limited cause for concern about its environmental and social externalities.

Things have now changed. Expanding our transport systems, certainly in terms of roads infrastructure, has increasingly been seen to be both unaffordable and limited in its effectiveness. Climate change and peak oil – the prospect that abundance of energy as we have known it may soon no longer be a given – have come to the fore to question the environmental credentials of motorised mobility and our ability to fuel it. Tough challenges now lie ahead. So how are we and how should we be rising to them? There are two notable areas of consideration in addressing this: technology fix and behaviour change. This chapter explores this. It takes a view that technology fix represents a convenient perpetuation of 'business as usual' and calls for more emphatic attention to be given to the role of behaviour change in addressing our challenges. The latter appears much more difficult and yet may ultimately realise much

greater achievement for society. The chapter moves towards a call for technology and behaviour change to come together.

The Transport System

Figure 8.1 depicts an overview of the determinants and consequences of the transport system.[1] The demand for people to travel (by motorised means) creates an energy requirement before demand can be realised in the form of traffic – the flows of people and more especially vehicles that the transport system must accommodate. Where and when there is insufficient capacity provided by the system the result is congestion. Traffic itself is a source of vehicle emissions but emissions are increased in congested conditions. Emissions have implications for health and for climate change and as such themselves have economic consequences. It has been widely accepted that congestion has an adverse impact on economic activity – people stuck in traffic reflect time being wasted that cannot be put to productive use (DETR, 2000). Economic activity generates a need for travel to achieve access thus feeding once again into travel demand.

Figure 8.1 also depicts three levers that can exert influence on a number of the factors described above. *Land use* affects travel demand. Where people are located in relation to the people, goods, services and opportunities they wish to reach has consequences for the distances that must be transcended and in turn influences the frequency and means by which travel is undertaken. *Technology* or rather technological developments can affect the ease, affordability and volume of energy production to support motorised mobility. Technology is also used within traffic management to try and make the most effective use of available system capacity to accommodate the traffic using the system and thus plays its part in potentially influencing congestion. It can also affect the efficiency of vehicles by reducing energy consumption per unit of distance travelled and reducing the levels of emissions per unit of distance travelled. Consumer behaviour has the widest set of potential impacts. Individuals' decisions on where, when, how, how often and whether to travel strongly govern travel demand. Consumers' choices about the vehicles they purchase and use and the ways in which they are driven affect energy demands as well

1 It is a partial depiction and not intended to be a full 'systems diagram'.

as the composition and distribution of traffic in time and space and thus the congestion that arises and the emissions that are produced.

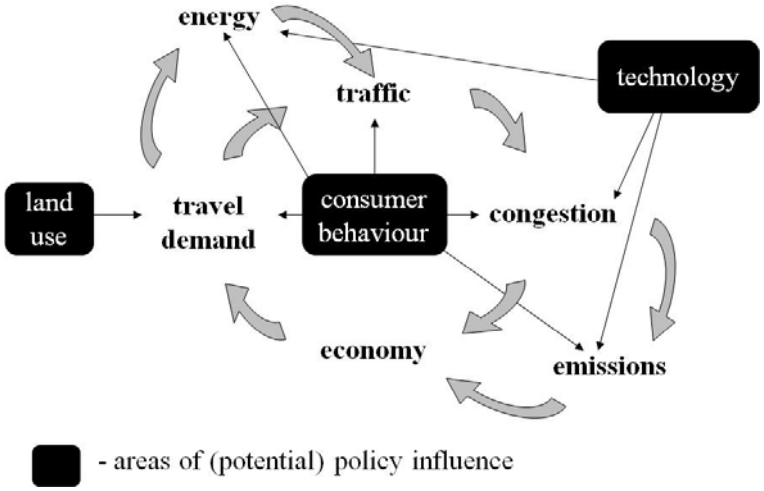

Figure 8.1 Determinants and consequences of the transport system

Ideologically from the perspective of addressing transport challenges: land use patterns would maximise proximity thus reducing the distances needed to be travelled; greater reliance on non-motorised modes of travel to transcend distance would reduce demand for motorised travel; motorised traffic that still exists would be highly energy efficient and have low(er) or zero emissions; and with reduced adverse impacts from motorised mobility there would efficient and sustainable access supporting economic and social activity.

All three levers in Figure 8.1 are in principle able to be influenced through policy and investment. However, each of them face differences in the extents of and inter-relations between affordability, effectiveness and acceptability.

With this overview in mind, the next section of the chapter considers technology fix as the lever of choice while the following section entertains the prospect of the alternative lever of behaviour change including the prospects of behaviour change through technology. The concluding discussion considers the prospects for the way ahead.

Technology Fix

As Figure 8.1 illustrates, technology has a part to play in addressing key issues such as energy, congestion and emissions associated with transport system use. This section first suggests how it is that we – the industry, politicians, the media and the public – come to espouse technology as a champion against the problems we face. It then highlights some of the recent commentary assessing the capabilities of technology fix before reflecting upon some of its limitations.

Attuned to Technology

Technology – which we might take to encompass 'science, engineering and technology' – is symbolic of mankind's ability to contend with the elements, to tame nature, to harness an understanding of the physical world around us, to apply logic and intellect and to improve standards of living. From the building of great cities and the unfolding of Roman roads, to water supply and sanitation, to navigating the oceans and studying the stars, we have evidence all around us of what technology can achieve.

In terms of transport one can conceive of three phases that exist in the unfolding of transport systems and their use:

- *Vehicles and infrastructure*. This first phase concerns creating the asset-building infrastructure (waterways, railways, roadways) that facilitates the movement of vehicles and in tandem designing and improving vehicles produced to use the infrastructure. In this phase science, engineering and technology dominate in terms of success and achievement.
- *Traffic management*. In this second phase, overlapping with the first, there is a need to ensure use of the asset is as efficient as possible – maximising the throughput of people or, more typically, vehicles and minimising delay. In this phase technology remains dominant in managing the system – optimising the operation of mechanisms governing vehicle movements and conflicts between them.
- *Demand management*. Success of the first two phases is likely to encourage the use of the transport system. There can then arise a problem in demand exceeding supply even in the face of ongoing expansion of the asset or the management of traffic using it. To address this requires the nature of demand itself to be changed either in terms of an absolute reduction in demand or an influence over how, when and where people are making use of the system. Demand management

can rely upon technology to facilitate but fundamentally it is about influencing the decision making of users of the transport system. This sees a broadening of the expertise required that begins to encompass social science: a need to study factors that give rise to travel demand (lifestyles and social and business practices) and which influence people's decision making.

These phases can be taken to apply in principle to each of the different developments in transport as it has evolved from pre-industrialised times to today's situation in which air as well as land and sea is a routeway for movement. However, in each stage of the evolution the first two phases dominate with an aim to provide for what society needs. It can be suggested that the dominant mindset is one of *transport is here to serve society* (Lyons, 2004). With this mindset it is presumed or implied that accommodating demand should take priority over influencing or managing demand. The dominance of the first two phases alongside this mindset has created a transport industry and profession that tends to be or have been dominated by engineers, scientists and technologists alongside mathematicians and economists. At the same time there are professionals tasked with profiting from the sale of mobility in a privatised market for whom reducing demand is likely to be unattractive unless compensated for by higher prices. The collective voice of transport as an industry or profession can thus have a natural leaning towards technology fix.

Technology fix is appealing to the public because it holds the promise of maintaining or enhancing 'business as usual' – improving levels of service associated with people's current behaviours or mitigating the problems caused by transport in ways that do not impinge upon their own lifestyles. *Politicians are here to serve the electorate* and unsurprisingly if the public are supportive of technology fix and the industry or profession offers some promise of being able to deliver then politicians will find technology fix favourable. Investment in technology supports industry and may win votes.

It should come as no surprise then that technology fix finds favour – it can comfort us and inspire us that human inventiveness and ingenuity can exert a mastery over the problems we face. This perspective is perhaps now being accentuated. For many years the central challenge facing transport was that of congestion and in the face of traffic management being unable to cope, demand management was receiving growing attention (DETR, 1998). However, the recent emergence of two other prominent

concerns may be changing this. Climate change for transport turns the focus from congestion to emissions, allied to the growing attention given to peak oil which brings energy supply to the fore, further overshadowing congestion as an issue. Emissions and energy supply readily lend themselves to science, engineering and technology.

UK Assessments of the Prospects for Technology Fix

Reports continue to emerge in the UK reflecting an optimistic and prioritising focus upon technology fix as a response to the challenge of climate change. Selected key reports are highlighted below before moving on to a commentary on this technology fix trajectory and its limitations.

In 2008 a report was published following a UK government commission to 'examine the vehicle and fuel technologies which over the next 25 years could help to "decarbonise" road transport, particularly cars' (HM Treasury, 2008). The report, *The King Review of Low-carbon Xars – Part II: Recommendations for Action*, in setting a context stated that '[d]emand for motoring is strongly linked to economic growth' and 'the global challenge is to enable growth in road transport, in a sustainable, environmentally responsible way'. Recognising the rapid motorisation that is taking place in countries such as India and China could suggest indeed an upwards pressure on global road traffic levels. However, in a UK context the strong implication is that we should expect to see a continuation of the current automobility regime in which high levels of traffic are inevitable and a necessary accompaniment to economic growth.

The report highlighted the significant potential to reduce CO_2 emissions from road transport 'through the development of more efficient vehicles, cleaner fuels and smarter consumer choices'. Acknowledgement was given to the role of behaviour change in terms of people's choices about which cars to buy and how they drive their cars and also to choices about how and when people use their cars. However in considering prospects for alternatives to car use, the report nevertheless concluded that 'we must assume that, at least in the medium term, improvements in vehicle fuel or driving efficiency will be required to achieve emissions reductions on the scale required'. Underlining the presumed capabilities of technology fix, the report suggested that 'in the long term (by 2050 in the developed world), almost complete decarbonisation of road transport is a realistic ambition'.

Later in the same year the UK's Committee on Climate Change published its first report *Building a Low-carbon Economy – the UK's Contribution to Tackling Climate Change* (CCC, 2008). This had a strong orientation towards technology fix, underlining the messages of the King Review.[2] It observed that '[d]eep emissions cuts in transport can be achieved through improved fuel efficiency of new cars and vans' and stated that 'the good news is that reductions … are possible without sacrificing the benefits of economic growth and rising prosperity'.

In April 2009 the UK government published its strategy *Ultra-low Carbon Vehicles in the UK* (DfT et al., 2009). The DfT website3 stated that '[c]entral to the strategy is an initiative to help put electric cars into the reach of ordinary motorists by providing help worth £2000–£5000 towards buying the first electric and plug in hybrid cars when they hit the showrooms – which we expect from 2011 onwards'. The strategy itself set out the challenge as follows:

> Our transport system connects people to places and businesses to markets. As such it is fundamental to our economic strength and quality of life. However, the only sustainable future for transport lies in a transformative shift to low carbon. Our ambition must be twofold, to reduce the environmental impact of transport and for UK business to benefit from this transformation.

Shifting attention from surface transport to aviation, an apparent major contradiction or policy conflict emerged in the UK – the government was simultaneously supporting aviation expansion with its negative implications for emissions and climate change and at the same time espousing the urgency and severity of CO_2 reductions with an Act of Parliament at the end of 2008 that places a legal obligation on the government 'to ensure that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline' (HM Government, 2008). The Committee on Climate change was asked by government to examine the prospects for reducing aviation emissions below business as usual as a means of accommodating increases in demand while containing emissions. In January 2009 the UK government set a target that UK aviation emissions of CO_2 in 2050 should not exceed 2005 levels. The Climate Change Committee's report *Meeting the UK Aviation Target – Options for Reducing Emissions to 2050* (CCC,

2 Professor Julia King, author of the King Review, is also a member of the Committee on Climate Change.
3 http://www.dft.gov.uk/about/strategy/whitepapers/ultralowcarbonvehicles.

2009) looked at 'the potential to reduce the carbon intensity of air travel through technological improvements in airframe and engine design, through operational efficiency improvements and through the use of sustainable biofuels'. While noting that unconstrained demand would be far higher, it concluded that 'there is potential for aviation demand to increase while still meeting the Government's target – in the most likely scenario, a 60% increase in demand is allowed'.

The reports touched upon above have a principal orientation towards energy, emissions and climate change. It is not to imply that technology fix in transport does not have broader application. Traffic and congestion have been of concern for much longer than these issues that are now firmly on the agenda. For instance there have been longstanding efforts to explore the opportunities to increase the effective capacity of our road infrastructure, specifically through a vision for the automated highway – an arrangement in which vehicles are able to communicate with each other and thus travel much closer together without risk of crashing as speeds change. While 'predict and provide' as a roads policy – predict how much traffic there will be and try to provide sufficient capacity to accommodate it – had been abandoned at the end of the 1990s in the UK (DETR, 1998), there are signs that to tackle congestion and anticipated traffic growth we are once again orienting our attention towards infrastructure and traffic management rather than demand management. The UK government has espoused the idea of what is called 'active traffic management' which sees the aim of using the hard shoulder of our motorways as a running lane at times of congestion (Chase and Avineri, 2008). It is also focusing attention on the prospect of new high speed rail lines to provide new capacity and support the current automobility regime's pursuit of faster journeys.

Reflections on Technology Fix

A defining characteristic of technology fix, whether in terms of tackling climate change, energy or congestion, is that it seeks to improve the efficiency of movement rather than the absolute amount of movement. We can of course reduce congestion, energy consumption and emissions by travelling less. Technology fix, on the other hand, seeks to allow us to travel as much or even more while aiming to diminish the negative consequences. It can seem alluring.

In relation to the current preoccupation with climate change and energy it seems we find ourselves in a rather deluded state of mind that if we can create a zero emissions perpetual motion transport system then our troubles will be over. The reality is that energy supply and climate change are indeed very serious issues that need attention. If, however, these are 'solved' through technology fix then society will still be faced with its 'old' problem of congestion and its social and economic implications. Greening motorised mobility cannot be the only answer. Indeed pursuit of 'greening' could merely be putting off the longer-term challenge of whether societies can sustain such high dependencies on motorised mobility.

Reference has been made above to the automobility regime. What is meant by this within this chapter is as follows. It refers to the factors that characterise the way our current transport system – dominated by the car – is perceived and developed. Such factors include the centrality of motorised mobility to connectivity and economic growth, the pursuit of faster journeys and freedom of movement as an apparent human right. The reports referred to above and indeed technology fix in general largely espouse this regime rather than questioning it. The implicit intention is to sustain the regime rather than to entertain any transition to a new regime in which our transport system is reframed. For instance a new regime may diminish the link between motorised mobility and connectivity, the merits of slower travel as opposed to faster journeys may be entertained and motorised movement may be seen more as a privilege than a right in which compromise on and cooperation in how to travel is a greater feature.

Sustaining the existing regime tends to find support from the public whose lives are entwined with the regime and have a (perceived) dependence upon it. People do not generally like the prospect of change so regime-preserving measures are appealing. Messages conveyed in the reports above to the public are (implicitly) that technology is fixing 'the problem' and that its business as usual for the regime of automobility.

It is notable that the regime is prone to be not only preserved but perpetuated with the assistance of technology fix. Aviation is evolving with alarming parallels with the car (Cairns and Newson, 2005). Notions of the 'right to fly' have emerged analogous to the 'freedom to drive' entitlement for the motorist. We have pandered to aviation growth in a 'predict and provide' manner equivalent to that for roads and car traffic. We can observe a slow but sure move towards 'plane dependence' as we come to

expect and to rely upon being able to fly to create and sustain local and national economies and, at the level of individuals and firms, business, social and personal relationships.

Perhaps at the heart of any debate about the virtues of technology fix or (as the next section will examine) behaviour change is whether or not as a society we believe the current regime of automobility to be healthy and desirable in terms of pursuing improvements to quality of life. Technology fix will prolong and intensify motorised mobility dependence, it will sustain the industries that rely upon it and it will put off the comparatively difficult political prospects of bringing about fundamental change. However, could it be that the regime has fuelled a confusion between economic growth and improvements in quality of life? Many would argue that the hypermobile world technology fix would have us move towards is at odds with creating a more cohesive, equitable and healthy society (Adams, 1999). There is also the risk that even if we subscribe to technology fix that it fails to deliver. It may fail for two reasons: firstly it may prove insufficient in being able to improve energy efficiency, reduce emissions per unit of travel or improve vehicle throughput for a given capacity; or secondly it may succeed in this only to encourage even higher levels of mobility that ultimately cannot be sustained and will be even more difficult to migrate away from. It might be said that technology fix addresses the symptoms of the problem but not the underlying cause.

The chapter now turns to consider an alternative approach to preserving or adapting the current regime of automobility – behaviour change.

Behaviour Change

This section begins with a brief reflection on the scope of behaviour change and an overview comparison with technology fix. It then moves to explore in more detail some of the challenges faced in bringing about behaviour change before considering the opportunities for behaviour change.

A Comparison with Technology Fix

Behaviour change essentially refers to an influence on decisions , such as the following, made by individuals and/or firms that serve to affect the nature and extent of travel demand and resulting traffic:

- where to locate (home, work, school);
- whether to invest up-front in mobility resource (car/(motor)cycle ownership, season ticket etc);

- whether to travel (as opposed to remotely accessing people, goods, services or opportunities through the use of information and communications technologies (ICTs));
- how to travel (which mode, way of using mode (e.g. car sharing), which route, etc);
- when to travel (time or day, day of week); and
- how to drive (lane changing and speed changing (acceleration and deceleration) – affecting fuel consumption, emissions and surrounding vehicles).

The first two in the list above may be referred to as *strategic* decisions – they will have implications over a time frame of many months or years. Meanwhile the remaining decisions can be deemed as *tactical* in that in principle they can be subject to change in response to circumstances on a more regular basis to the limit of each time a journey is contemplated or within the journey itself.

Table 8.1 provides a simplistic overview comparison of behaviour change and technology fix. It highlights that both can, in different ways, improve the efficiency of consumption – for example technology can ensure a vehicle achieves more miles per gallon and produces less emissions; meanwhile different driving styles and sharing cars with others can also achieve, per person, more miles per gallon and less emissions per person. Technology fix, as discussed earlier, has a tendency to maintain or even encourage consumption of motorised mobility while behaviour change has more evident prospect of reducing motorised mobility consumption. In this regard, however, there is an important point to note. If technology fix encourages consumption then this arises through behaviour change – for example being able to travel faster or more fuel efficiently may encourage or facilitate an individual living further away from where they work. It is also important to note that behaviour change is not uni- but bi-directional in that it could result in more or less consumption of motorised mobility. With this in mind there is a role for 'lock-in' with regard to effects on levels of consumption: in other words any improvements in the efficiency and levels of consumption together need to be prevented from being eroded by (other) changes in behaviour that bring about an increase in consumption. Nevertheless, it remains the case that technology fix alone is unlikely to reduce consumption while for behaviour change the reverse applies.

Table 8.1 Behaviour change compared to technology fix

Technology fix	Behaviour change

improves efficiency of consumption	improves efficiency of consumption
maintains/encourages consumption	can reduce consumption
supports transport industry	could create a healthier society
is politically palatable	is politically challenging
preserves the automobility regime	challenges the automobility regime

As noted already, technology fix supports the substantial transport industry and the jobs it provides for through investment in research and development and in the production and maintenance of vehicles and the infrastructure and fuel sources they rely upon. Behaviour change could adverse affect some parts of the industry if it resulted in less motorised mobility. However, behaviour change may be able to yield a healthier society in the sense that a move away from the sedentary lifestyle associated with the car to more walking and cycling would increase exercise and could improve mental alertness and hence productivity. Less motorised mobility may enhance social cohesion both in a reduced presence of the motorcar in the physical landscape but also through greater interaction between people who are less commonly 'carcooned' (Mokhtarian and Salomon, 2001).

Perhaps one of the most significant contrasts between behaviour change and technology fix is the extent to which they can be readily supported politically. Technology fix allows a political message that says 'we are doing something positive to tackle the problem while you get on with your lives'. It echoes the 'transport is here to serve' mentality and expectation of the electorate. Technology fix is also able to be defined in terms of what it will achieve – improved miles per gallon, reduced grams of emitted gases per mile, improved throughput of vehicles – in other words there appears to be reasonable if not robust evidence about what can be achieved with appropriate investment and legislation. Meanwhile, behaviour change comes with a political message that may read, or be read as 'in order to do something positive to tackle the problem we require you to make some changes in your lives'. It begins to suggest that transport should be doing something other than serving us and that interference in our freedoms is mooted. It is generally seen as more difficult to pinpoint what could be achieved by behaviour change initiatives leading to a scepticism by some that it merits attention. It is also more challenging to convey how change in our lives may be for the better rather, as the media would likely have it, for the worse.

With this last point in mind and taking the other considerations in Table 8.1 together then technology fix tends to have the effect of preserving the automobility regime whilst behaviour change

represents challenge to it. There is a comfortable familiarity with the regime and its norms and keeping things 'as they are' is welcome as opposed to opening up all the uncertainties that change may have in store.

Challenges of Behaviour Change

Changing behaviour requires that individuals have available to them viable alternatives and that they are minded to consider those alternatives. The viability of alternatives is determined by the factors individuals deem important when making comparisons across their options. Whether they are minded to consider alternatives rather depends upon how comfortable they are with their current behaviours. A number of challenges relate to pursuit of behaviour change, including: acknowledgement of a 'problem', social norms, social dilemmas and decision mechanisms. These are now considered in turn.

Goodwin and Lyons (2010) have highlighted an intriguing contrast on the matter of the problem of congestion, pointing to UK data that offers 'the robust finding over time that while a very large majority of the public asserts the seriousness of congestion for the country, a large proportion of the population do not find congestion as a serious problem for themselves'. We are told by politicians and the media that congestion is problematic and costly to the economy and seem to subscribe to the view that it is a problem for the country. However, in our daily lives we are either accustomed to congestion (especially predictable congestion), have mechanisms to cope with it (such as listening to the radio when we sit in traffic) or we are able to take our own steps to avoid it in terms of how and where we travel. The apparent lack of frustration with congestion, it can be suggested, prompts individuals to be unwelcoming of endeavours by authorities to 'solve' it through measures encouraging behaviour change such as road pricing (Musselwhite and Lyons, 2009).

This familiarity with and conditioning to congestion relates also to the power of social norms. Social norms reflect what, within peer groups or more widely, is seen to be acceptable or normal in terms of behaviours and attitudes (Therborn, 2002). For many people aligning with the norm is important in engendering a sense of belonging and conformity. Individuals who act or think outside of the norm may be frowned upon by their peers or fear this being the case. Social norms relate in turn to notions of social imitation – copying what others do can be both easier in terms of ease of decision making and also assist

in ensuring one is ‘in’ rather than ‘out’. Norms are not universal and importantly they change and therefore can be changed. Nevertheless some norms can be powerful barriers to entertaining behaviour change, for example it is or has been normal to drive by oneself to and from work each day, it is or has been normal to judge public transport (especially the bus) as being second rate to the car and so on. At the same time some norms can be seen to change: it has become normal to engage with household recycling; and in some circles normal to view sports utility vehicles (4x4s) with distain (while (formerly) in other circles to hold them in high esteem as tokens of status and achievement). If social norms can be influenced in favour of the sorts of behaviour changes sought then there is a greater likelihood that behaviour change momentum can be built up.

Social dilemmas intriguingly reflect how as individuals we can all lose out through selfish behaviour when changing our behaviour to be more co-operative could benefit us all4. They also reflect the potential importance of sticks as well as carrots to change behaviour. The example in Figure 8.2 illustrates the point. Commuters to an urban centre have a choice of travelling by car or by public transport (let us assume that both modes share highway space and that there is ample provision of public transport services). With all or most of the commuters travelling by car they all face (collectively self-inflicted) congestion (situation 1). If an individual chooses to switch from car to public transport (s)he will remove a car from the road and thereby marginally reduce the traffic level and improve the journey for all other car users and public transport users (situation 2). This may well, however, be at a greater personal ‘cost’ to the individual concerned than the benefit they receive from the switch. If all or most car users switch to public transport then all commuters would benefit more than they would if no-one switched (situation 3). In this situation the rational car user will remain in their car (situation 4). This is explained as follows. If the individual is the only one to switch then they will lose while all others will gain. If the individual switches and sufficient others do likewise then the individual will gain. If others switch and the individual does not (i.e. the individual is a freerider) then (s)he will gain. Such rational behaviour regrettably results in all commuters being (or remaining) disadvantaged.

4 For an excellent discussion of social dilemmas, see Felkins (2001).

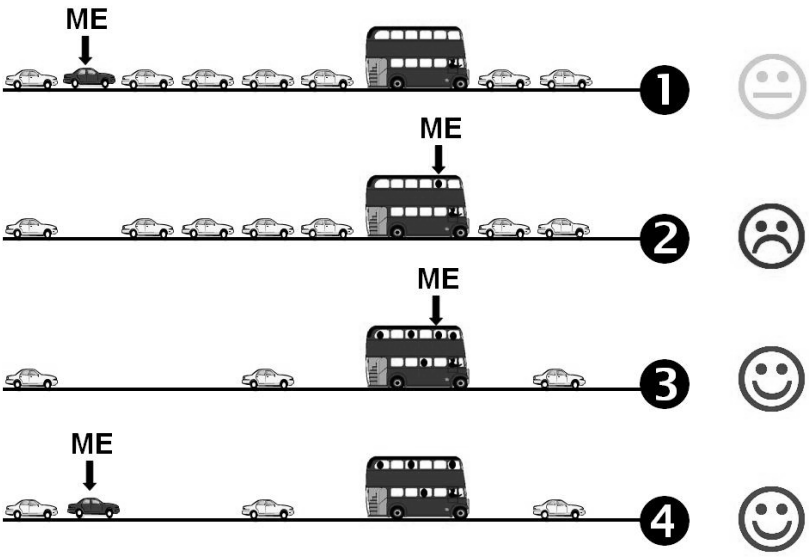

Figure 8.2 A social dilemma

Such social dilemmas require an intervention for them to be broken – this is what a measure such as London's congestion charge achieves. The individual is effectively penalised for selfish behaviour and everyone receives collective reward through those choosing not to use their car making traffic less congested and journeys easier.

Returning to the individual then there is a need to better understand decision mechanisms that individuals employ in order to appreciate the challenges of changing behaviour (Lyons et al., 2008). Notable in these is the distinction between utility maximising behaviour and satisficing behaviour. In the case of the former an individual wishes ideally to be in possession of all of the facts and aware of all their travel options in order to be able to compare them and identify the preferred option that maximises utility ('attractiveness') or conversely minimises disutility. In the case of the latter an individual has a threshold of acceptable 'attractiveness' which once exceeded renders the travel option 'good enough' or satisfactory. Either through repeated assessment of available options for a given journey (such as the daily commute) or through an immediate tendency towards satisficing behaviour, an individual can move into habitual behaviour whereby the options are no longer considered and the behaviour is an 'automatic' response to the need to travel confronted. Technological developments in the provision of travel information services have implicitly if not explicitly been founded (in the past and arguably still so) upon

assumptions of utility maximising behaviour – individuals wishing to use information once made available. What tends to transpire instead is that individuals are unlikely to seek information for journeys that are sufficiently familiar and/or predictable (which constitute the majority of journeys).

Before turning from challenges to opportunities for behaviour change we must raise the matter of which behaviour changes can substantially tackle the problems of energy, emissions and congestion. Although more recently there has been a greater policy emphasis in the UK on cycling, there has been a tendency to turn attention to public transport (bus and rail) as the travel alternative to the car to be promoted. Undoubtedly this is part of any 'rebalancing' of mobility that a behaviour change approach would seek to achieve. However, a simple assessment of the facts highlights the need for behaviour change to be about much more than this. In 2008 the average number of car trips5 per person per year in the UK (as a driver or passenger) was 637 (64 per cent of all trips). The figures for surface rail/underground and local bus were 27 (3 per cent) and 65 (7 per cent) respectively (DfT, 2009a). If a 10 per cent reduction in car trips were to be achieved by mode shift (or a suppression of a 10 per cent increase in car trips) then this would amount to either a 236 per cent increase in rail trips or a 98 per cent increase in bus trips. This would have major implications for the capacity of these modes. This highlights the need to turn attention to a wider set of behaviour changes that notable include cycling and walking or a decision not make certain journeys.

Opportunities for Behaviour Change

It will be apparent from the above that there is much to suggest that behaviour change is challenging, not least politically, because people are in general wedded to the current regime. However, behaviour change potential remains substantial, whether or not it can be realised.

While people can be vocal in their resistance to change as a collective, behaviour change is in fact a characteristic of all our lives in terms of changing circumstances and strategic decisions. As we move through our life course we change where we live, we acquire and change jobs, we form and reform households, we have children, etc. As these changes occur our travel behaviours can be subject to reassessment and we may actively seek to change them. For example, in a study into residential relocation

5 Where car was the main mode for the trip.

it was found that over a quarter of respondents had changed their main mode of travel for commuting since relocating (Stanbridge and Lyons, 2006). Aggregate statistics on travel such those reported earlier can imply that little overall change is occurring while in fact change at the level of the individual can be appreciable. This phenomenon has been referred to as 'asymmetric churn' (Chatterjee, 2001). An example of this has been highlighted by Dargay and Hanly (2007) in relation to car ownership. A very small net increase in car ownership at the aggregate level between two consecutive years (0.2 per cent) was shown to have resulted from nearly 16 per cent of households changing car ownership overall: 8.2 per cent increasing car ownership and 7.6 per cent reducing car ownership.

Hence behaviour changes are occurring all the time but in different directions in relation to greater or lesser car use. The challenge is how to encourage, facilitate and 'lock-in' the desirable behaviour changes and discourage those changes that are contributing to the overall problems facing transport. People need to be incentivised in their strategic decisions and when their circumstances are changing to make choices that will have lasting preferred effects. Behaviour change of a different sort is that which takes place when an individual's circumstances have not changed. This is more challenging. However, initiatives known as individualised travel planning do exist that seek to raise in people's consciousness consideration and reappraisal of their travel with informational assistance and advice provided. Such initiatives where applied, albeit targeted at willing volunteers, can yield significant results. Sustrans (n.d.) reports achieving relative reductions in car trips of between 9 per cent and 14 per cent.

As noted earlier, to create an environment for behaviour change requires both carrots and sticks. It is recognised that while positive enticements to change behaviour (e.g. improved public transport) may be appealing as propositions to the public, their effectiveness relies also upon other measures to 'push' them to change (e.g. parking restrictions or road pricing). The latter are not as popular with the public. However, the public are more supportive of sticks or rather combinations of carrots and sticks when they can see that the approaches are effective. There is thus a longstanding need for political courage to introduce packages of measures that truly incentivise and achieve behaviour change. Pricing and restraint measures are unavoidable in this and political courage must come from a realisation that effectiveness when demonstrated can improve public acceptability.

Change must be recognised as something that can be gradual overall rather than always immediate in response to an intervention. Carrots and sticks change the relative attractiveness of the travel options for people. Their circumstances may not enable immediate change but changing circumstances can then bring into play reappraisal of travel options and influence of carrots and sticks on strategic decisions. As change at the aggregate occurs this can permeate into social norms as people come to recognise that more people around them are doing things differently to the point that other behaviours become more acceptable.

One of the challenges of travel behaviour change in terms of its link to climate change concerns is that it can be (perceived to be) hard for a behaviour change to offer benefits that are proximate to the individual. However, with increasing attention being given to societal health problems relating to body weight and the need to consider eating and exercise behaviours, change from sedentary travel (sitting as a driver or passenger) to active travel (walking or cycling) offers proximate benefits to the individual. Thus an opportunity may currently present itself for the urgency of climate change to legitimise political bravery associated with measures to change behaviour and health concerns to improve public acceptability and behavioural response.

In the earlier examination of technology fix, the focus was upon technologies within the 'transport is here to serve' context. However, information and communications technologies (ICTs) are now offering a substantial opportunity to influence travel behaviour. They are making it possible for people to access goods, services, people and opportunities without the need for them to travel. Most notable in this regard has been the arrival of the Internet in society and the invention of the Web. Perhaps only a coincidence but since the early 1990s (when the Web was invented) the road transport intensity of economic activity has been decreasing: '[b]etween 1980 and 1992, traffic (measured in vehicle kilometres) and overall travel (measured in passenger kilometres) grew at a faster rate than GDP. Since 1992, GDP has increased by 56 per cent compared with a rise in road traffic of 23 per cent' (DfT, 2009b). Kenyon et al. have suggested that ICTs can *supplement* travel (increasing levels of access and social participation without increasing levels of travel – that is, ICTs can substitute for an increase in travel) (Kenyon et al. 2002; Kenyon et al. 2003). However, ICTs can also stimulate more travel through

encouraging people to interact. Accordingly there is a need to return to the importance of carrots and sticks. ICTs make possible less reliance on motorised mobility to achieve access but in a regime setting where motorised mobility use is supported rather than restrained, rationed or more highly priced the impact may be limited.

Intriguingly different parts of the 'technology industry' can be seen to be in conflict in terms of their implications for motorised mobility (intended or otherwise). Technologies under the umbrella term 'Intelligent Transport Systems' (ITS) seek to tackle congestion. Meanwhile mobile ICTs that enable remote communication, mobile working, mobile entertainment and relaxation are effectively exploiting congestion.

Little reference has been made to land use changes in this chapter further to the earlier mention regarding Figure 8.1. However, land use patterns play an important part in defining opportunities for different travel behaviours and shaping norms in travel. A partnership between land use planning and exploitation of ICTs could hold the prospect of 'acting globally, living locally' allied to greater interest in walking and cycling.

The Way Ahead

The RAC Foundation's Director, Professor Stephen Glaister, has recently noted in relation to tackling climate change that 'while policies aimed at changing drivers' behaviour have their parts to play, the current emphasis of government is on the greening of private and commercial vehicles through advances in technology' (RAC, 2010). This epitomises the mindset of the current automobility regime: technology fix is seen to be the primary opportunity and that deserving of most immediate intense attention and investment while behaviour change is a 'nice to have' bonus but an opportunity bestowed with low expectations and consequently much less attention and resource. This chapter has sought to highlight the two opportunities for transport of technology fix and behaviour change. It has pointed to the limitations and challenges of each and aimed to raise the more fundamental and underlying issue of the automobility regime and the tendency for regime preserving rather than regime changing actions to be taken.

The way ahead may well be characterised by technology fix because it suits the status quo. Yet proceeding in this fashion could expose us as a society that has been subject to the frogboiler

phenomenon: a frog put in a pan of hot water will jump out immediately, recognising the threat to its safety; a frog put in a pan of cool water that is gradually warmed up to become hot will adjust its body temperature and will not detect the gravity of the threat to its safety until it is too late. In transport terms we have been adjusting to mounting traffic and growing dependency on motorised mobility in a way that it gradual such that we do not sense the cumulative effect of the automobility regime. We are doing our best to adjust our body temperature through technology fix and upholding an expectation of further growth in travel demand. We may discover that our dependency eventually reaches a critical point where serious system instability results. Would we not be wise to more seriously contemplate significant adjustment to the regime?

Most evidently the way ahead should be marked by a marriage between technology fix and behaviour change: the answer is to pursue both rather than one or the other. However, for the marriage to work requires a sufficiently meaningful input from both sides. At present we are at risk of saying we are doing both while in practice giving too much attention to technology fix such that it overshadows and diminishes the role of behaviour change. Rather than allowing the mindset of 'transport is here to serve' to persist, the way ahead requires us to recognise that transport shapes society and should be developed in such a way so as to support society. Some have cautioned against transport policy moving into the realms of social engineering but in fact whether we like it or not, transport policy does engineer society, whether or not intended.

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