VENICE PAPER

Car Dependence within City Regions
Mo.Ve Mobility Forum, Venice 2008

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PREFACE

The knowledge accumulated by Mo.Ve over recent years is now sufficient to call for a synthetic approach that at this point is fairly close to a *manifesto*, that could ultimately be promoted by the Mo.Ve Association itself towards its network and by means of specific activities. The following effort performed on behalf of the Mo.Ve Scientific Committee by Martin Richards intends to summarise the major findings cumulatively elaborated by Mo.Ve over the past years.

As Chair of the Scientific Committee, I recommend a careful reading of this substantial document, written in studiedly unimposing style around the central theme of Mo.Ve 2008, namely "Car Dependency". The title refers to a widely diffused way of saying (and although on a more analytically critical level the concept might even be disputed) Mo.Ve decided to adopt it from common language as testimony of the difficulty of moving away from the car system, despite the increasing awareness of the negative externalities connected with its widely diffused uses. These externalities are sometimes described as unbearable, but while it is easy for armchair philosophers and planners to state in abstract that the elimination of the car would solve the problem, this position completely avoids the question of what type of city would be it be without the car, and how we might want to go from here to there.

Mo.Ve's philosophy is completely different, we do not play around with ideological and abstract concepts; we want to deal with realistic issues, with the intent of improving quality of life and the empowerment of the individuals. There are many ways in which you can intervene toward rendering metropolitan mobility more sustainable, and Mo.Ve has explored many of them over the years, and Martin Richards is summarising that effort in a convincing way. Unfortunately things are not moving as fast as the armchair planners would. It takes a long time to adopt, plan, test and enforce plans to increase sustainability in urban policies. From this point of view the annual rhythm of Mo.Ve Forums could feed the misleading image that nothing or very little is actually happening. It would be a mistake to follow this reasoning. Things are on the way, this is not an unduly optimistic vision but a realistic view based on the fact that the issue of sustainable metropolitan mobility is firmly on the agenda of policy makers and stakeholders at all levels, from local to European to say the least. Mo.Ve's philosophy has been constantly to warn that with a short time span scale one should not expect shocking changes, also because innovation in this field is multifactor and changes are the product of a number of converging and synergic actions rather that of one single valve being opened or shut. The following report gives substantiation to this basic approach.

Professor Guido Martinotti
Milan, October 2008

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CONTENTS

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EXECUTIVE SUMMARY

Mobility in its various forms – including, notably social, economic, residential, employment – is central to a vibrant and successful economy and a fair society. Yet, some of the consequences of geographic, or horizontal mobility are damaging our economies, our environment and equity; they are having an adverse effect on the true quality of many of our lives, and they risk leaving the world in a worse state for future generations than it was at the beginning of ours.

There is, therefore, a very real need to consider how we can best manage mobility so at to reduce the adverse impacts whilst minimising the consequences on those aspects of mobility that are key to a successful economy and a fair society.

The Mo.Ve Mobility Forum promotes debate and discussion on the sustainable mobility of urban areas, with an annual meeting in Venice that focuses on a particular aspect of its agenda. That for the 2008 meeting is Car Dependence of City Regions.

As our cities have evolved over the last fifty years, they have become increasingly dependent on the car which, in very may cities, has become the dominant means of transport for people, with public transport, cycle and foot accounting for only relatively small shares. Indeed, there are some cites that are so dependent on the car that they would find great difficulty in functioning if the use of cars, but not other vehicles, was suddenly to be severely restricted.

But, there are cities around the world that have retained much of their traditional compact, mixed land use structure, well served by pedestrian cycle and public transport networks, that is very much less car dependent, However, even in many of these, there are areas where the car dominates.

This, our 2008 Report, is concerned with both those cities that have become truly car dependent and those city regions of which significant parts are car dependent – but for simplicity we refer to "car dependent cities" – recognising that there a spectrum of dependency, not only in terms of city structure but also in terms of the city's people, some of whom are very much more dependent on their car, as they go about their daily lives, than others.

Car dependency is largely a product of market forces, evolving with:

- increased personal economic wealth
- reductions in the costs of car ownership and use

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- increasingly higher expectations for the quality and quantity of space within individual homes, with private space around them
- a willingness of city authorities to allow low density development
- planning regulations that militate against mixed use developments
- pressures by both the private and public sector to locate jobs, shops, education, health and leisure facilities on new sites, many of which are not easily accessed by foot, cycle or public transport
- a relative decline in the density of public transport services.

Just as cities and the areas around their fringes have become increasingly car dependent, so have their citizens. Yet, in many cities, depending on their structure (including density), there is relatively small proportion of residents who are truly car reliant, for whom there is no alternative to using a car. However, for very many people who use their cars for nearly all trips there are feasible alternatives for at least some of the trips they now make by car. These might be to walk, cycle or go by public transport, possibly to a different destination, for leisure for example, or to combine a number of separate trips into a longer chain, reducing the total distance travelled. There could also be opportunities to use information and communication technology instead of making a trip.

Thus, there is spectrum of dependency, ranging from those for whom there is no feasible alternative to the car through those for whom alternatives exist through to those without a car. However, even some of those without a car are able to get lifts.

Because of the real and perceived individual benefits of travel by car – the flexibility, the privacy, the wider range of opportunities available, the use of a cost (the capital and fixed annual costs) sunk in ownership the social symbolism – for many people using their car has become a habit, and alternatives are rarely, if ever, considered even when feasible.

Indeed, in many cities, owning a car has become a necessity for very many, as the cities have developed in ways which make the use of alternatives to the car unattractive, and whilst, in many countries, car ownership among the better off is close to saturation it is still growing among those on lower incomes. However, the changes in city structure that have made a car a necessity have made it increasingly difficult for those without a car to benefit from the opportunities cities offer, and they often find t hard to get to work, and thus to get and keep a job, or to education or to healthcare.

A key challenge for us now is managing our cities to reduce their transport based greenhouse gas emissions as well as traffic congestion, both products of car dependency, whilst maintaining the economic dynamism necessary to the resources required to achieve successful change.

Fortunately, there is very much that can be done to reduce the current levels of car dependence found in cities around the world. We really can make both cities and their citizens less dependent on the car in their daily lives being and in their economic well.

There is limited need for invention, as there is a wide range of measures that have been tried and tested somewhere around the world – and proved both effective and acceptable to the different stakeholders. What is needed is a willingness to take and accept action across a broad range of fronts. We need to develop and implement packages of measures that will provide the step change needed for our cities to become better places, with much lower carbon footprints.

Whilst change is rarely easy, if we do not start now it will become even more daunting in the future. Thus, action needs to be taken by regional and city authorities, supported by national governments to strengthen existing measures and to introduce measures that are new to their city.

And that action must gain the support of all key stakeholders, politicians, the media, transport providers, residents and businesses. They must all recognise that they have a responsibility in helping to make their city region more sustainable.

Mo.Ve is convinced that only if all the key stakeholders all work together in developing, implementing and successfully managing a wide ranging package of measures can our dependence on cars in city regions be successfully managed, greenhouse gas emissions reduced and health improved, whilst also maintaining the economic dynamism on which thriving cities rely.

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1. INTRODUCTION

Promoting sustainable mobility is a central element of the policies of government agencies - national, regional and local - across and beyond Europe. Although initially driven by the need to address both global warming and social equity issues, the rapid rise in fuel prices during 2008 has made it even more urgent to find ways of reducing our use of fossil fuel derived energy in meeting our transport needs.

The Mo.Ve Mobility Forum was established to promote debate and discussion on the sustainable mobility of urban areas, between those who make policy, researchers and other stakeholders, including national Automobile Clubs. It does that by promoting a number of activities which find their highlight during the annual Forum in Venice, held every autumn which involves key players in informed discussions on selected issues relating to sustainable mobility and possible policy measures. Each spring there is Mo.Ve workshop in Madrid which helps prepare for the Venice Forum.

Over the last few years, the Mo.Ve Venice Forum and its Scientific Committee have examined the understanding of travel behaviour – individual, collective and institutional – and how governance systems impact on sustainable mobility together with our rights to mobility and the associated responsibilities. Consideration has also been given to relationships between mobility and social equity and exclusion, as well as with congestion and pollution, and how new technologies might influence mobility along with the other effects they might have.

For 2008 the focus of the Mo.Ve Venice Forum is on a crucial element of sustainable mobility - car dependence, of both individuals and of cities – or large parts of cities. This distinction between individual and city – and its actors and stakeholders - is important in helping us understand how we can best influence car dependence through measures that relate to the way we plan and manage our cities as well as those that relate to how individuals choose to travel within our cities.

We have chosen to focus on city regions for three main reasons. First, it is within the city regions of developed – and many developing – countries that most people live. Second, whilst challenging, some of the aspects of car dependence within major urban areas can, probably, be more readily addressed than those of small towns and rural areas, where jobs and key facilities – health, education, leisure - can be some distance away and there are often no viable alternatives to the car. Third, cities are the primary focus of Mo.Ve's work.

The "car dependence" of our cities is a function of the extent to which their economic, social and cultural lives rely on the car, for getting people from their homes to work, to education, to the shops, to healthcare and to all the other activities that constitute the life of a successful city. Yet, whilst they have become car

dependent, concerns about climate change, energy supplies and costs, as well as health, social equity and exclusion and the environment are increasingly leading to questions about the sustainability of current levels of car dependence, and to the development and consideration of measures which would, at least, prevent further increases in car dependence and ideally reduce it.

Whilst there is evidence that car dependence can be reduced, policies, and action plans to achieve this must be carefully planned and managed. In most cities a sudden and extensive reduction in car use would have serious consequences. Given the structure of most of our urban areas the other transport facilities could not support the activities essential to allow the city to continue to function effectively, and to maintain its prosperity.

As we will explore later, there is an important difference between the "car dependence" of individuals and that for specific trips. Whilst many people might choose to use the car for all their travel, other than when they walk a few paces to a local destination, the evidence suggests that, within urban areas, not many of us are totally dependent on the car. With some changes in our lifestyle, we could use other modes for some of our travel, or simply avoid making that particular trip. But for other trips, realistic alternatives to the car, or for the trip itself, do not exist. Changing to another mode or to another destination or travelling at a different time might reduce the distance we travel, and some of the averse impacts of using a car, but would not obviate the need to use a car.

Figure 1.1 indicates the process of car dependency by transforming choice riders to captive riders (Litman with adaptions from Georg Hauger)

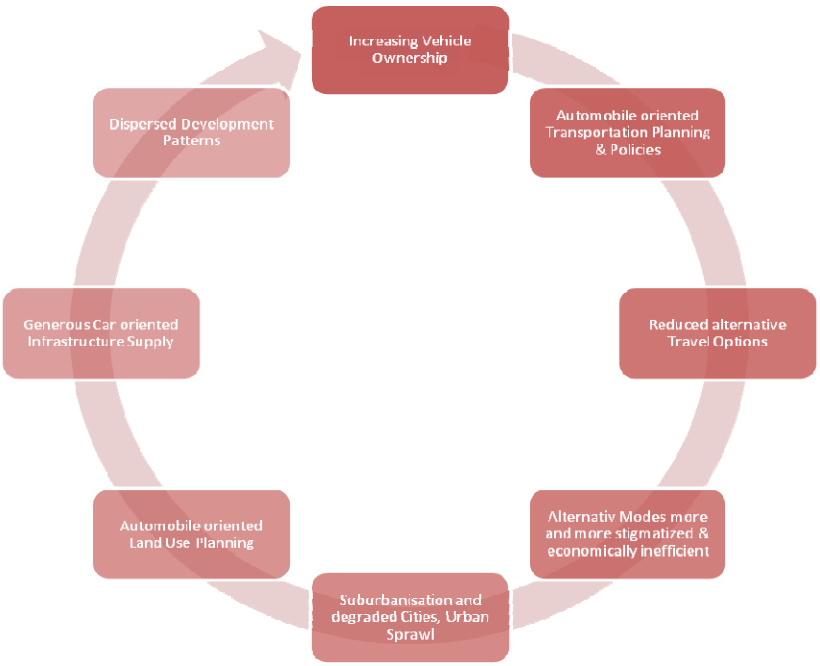

Figure 1.1 The Cycle of Car Dependency

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The 2008 Venice Paper is intended to inform reasoned debate at the 2008 Venice Forum on how that knowledge might be used to inform future city region policies.

In the next Chapter we consider the broad issues of mobility, before focusing on sustainable mobility within urban areas. That is followed by a pair of chapters reviewing what we know about the car dependency of both cities and individuals. Building on that knowledge, we seek to answer the question "can urban mobility be managed?", and in so doing providing policy makers with guidance on how car dependency can best be reduced, concluding with a set of key actions that city regions around the world need to consider, if they are not already on their agenda.

2. MOBILITY

2.1 Setting the Context

Mobility, in all its various dimensions, is central to society and to our economies. Social and economic, or "vertical" mobility enables people to change their lifestyles, moving from one group (including that they were born into) to another. Whilst the goal for many is "upwards" mobility, implying improved economic, social and health circumstances, for some it is sideways, into a different lifestyle whilst others drift downwards. Becoming the owner of a car, or a particular type of car, can be seen to represent a person's (or a household's) move upwards into a higher economic or social group.

We also have "horizontal", or residential mobility, as people move from one community to another, or from one part of a community to another part, and job mobility as they move from one job to another, possibly in a different location. Job mobility is complemented by employment mobility, as job opportunities change, with jobs being lost in one location whilst being created in another, and those changes can cause residential mobility, as people move to where they can find the type of job they want – or even just work.

Each of these dimensions of mobility is fundamental to that with which we are primarily concerned – travel mobility. Social and economic mobility influence both our attitudes towards and our choice of transport options, as well as the amount of travel and the type of transport we can afford. Residential mobility is influenced by our need for transport, the particular options available to us and how far we are willing and can afford to live from where we work, and from the other necessities of life.

Job mobility is also likely to involve travel, if it requires us to change the area in which we work, and the way in which we get there. And employment mobility might cause us a range of sequential changes including where we live and our travel patterns.

Today, as opportunities have expanded and we have become more selective, many of us are willing to travel substantial distances to get to the job of our choice or, conversely, to live in the home and location of our choice or to enable our children to go to a school of our choice. We are also willing to travel further to get to a particular shop or shopping centre or to participate in particular leisure activities, and some of us think little of flying long distances regularly, for work or leisure.

Within this complex set of interacting mobilities, our focus for the 2008 Venice Forum is on geographic mobility - travel, and transport - within city regions, and sustainability.

2.2 Urban Mobility

Our cities have been growing outwards for well over a century as, first, railways enabled people to live further from their place of work, or to work further from their home. In many cases, railway lines led the development of new suburban communities, as speculators invested in both the rail line and associated residential development. The railways were followed by the tram and the bus, helping create other new suburbs outside the corridors defined by the railways with the ubiquitous bus helping to infill between the train and tram lines.

As our cities grew steadily outwards, so they provided people with more space for their homes away from the grime and hubbub of the centres and industrial areas of our cities.

As we have noted, the initial patterns of suburban residential growth were strongly based on public transport services radiating out of the city centres where the jobs where. However, as the nature of industry and commerce changed, so jobs moved out too. But the historic radial public transport services no longer matched the travel needs of many of those living and working in the suburbs. For increasing numbers, their needs were best met by the car, which was becoming increasingly affordable, and which could go anywhere where there was a surfaced road. And so cities continued to grow in area, sprawling ever further from their original core whilst becoming increasingly dependent on the car. Many of these "traditional" cities still have a strong public transport based structure serving their inner core whilst being very dependent on the car for suburban and peri-urban travel.

Although many cities grew from long established settlements, progressing from the walking city through the transit city to the car city, some have grown directly as car cities.

Today, the car dominates land transport. Across all 27 EU countries in 2006, it accounted for 82.3% of all passenger km. In the 15 members before the expansion of the last decade, passenger km travelled by car grew by 170% between 1970 and 2006. Over the same period, car ownership within the 15 grew by a similar percentage, from 173 cars per 1000 people to 508 (European Commission, Energy and Transport in Figures, 2007)

Whilst the car is somewhat less dominant in our cities than it is across whole nations, it still dominates in most, even in those widely regarded as having good public transport systems. In most European cites the car accounts for at least half of al trips made, although in some, including Amsterdam, Bilbao and Budapest, it accounts for only one third of total trips. With its flexibility, its availability to go where you want, how you

want, in a space you control, it is not surprising the car has come to be the dominant mode in very many cities, and, where it does, that public transport plays a relatively minor role, in terms of market share.

Although public transport accounts for less than 25% of all trips made in most European cities, and only in a few does it account for more than one third; these include Budapest, Prague, Vienna and Warsaw. However, there are many major European cities where walking and cycling account for one third or more of all trips made, including Barcelona, Berlin Copenhagen and Paris, and in Amsterdam they account for about half of all trips.

But these statistics are averages, across the whole city, disguising wide variations in modal shares, with public transport use highest fro trips t and from the city centre and along the corridors with high service levels, and low in the suburbs and exurbs – the areas around the city fringes. And it is in the outer suburbs and beyond where many of the news homes and jobs are located. It is here where the car generally dominates

Yet not everyone owns a car, or has access to one, and for them travel in car oriented cities can be difficult and time consuming; in some cities it can also be relatively expensive, since the majority of non-car owners are among the poorer in society. Whilst the car opens up opportunities to those with one, its effect on both the shape of our cities and the supply of public transport has seriously restricted opportunities for those without one. As car ownership and use increase, so the opportunity gap between the "haves" and "have nots" widens. This is exacerbated by the ability of many better off wealthier households to make a trade-off between higher expenditure and lower transport costs in city centres against lower housing costs and higher transport costs of living near the city fringes, whilst poorer households cannot necessarily make up for lower housing costs in the suburbs by spending more on car mobility, making them "worse off".

2.3 Sustainability and Urban Mobility

The Mo.Ve Forum has adopted the definition of sustainable development put forward by the 1987 World Commission on Environment and Development report, the Bruntland Report:
"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, "Our Common Future", 1997

The Bruntland definition sets out the broad objectives, which are further developed by the EU Council of Ministers of Transport in their definition of a sustainable transport system (European Union Green Paper on Urban Mobility, 2007. Their definition of such a system is one that:

- allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
- is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development.
- limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimising the impact on the use of land and the generation of noise.

An EU Green Paper, "Towards a new culture for urban mobility" published in 2007 identifies five challenges in urban mobility, namely progressing towards:

- free-flowing towns and cities
- greener towns and cities
- smarter urban transport
- accessible urban transport
- safe and secure urban transport

It is evident, from the work of Mo.Ve in earlier years as well as that of others, that there is a wide range of new policies, regulations and services that can help us address the EU's five challenges, and that there is a wealth of information about "best practice".

But, whilst we might know what we need to achieve, at least in general terms, and how we might best make progress towards sustainable mobility which ticks all the EU Ministers of Transport boxes, it is very clear that making that progress is not easy.

As we identified in our 2007 Venice paper, the essential difficulty is that the principle products of mobility - both positive, such as economic and social development and negative, such as congestion, pollution and safety risks – are the result of a complex system of actors with differing motivations, constraints and behaviour. We have not yet moved to a position in which all those actors - individuals, businesses, transport providers, governments - work together, with an agreed agenda.

We still tend to focus on relatively abstract principles or on the behaviour of particular sectoral groups –the car industry, car users, local government, for example - rather than collective action in which the rights as well as the responsibilities of the various players, individual and collective, are recognised and a holistic strategy developed.

It is essential that urban mobility is not seen simply as traffic and transport engineering policy – it is very much broader.

Effective action requires comprehensive strategies covering all the relevant elements - including social, economic and land use as well as transport – that are

- developed for complete city regions
- accepted by all stakeholder
- formally adopted by all relevant agencies and implemented, with active management under strong leadership, overcoming the weaknesses of the fragmented governance of many of our city regions, with the full and effective support of national government agencies.

2.4 Trucks and Vans

Although the 2008 Mo.Ve Venice Forum is primarily concerned with car dependence, we cannot ignore the truck and van. Their use has also grown very substantially, as the production of food and goods has become increasingly concentrated and much has moved away from the countries were they are consumed, involving much longer distribution chains.

And the demand for services has also grown, resulting in ever increasing numbers of light vans conveying service engineers, couriers and all the other skills and services the modern economy and society call for.

Between 1970 and 2006, the number of goods vehicles within the EU 15 grew by 264%, from 7.5 million to 27.4 million. and within the EU 27, freight transport by road increased by 3.5% every year between 1995 and 2006.

The impact of these substantial increases in truck and van traffic must not be ignored in the development and management of plans for sustainable mobility in city regions. We must also consider how we can better manage the distribution of goods and the provision of services so as to lessen the volume of vans and trucks using city streets.

2.5 In Summary

Mobility in its various forms – including, notably, social, economic, residential, job, employment – is central to a vibrant and successful economy and a fair society. Yet, some of the consequences of geographic – or physical - mobility are damaging our economies, our environment and social equity; they are having an adverse effect on the true quality of many of our lives, and they risk leaving the world in a worse state for future generations than it was at the beginning of ours.

There is, therefore, a very real need to consider how we can best manage mobility so at to reduce the adverse impacts whilst minimising the consequences on those aspects of mobility that are key to a successful economy and a fair society.

3. WHAT DO WE KNOW ABOUT THE CAR DEPENDENCY OF OUR CITIES?

3.1 The Evolution of City Regions

As cities developed, they provided opportunities for the sharing of skills and knowledge, as well as for mutual defence, and they became "honeypots" attracting people seeking better lives than subsistence living in rural areas. The industrial revolution provided a great stimulus to their growth, not only as manufacturing produced wealth and jobs, but it also provided new ways of transporting goods and people, the canals networks of Britain's industrial heartlands being crucial to their success. But they were quickly followed by the steam engine and the railway, providing "mass" transport for the first time, and enabling people to live more than walking distance, or a horse ride, from where they worked.

From then on cities grew rapidly, attracting people from rural areas. The science and engineering that underpinned industrialisation had also changed agriculture, enabling fewer people to produce more, to feed those in the cities, and the railway helped get the food from the country to the cities.

The growth of cities as automobile cities is a result of their economic evolution, fuelling the need for more people, and thus homes, and funding the expansion of the necessary infrastructure – including the roads. Their wealth was initially generated by industry, producing goods, benefiting from the presence of firms making different things, or dealing with different stages of the whole manufacturing process in close proximity to each other. But as production grew and became more integrated, and transport – for both goods and employees - became more efficient and cheaper, so the need for different producers to be close together lessened, and industry was able to mover away from the central core, frequently to new plants on what was then the urban fringe, served by the ubiquitous bus, often in the form of special works services.

Thus, transport has played a key role as an enabler of city development, taking us from the early "walking city" through the "transit city" of the 19th century and first half of the 20th century to the "automobile city" of today.

The car has had two key influences on city form. First, it has enabled cities to grow wherever there is a road, or roads can be constructed, and it has removed the need for people to live within easy walking distance of a train station or a tram or bus stop. Second, that "freedom" has enabled cities to grow at low densities and to decentralise, and to spread.

Access to cheaper property in the suburbs and beyond enabled people to trade travel time and costs, particularly for the journey to work, against property costs – whether rental or mortgage costs. And the

relatively low costs of suburban locations have encouraged the growth in jobs in suburban. The advent of high speed data communications and low cost technology has added a further dimension to the equation, for both residents and employers.

Although most European cities have retained characteristics of both the walking and transit city, whilst also spreading out as an automobile city, many (but by no means all) US (or Australian or Canadian) cities have become almost entirely automobile cities, with public transport providing little more than skeletal services in an endeavour to meet some of the needs of their car less.

Yet, there are some functions that still benefit from the agglomeration effect that was central to early urban industrial development. Despite the power of modern technology and communications, which were expected to make even more dispersion possible, with jobs following people fleeing the city for more rural settings, places like New York's Wall Street and the City of London depend on the closeness of key skills - bankers, lawyers, IT specialists, PR people, and many more – all working close together and easily able to meet face to face; they are still very much walking cities. The creative arts is another sector benefiting from the closeness afforded by the walking city, and there are several more.

In contrast, whilst agglomeration, or close proximity has benefits for the services and trades associated with international airports, as well as for those businesses who benefit from being close to international hubs, they are microcosms of the car dependent city.

3.2 What Is a Car Dependent City?

There is no standard definition of "car dependence" in the context of urban areas, but it is clear that a car dependent city is one in which the car is very much the dominant means of transport for people, with public transport, cycle and foot accounting for only relatively small shares. It is a city which could not function if the use of cars, but not other vehicles, was suddenly to be severely restricted.

Car dependent cities – or better the car dependent areas of - have:

- low densities
- widely dispersed jobs
- education, health, shopping and leisure facilities that cannot be easily accessed by foot, cycle or public transport
- zoned development, discouraging land use mixes within local developments
- usually (but not necessarily) a relatively weak central area

- high levels of car ownership
- direct car use costs, incurred by the driver, that are below the full socio-economic costs of many of the journeys made, particularly those when roads are congested
- high levels of car use
- extensive highway networks
- ample and free or cheap parking
- limited public transport services, often primarily serving those on low incomes and without cars (captive riders)
- limited facilities for walking and cycling
- low levels of travel by foot cycle or public transport - other than as part of fitness regimes.

They are, thus, cities or city areas, where the car is not only omnipresent, but has become an economic and social necessity, because you can only get to many destinations of choice if you go by car, and those without a car are seriously disadvantaged, as explained in the next chapter.

However, we must recognise that very many cities have a diversity of "car dependence". It is only in the suburbs and exurbs, particularly those developed in recent decades, that there is a high degree of car dependence. Other parts function very successfully with high levels of waking and public transport use,

Car dependent cities - or the car dependent areas of cities – often invest in roads with the objective of avoiding or reducing congestion, to keep the traffic moving. This investment enables people to use their cars more, including living further from where they work or shop, requiring yet more highway capacity.

Truly car dependent cities have tended to develop in countries with plenty of space – the USA and Australia, for example. Although car dependence occurs throughout the world, it is a question of degree, but even relatively compact, dense, traditional European cities depend on the car to satisfy many economic and social needs

It is also argued that car dependency tends to be higher in cities with warmer climates, better suited to low density suburban lifestyles than in colder climates, where higher density (and, thus, good public transport services) are better suited.

Cities or city areas, have become car dependent because they have responded to market forces. In part this is because as people become better off, they aspire to car ownership. It symbolises their wealth. And having acquired a car, they want to use it. Further, the roads and land development industries have, historically, been powerful political lobbies, successfully arguing for the rights of the individual to choose how and where they want to live, and for their industries to provide the wherewithal.

But the development of car dependent cities has also occurred over time because. in many of them, there is not a single body responsible for land use and transport cross the whole city region as well as because land use controls have not ensured that new areas are developed as balanced communities at densities that encourage walking and cycling and the use of public transport. Indeed, many zoning laws and city development plans prevent the development of mixed use areas.

3.3 Cities, the Car, the Environment and Climate Change

Concerns about the impact of cars, as well as vans and trucks, on the social and physical fabric of our cities have been with us for over half a century. Faced with sections of the US Interstate system being driven right through their cities in the 1960s, taking homes and businesses with them, citizens challenged the plans and stopped their construction in many cities including New Orleans, New York and Washington DC.

Similar citizen led action in London in the late 1960s stopped the plans for the construction of a 50km long "motorway box" series of motorways through inner London, close to the centre.

Despite these movements, new highway capacity continued to be added in other major cities right through the rest of the twentieth century, as well as new suburban, peripheral and interurban highways, facilitating the evolving sprawl of our cities and the dispersion of homes, jobs and leisure well beyond the new suburbs into smaller towns, and rural areas.

Whilst new urban road systems were being developed, the impact of the car on shopping centres and within residential areas was causing concern, particularly in many European cites as early as the 1960s, when measures were introduced to give preference to the pedestrian. However, the concept of physically separating the car and pedestrian, espoused by many of the urban planners of the 1940s, '50s and '60s, perhaps presented most clearly by Colin Buchanan's "Traffic in Towns" work, had little impact on overall city form.

It is only over recent decades that concerns have grown about environmental sustainability, emphasised by the 1987 Bruntland Report, and climate change,

Globally, road transport accounts for 14% of greenhouse gas emissions, and cars account for 45% of that share, or just over 6% of total emissions. Based on current trends, global road transport emissions are likely to double by 2050.

However, within the EU, road transport accounts for some 24% of CO2 emissions. Further, cars in European countries, with their higher levels of car ownership than the global average, account for a very much higher proportion. In the EU cars account for 60% of road transport CO2 emissions.

In the UK cars account for 13% of greenhouse emissions, and other forms of road transport for a further 9%, taking the total to 22%. If current UK trends were to continue to 2050, road transport, measured in vehicle kms, could well double. However, improvements in vehicle technology could reduce the emissions per vehicle km by 50% by 2030 and total road transport emissions by nearly 40%. A more optimistic, but some argue less realistic view is taken for the EU as a whole, with CO2 emissions being expected to rise more slowly, with growth of 25% between 1990 and 2010 after which it reduces to a very slow rate, moving towards a levelling off.

Whilst a good part of the greenhouse gases emitted by road transport are from inter-urban transport and movement within our smaller towns and rural areas, a substantial part comes from our cities. It is argued that, in theory at least, it is in these areas where the greatest potential for reductions in the use of motor vehicles exists, that the car is less readily replaced in rural areas than within cities. And it is quite clear that if we are to be successful in managing climate change, we need to reduce transport generated greenhouse gas emissions by a very substantial amount.

In their study of sustainability and cities Newman and Kenworthy analysed the relationship between energy use per person for private transport and urban density, and found the two closely related as shown in Figure 3.1. A similar pattern was found when they analysed petrol consumption and density. There is also evidence that petrol price and petrol use are related, indicating that price plays a role in defining city form; it is in those cities with lower fuel prices that people can afford to travel further by car.

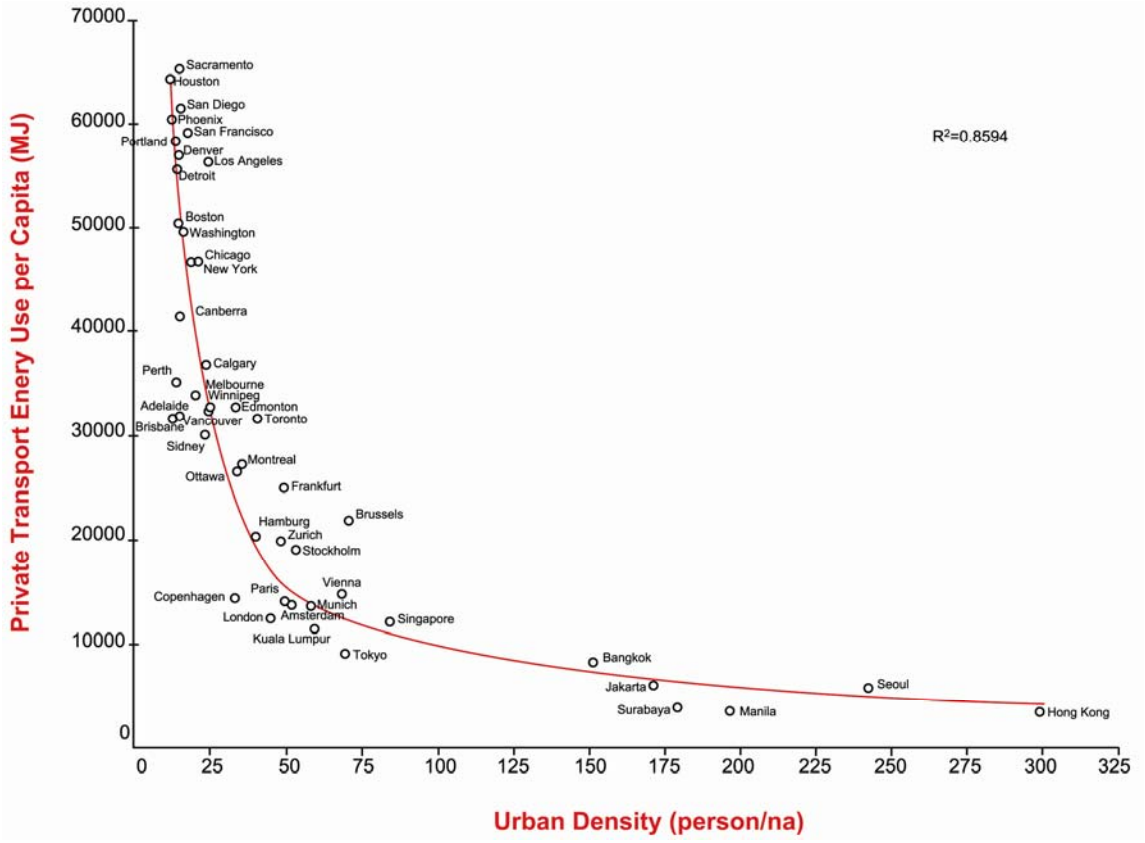

Figure 3.1 Energy Use per Capita for Private Passenger Travel versus Urban Density *Source: Sustainability and Cities: Overcoming Automobile Dependence, Peter Newman and Jeffrey Kenworthy, Island Press, Washington DC, 1999.*

3.4 What Else is Wrong with Car Dependent Cities?

There is a growing body of evidence that links car dependency with poor health, with many of those using cars taking little if any regular exercise, unlike their forbears who not only walked to and from work – and whatever activities they undertook - but also often had physical work to do. There is particular concern about children, who get taken to and from school by car, adding to other concerns about their lifestyles and diets.

Car dependent cities can suffer from excess congestion even those with a relatively high level of investment in highway capacity. Indeed, it is argued that it is inefficient to invest to meet peak demand. In almost any context including transport systems; some congestion at peak times is efficient.

They are also likely to be more vulnerable to rapid changes in energy supplies and costs, as well as other shocks affecting key parts of the urban system, as periods of oil shortages over recent decades have demonstrated.

There is some evidence that dense, less car dependent cities, have better road safety records, in part because of the lower use of cars – car kms – but also because speeds are lower so when crashes occur they are less likely to result in death or serious injury.

There are concerns about the social structure of low density car dependent suburbs, in which there is little daily contact between neighbours, and less community interest and pride than tends to be associated with denser more vibrant areas, where people meet as they walk and in the local shops, cafes and bars. The structure of the car dependent city is seen to exacerbate the problems caused by weak social cohesion, with all the adverse effects that can have on the city as a whole - with different parts of society, the old and young, the better off and the less well off, people from different ethnic or racial backgrounds, all living their separate lives. That reduces the social and economic mobility at the heart of the development of urban societies, and, some argue, increases the risk of crime directly affecting the individual citizen.

Social separation also gives rise to concerns about personal and household security, leading to the growing creation of the gated community that some see as the ultimate form of the car dependency, exacerbating the wider problems of cohesion.

3.5 What are the Benefits of Car Dependent Cities?

It can be argued that we have low density, car dependent cities because that is what people want. Not only do many people want to own cars as a symbol of wealth, when provided with the choice, most Americans, as well as some people in other countries, will choose a detached house on its own plot in the suburbs where they need a car to get almost anywhere, rather than live in denser areas, near transit.

It is also argued that free market economies with relatively weak development controls enable business to respond quickly to changing demand and new opportunities creating a more dynamic economy and, thus, higher wealth than those with tight controls, and that the car dependent city is typical of such economies.

Car dependent cities also provide employers and other businesses with larger markets, since their staff or customers can get to them from many different directions, over a large area.

Returning to the issue of social cohesion and crime, many see the low density suburb and the use the car as a way of reducing their personal exposure to criminal attack. Characterised as "the flight from blight", the growth of the suburbs has enabled people to get away from, to turn their backs on, the degenerating inner cities – another reflection of the drive of the market forces behind suburbia.

3.6 In Summary

Car dependency is largely a product of market forces, evolving with:

- increased personal wealth
- reductions in the costs of car ownership and use
- increasingly higher expectations for the quality and quantity of space within individual homes, with private space around them
- a willingness of city authorities to allow low density development
- planning regulations that militate against mixed use developments
- pressures by both the private and public sector to locate jobs, shops, education, health and leisure facilities on new sites, many of which are not easily accessed by foot, cycle or public transport
- a relative decline in the density of public transport services.

Although car dependency has increased sharply over recent decades, and some cities are almost totally dependent on the car, there are some cities around the world, particularly some of the smaller ones, that have retained much of their traditional compact, mixed land use use structure, well served by pedestrian cycle and public transport networks. And in many, it is only towards the outer suburbs and beyond that car dependency dominates.

The challenge for the future is managing our cities to reduce their transport based greenhouse gas emissions whilst maintaining the economic dynamism necessary to generate the resources required to achieve successful change.

4. WHAT DO WE KNOW ABOUT THE CAR DEPENDENCY OF INDIVIDUALS?

4.1 Car Dependence or Car Reliance?

As we explained in the Introduction, there is an important difference between total dependence on the car, for all travel, and dependence on it for particular trips. Some seek to explore this difference by differentiating between "car reliance" and "car dependence", suggesting that reliance is when there is absolutely no alternative to the car for a particular journey, whilst dependence implies depending on the car regardless of alternatives.

Whether there is a true difference between reliance and dependence, or whether it is a matter of semantics, there is no doubt that car dependence represents a range of behaviours and opportunities. For some individuals, or households, the car really is the only option available for all but very local trips. But for some the car is the only option they ever consider, even when going somewhere well within comfortable walking or cycling distance or where they could get to by public transport without difficulty. Some argue that the latter are car reliant, whilst the former are car dependent, but we shall use the term car dependence to cover both reliance and dependence, rather than complicate the discussion.

Thus, we have a range, with at one extreme those individuals who have chosen a lifestyle that makes them dependent on the car, for whom the choice of an alternative – walking, cycling, bus, tram or train – is never considered. Moving towards the middle, we have those who usually prefer to travel by car but will consider (and sometimes use) alternatives when they are feasible, and a little further along are those who chose carefully between the car and alternatives, usually selecting the alternative if the car is not essential, and then there are those who will only use a car when all other options fail. Finally, we have those who never use a car, because they do not have one or do not have a driving licence but would use a car if they could, and another group those that have a phobia about being in a car or will not use one as a matter of principle.

Central to this concept of a spectrum of choice and options is the recognition that, for some trips, the car is the only feasible option. Possibly because the trip destination is beyond walking or cycling distance and there is no public transport service close to one or both ends, or there is but the time taken would be considerably more than that required for the car trip, and there is no alternative destination accessible by foot, cycle or public transport. But it might be that there are alternative mode choices but baggage or goods, or young children or pets, which need to be taken mean the car is the only real option. Another scenario is that at least one of the travellers suffers from a disability that prevents the use of any alternative, or such alternatives as

are feasible are either very much more expensive or much more inconvenient. However, there is evidence that suggests that the group of truly car dependent travellers only accounts for about one fifth of the total.

Whilst it is possible to provide a reasonable rationale to trip decision behaviour across the spectrum of car dependence, there is a very real possibility that those who might consider, and use, alternatives come to rely on the car, failing to check what alternatives exist before deciding to use their car. They become creatures of habit, and having a car they use it whenever they make a trip, even when they go to the local shop or to the park to walk the dog. Thus, for some, car dependence is a state of mind, rather than a strict necessity. In part, this might well be engendered by the high fixed costs of car ownership and the relatively low, marginal, use costs.

And the habits of car dependency impact on the young, who do not learn to walk, rather than drive, or cycle or use public transport – to know their way round their city other than by car.

For some, there are real alternatives to the car, and as the recent sharp increase in fuel prices has shown, not all car trips are essential, and even if they are it is sometimes possible to go somewhere closer, or to combine trips, and cut costs.

4.2 The Benefits of Car Use

The car is often seen as a "liberator", providing its users with the ability to go where they want, when they want. Once you have a car, your horizons are no longer limited to what is within waking or cycling distance or reasonably accessed by public transport. The car widens opportunities for car users across a wide range of activities, employment, education, healthcare, shopping, and leisure. It also broadens the market that employers, retailers and service providers can reach; it enables employers requiring special skills, as well as specialist retailers and service providers, to access the market they need for viability, so extending the opportunities for those who can reach them.

The car also provides for seamless end to end journeys, avoiding the need to get to a bus or train stop, wait for the next service and then, possibly, find and wait for another service, before walking to the final destination. Seamless, that is, provided that parking space is readily available at each end of the trip. Many see it as safe, avoiding the risk of robbery or other attack. But again, that depends on parking.

It also makes it easy to combine a number of trips into one chain, stopping off to buy a newspaper or a coffee on the way to work, and to do some shopping or to go to a fitness centre on the way home. There is

some evidence that the combination of trips into such chains explains some of the use of the car for short trips that could be made by foot or cycle, if they were independent trips rather than part of a chain.

The car is also a personal space, an extension of your home. You choose who you travel with, or to travel alone and enjoy music or the radio without headphones, and it is much easier to carry luggage or shopping and to travel with young children – as well as pets. Your choice of car can also reflect your personality, or represent a lifestyle concept to which you aspire; it tells other people who you think you are, or would like to be seen to be.

Given these benefits, owning a car is a widespread ambition even though for many its costs are second only to housing on the list of personal, or household, expenditure. Indeed, it can represent a substantial capital investment as well as an ongoing cost with regular outgoings to keep it taxed, insured, maintained and fuelled up ready for use.

The perceived benefits of having a car are demonstrated through the relentless increase in car ownership. Whilst the average car ownership across the EU 27 in 2006 was 466 cars per 1,000 people, within the EU15 it was 508, and 556 in Germany and 597 in Italy. Yet, only 371 people out of every 1,000 in Denmark own a car, 461 in Sweden and 475 in Finland, offering some evidence of a suggestion that car dependency is greater in warmer climates.

4.3 The Costs of Car Use

One key reason for the growth of car dependency is that in very many parts of the world, the direct of costs of travelling by car – the costs the user incurs out of their own pocket – are substantially below the total costs to the community, when the costs of providing and maintaining and operating roads, traffic control systems, lighting and policing, as well as those imposed on other users through congestion and on society through environmental impacts and accidents, are fully accounted for. The gap is particularly large when roads are congested, as they often are in cities.

So, because costs are low, we consume more than we would if costs were higher. The relatively low cost of car use have encouraged us to use our cars when we might otherwise walk, cycle or go by public transport, or still go by car but to somewhere closer.

This has been compounded by a progressive reduction in motoring costs in real terms, mainly because of decreases in the real costs of cars and increased fuel efficiency counteracting absolute increases in fuel costs.

It is important to note, however, in some parts of the world, particularly Western Europe, the total costs paid by road users in the various taxes and the tolls they incur are of similar order to, or exceed the total costs of highway provision.

But even where, on average, motoring taxes and charges paid by car users equate to, or exceed, the total socio-economic costs of car use, the taxes and charges allocated on an average per km basis are usually well below the socio-economic costs attributable to the use of congested roads and well above those that can be attributed to the use of quiet roads

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Whether road users do or do not meet the full costs of highway provision through taxes and other charges, there is evidence that because we do not pay directly for the use of roads, we do not consider even the car ownership and use costs we incur when we actually use our cars; we don't think "it is going to cost me 10.00 to make this trip". Instead we treat ownership as a sunk cost, as we do the costs of refuelling.

Transport economists, and others, have long argued that we need to change the way we pay for driving, so road users directly incur the full socio-economic costs. And to make sure we appreciate the costs we are incurring, all vehicles should be fitted with some form of in-vehicle meter, ideally registering a direct road user charge, replacing all, or much of, the current vehicle and fuel taxation.

4.4 The Car, Car Dependency and Social Exclusion

Whilst the car has opened up new opportunities for those with access to one, whether as a driver or as a passenger, those without any access to a car have become increasingly disadvantaged as our cities have been reshaped in response to growing car availability and use.

Those without access represent an important minority group. They are predominantly, but by no means exclusively, from lower income households, and those without access to a car can be dominant in the lowest income groups, reducing the possibility of getting a lift from family, friends or neighbours. They also include more women than men, because fewer women hold driving licences – in the UK in 2006, only 63 per cent of women had one, compared with 81 per cent of men, with the difference being particularly marked among older people.

Although there is evidence that those with cars often help those without, by giving them lifts, sometimes making special journeys just to help another, some people without access to a car have no alternative but to walk, cycle, use public transport or incur taxi fares, despite their low incomes. As a result, the opportunities

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they can access are limited to those nearby and those that they can reach reasonably easily by public transport. They therefore find it harder to get to education, to healthcare, to the wide range of shopping opportunities open to those with a car. And, most importantly, they find it difficult to get to jobs, and the possibility of increasing their income, to enable them to become car owners. As jobs have moved into the suburbs and exurbs, so the range of jobs reasonably accessible to those without a car has declined, many of whom live in the inner parts of our cities. And a significant proportion of the jobs those on lower incomes are likely to be in require a car, since the jobs open to them require them to travel to and/or from work when public transport services are limited or non-existent – late evening, through the night and into the early morning.

There is a vicious spiral. For some, their low income precludes the use of a car, which limits education, health and job opportunities. That, in turn, prevents them from obtaining the money they need to own and use a car. Although this paper is about major urban areas, this problem can be particularly severe in rural communities, and some authorities have tried to break the spiral by providing cars to those receiving public financial support.

The problems created by poor accessibility for those without a car are particularly serious in those parts of the city where the car dominates – the suburbs and exurbs - and where many jobs and facilities (education, healthcare etc) are difficult to reach without a car. They tend to be less serious within the inner cities, where public transport is better and facilities more readily accessed by foot – provided they are still there, not having been closed because of limited demand, or having been moved to be concentrated into bigger, more "efficient" but more remote - facilities.

To get to jobs as well as to the other essential facilities, many on low incomes find it essential to have a car. But these tend to be cars that are cheap to buy, and the owners are unlikely to be able to keep them well maintained. Thus, these cars are likely to be among the less safe and more polluting vehicles on the road. In some parts of the world, many of these cars are not legal, being neither licensed nor insured, and some are driven by people without driving licences. Many cities have a real car using underclass, driven to the illegal use of their cars, in part by the structure of cities they live in.

Thus, with the increasing use of the car coupled with the structure of our cities, those without access to a car, or to someone to give them lifts, are unable to share in the full range of work, education, health, shopping or leisure opportunities available to those with a car. Although that might be a life-style choice for some, for many it is a grim factor of economic or social circumstance.

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The logic of this is summarised in a structure defined by Clifton and Lucas in Figure 4.1.

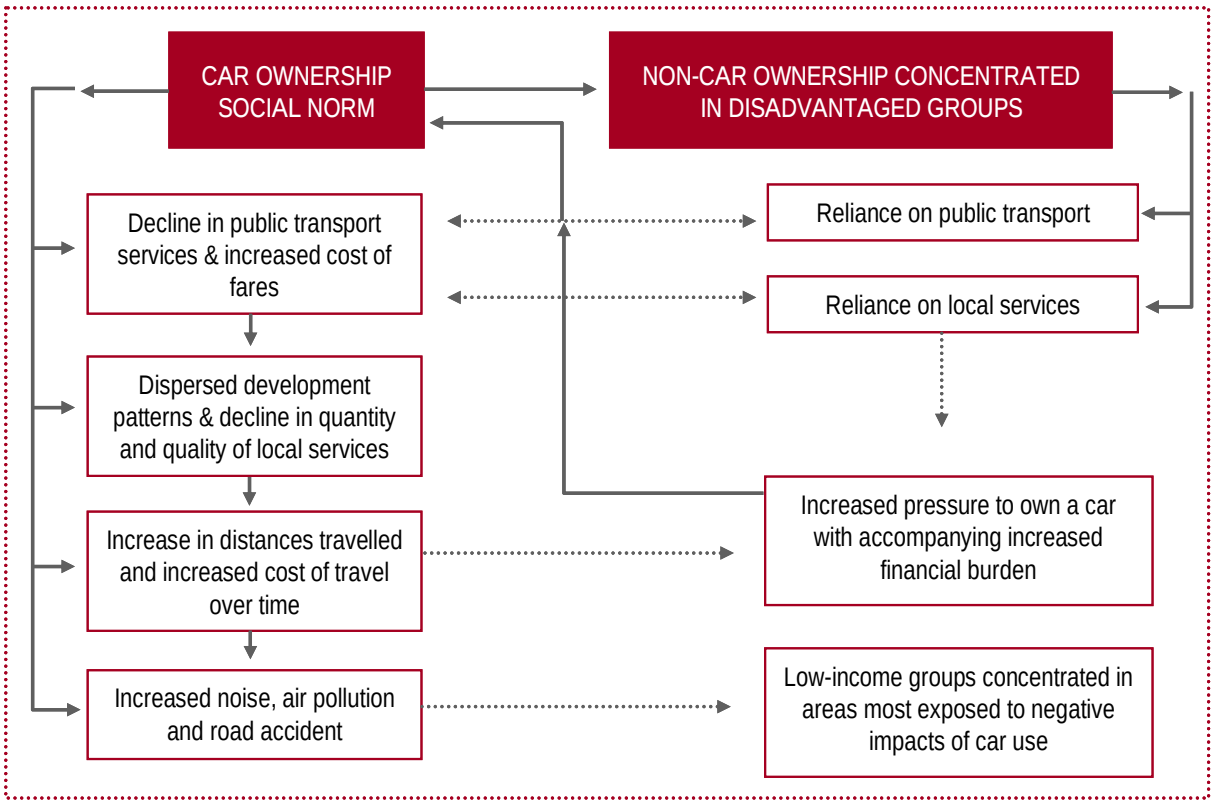

Figure 4.1 The Dynamics of Diminishing Accessibility

Whilst there is evidence that an increasing proportion of households on low incomes are becoming car owners, and that car ownership is an important ambition for those on lower incomes, policies that reduce the need for a car to access jobs, education, healthcare and a range of shops will be of great benefit to those who cannot afford to own and run one, and so in many of today's cities are seriously disadvantaged.

However, whilst decision makers – politician, bureaucrat or technocrat- may be conscious of the need to reduce social exclusion, those excluded, or close to exclusion, are rarely as vocal or effective in influencing decisions about the future of their communities as are those on higher incomes. There is, therefore a very real risk that dealing with their mobility and accessibility difficulties fails to obtain the same attention as that of more vocal groups in society when policies are being formulated.

4.5 Car Users and Sustainability

As we have noted concerns about the impact of cars, as well as vans and trucks, on the social and physical fabric of our cities have been with us for over half a century.

However, despite the protests that plans for new roads often generate among those likely to be most immediately affected, as well a principled campaigners such as those who stopped the construction of London's motorway box and similar schemes in many other cities, there is little evidence to suggest that more than just a small proportion of individuals actively consider the impacts of their use of a car on the local and global environments, and either drive less or change to a car with significantly lower harmful emissions. They are very much more sensitive to price signals, as demonstrated by the recent substantial increases in fuel prices.

Thus, whilst there is wide public awareness of climate change, and of its possible threats to the planet, there appears to be only limited willingness on the part of car drivers to change their car use to help "save the planet". This suggests that environmental concerns are unlikely to have a significant effect on habitual car dependency.

Car Dependency in the UK: Research by the RAC Foundation

The UK's RAC Foundation[1] published in 1995 a study of car dependence it had commissioned the University of Oxford's Transport Studies Unit to undertake. It is following this up with a new study on the issue, being undertaken by a group of researchers from Imperial College London, UCL and Westminster University. The First Phase of this new study will be published in early 2009.

To help inform the 2008 Mo.Ve Venice Paper, the RAC Foundation has kindly agreed to the inclusion of some of the material from the new, 2008 study as well as from the 1995 study, for which the Mo.Ve Forum is very grateful. Further information on the RAC Foundation's work is available at www.racfoundation.org.

One key difference between the RAC Foundation's work and the 2008 Venice Paper is that the first is concerned with the whole of the UK, whilst the latter is focused on large city regions around the world.

[1] The RAC Foundation explores the economic, mobility, safety and environmental issues relating to roads and the use of motor vehicles, and campaigns to secure a fair deal for responsible road users. Independent and authoritative research for the public benefit and informed debate are central to the RAC Foundation's standing.

The Key Findings from 1995

The study was based on a variety of data sources including the UK's National Travel Survey (NTS) for the period 1975 to 1990, and survey research undertaken for the study.

It was found that for many people the word "dependence" does not accurately describe their perception of how the car helps them address their needs. Indeed, many see the car as providing independence, with immediate advantages of convenience, control, privacy and cost savings, as well as pleasure from the task of driving. But set against these is the perception of stress, as well as adverse health impacts.

Willingness to forgo the car entirely is very dependent on the availability of alternatives and the pressures on an individual's time. And those who rely most heavily on the car tend to perceive local bus and rail options to be inferior, whilst they are less likely to be familiar with them than others. Yet between a quarter and a third of people would like to use their cars less if circumstances allowed them to do so.

Although in the early stages of the growth in car ownership, expenditure on a car could be classified, in economic terms, as a luxury, it has now moved towards being classed as a necessity, with limited sensitivity to price in the short run. However, there is some evidence of longer run price sensitivity, with people seeking a wider range of options over a 5 to 10 year period following price increases, but decreases in car ownership are resisted.

The whole process of car dependency is dynamic, involving both individuals and society. As people increase the use they make of cars, so they increasingly come to rely on them, paying less attention to possible alternatives. In parallel, changes in land use and the provision of services make the use of the car more necessary and alternatives less attractive. Thus, although the very first car purchases in the UK might have been a luxury, the changes cars have generated have caused them to become a necessity.

Although the period covered by the research was one of rising car ownership, some households reduced ownership levels. Whilst car acquisition is usually followed by a substantial increase in the number of car driver trips and a reduction in those by public transport, foot and cycle, reductions in car ownership are not followed by equal and opposite changes.

Car ownership and use is not simply a function of time and cost. It is also a symbol and a signal, and is influenced by a desire to achieve a preferred lifestyle and an ability to cope with the complex pressures of living.

The use of cars for very short trips, less than 5 minutes, increased significantly and rapidly over the 15 years covered by the NTS analyses, even though, given starting and parking times for many of these trips, the car would have been no quicker than walking. This growth in short trips is particularly noteworthy for work, education and shopping journeys. A substantial growth in "escort" trips by car – taking another person somewhere – was also noted, as was use of the car for "bulk food" (supermarket) shopping trips, usually undertaken once a week.
Although the car is used for a higher proportion of travel at night than during the day, no evidence was found to support suggestions that car dependence is driven, in part, by the need to travel at night and the early hours of the morning

The study found that there is distribution of car dependency for individual journeys, through which the level of dependency varies. At one end of the distribution some 20% of journeys have to be made by car. At the other end there is a minority of journeys which either do not have to be made at all, or for which perfectly good alternatives exist. For the majority of journeys lying between the two extremes there is a degree of car dependence, but it is not absolute. For very many, a combination of physical and time constraints and poor alternatives make the choice of car a rational individual decision. For these, reducing car use needs either very substantial improvements in the alternatives, which could be costly, or very substantial changes in lifestyle, which take time. However, there is another significant group for whom the improvements in alternatives or changes in lifestyle need to be less substantial.

It was also noted that car dependence becomes more entrenched over time as behaviour and land uses adapt to unrestrained car use, although people can adjust to new policies and alternatives over the longer term. The then current (1995) trends suggested that car use would continue to increase, with an increasing proportion of journeys being deemed car dependent. Thus, the longer these trends continue, the greater the challenges in achieving change.

The study concluded that policy should first focus on the "easiest" targets – those for which feasible alternatives are already available, including walking and cycling - before addressing those for which improvements in public transport, infrastructure and development patterns are necessary. It is suggested that, with a coherent policy framework and persistence, effects can accumulate over time.

However, the authors stressed the need to target policies carefully, and they warned against "blanket policies" aimed at a minority of users but affecting the majority, noting that such policies are likely to be the least successful and trigger the greatest resistance.

They concluded by saying that "while it is not suggested that such policies [to reduce car dependency and use] will be easy, car dependence does not appear to be so uniformly strong as to present an unbreachable barrier to success".

The Background to the RAC Foundation's 2008 Work

Since the 1995 study, it has been established that travel planning programmes can achieve a 10% reduction in car use, However, with growth in the number of households and cars owned, car use continues to rise, albeit relatively slowly. Concerns about climate change and energy security, plus localised traffic congestion and air quality hotspots, are leading to growing pressures to reduce car use, potentially by much larger amounts than is likely to be obtained just through voluntary behavioural change. But, the introduction of coercive measures could generate significant negative economic and social impacts, particularly within specific groups of the population and within certain areas of the country. The new study is intended to help inform the development of such policies, and the mechanisms by which negative impacts can be mitigated or minimised.

The first phase of the current study has focused on the analysis of existing literature and analysis of data from the UK's National Travel Survey (NTS) for the period 1988 to 2004.

Subject to the availability of the necessary funding Phase 2 is planned to include:

- further NTS analyses, as well as analyses of other sources
- use of an omnibus survey to get a view of current car dependence
- a pilot study, to explore in more detail the most appropriate approaches for identifying people's car dependence over time and the likely impacts of coercive measures
- some form of gaming simulation/stated preference method with these panels to look at the effects of non-marginal changes in car use on household activity/travel patterns, and the various economic and social aspects of the costs of adjustment

The Initial 2008 Findings

The key findings from the NTS analyses for the 2008 study largely show the continuation of trends identified in the 1995 work, but there are some changes.

Car ownership is more closely related to income than with the type of area the owners live in, although the relationship with income has weakened, as more low-income households acquire cars, and the relationship with location has strengthened, as shown in Figure 4.2. Thus, the evidence indicates that the smaller the town, the greater the need for a car.

Z-axis

- 2001 – 2004: Furthest Bars
- 1996 – 2000
- 1992 – 1995
- 1989 – 1991: Closest Bars

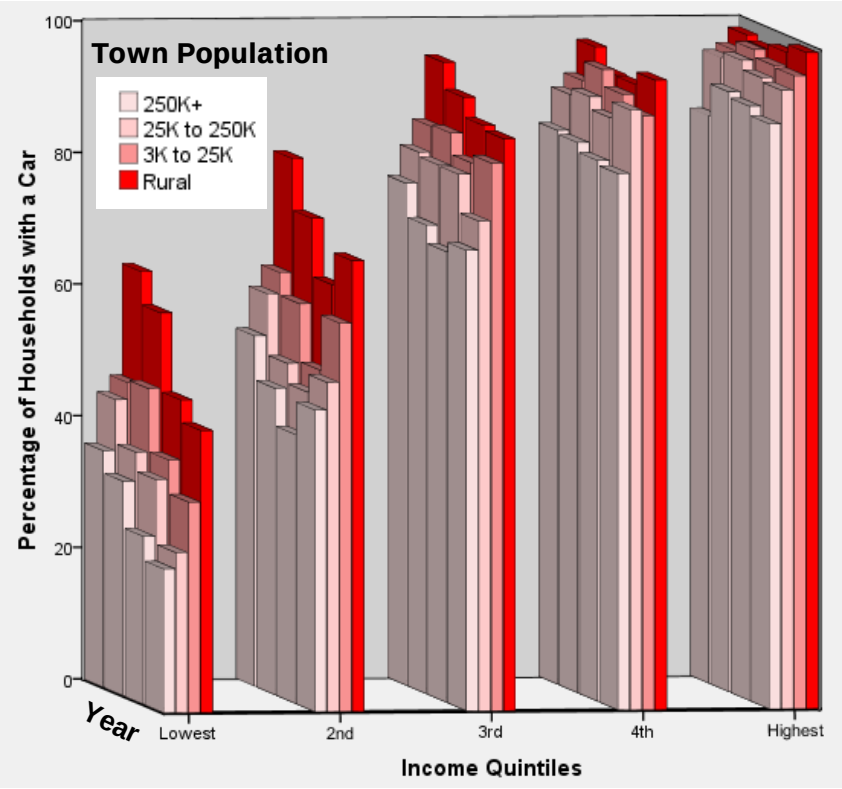

Figure 4.2 Car Ownership, Income and Location, 1989/91 to 2001/4

Analyses of car usage relative to income and to location, Figure 4.3, indicates that car ownership is much more closely related to income than is car usage. This is explained by the relatively high threshold of the large fixed costs of car ownership, both the capital costs of acquisition and the annual costs (insurance, vehicle tax, maintenance etc).

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- 2001 – 2004: Furthest Bars
- 1996 – 2000
- 1992 – 1995
- 1989 – 1991: Closest Bars

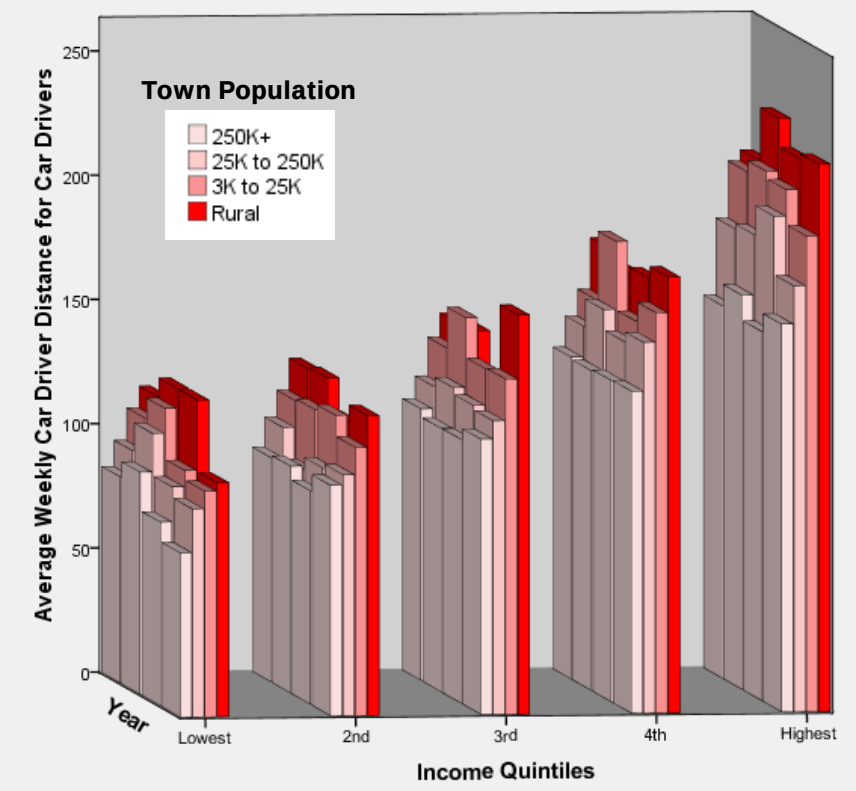

Figure 4.3 Car Use, Income and Location, 1989/91 to 2001/4

- 2001 – 2004: urthest Bars
- 1996 – 2000
- 1992 – 1995
- 1989 – 1991: Closest Bars

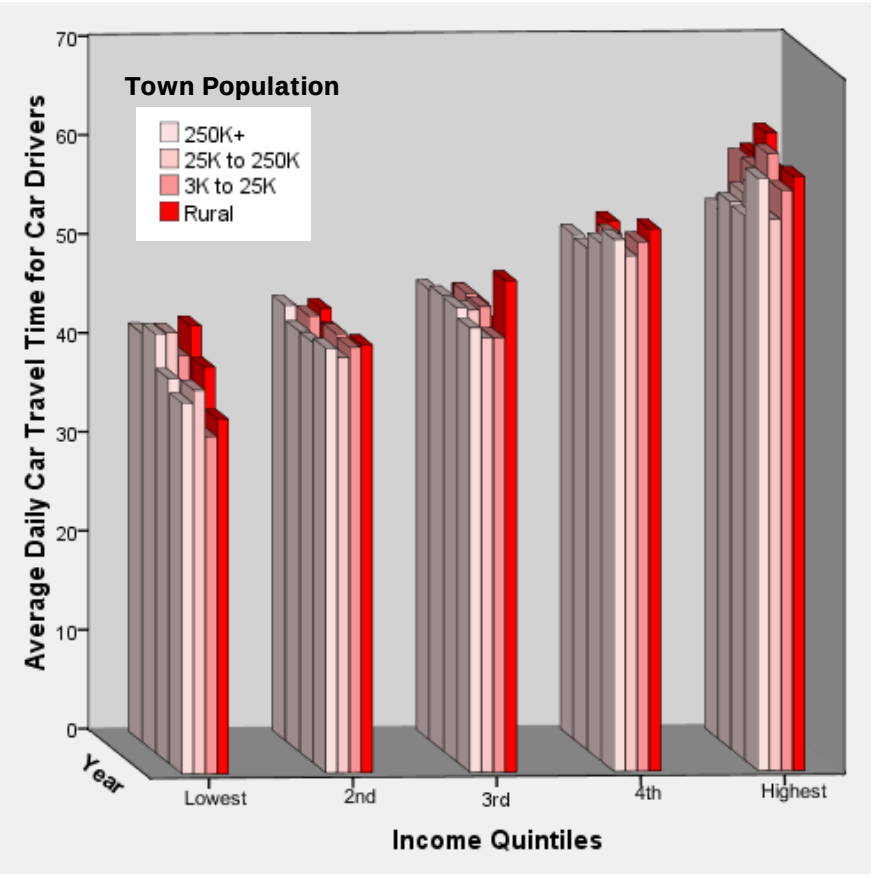

Figure 4.4 Time Spent Driving per Day, Income and Location, 1989/91 to 2001/4

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As shown in Figure 4.4, the time people spend driving each day varies very much more by income than it does by location. It is suggested that the accessibility offered by the car provides sufficient benefits to higher-income drivers to justify their higher amount of time spent motoring day-to-day, relative to those of more modest means.

Figure 4.5 indicates that the car is being used increasingly for all trip lengths, with the most marked increase being for short trips of up to 1.5 miles (2.4km).

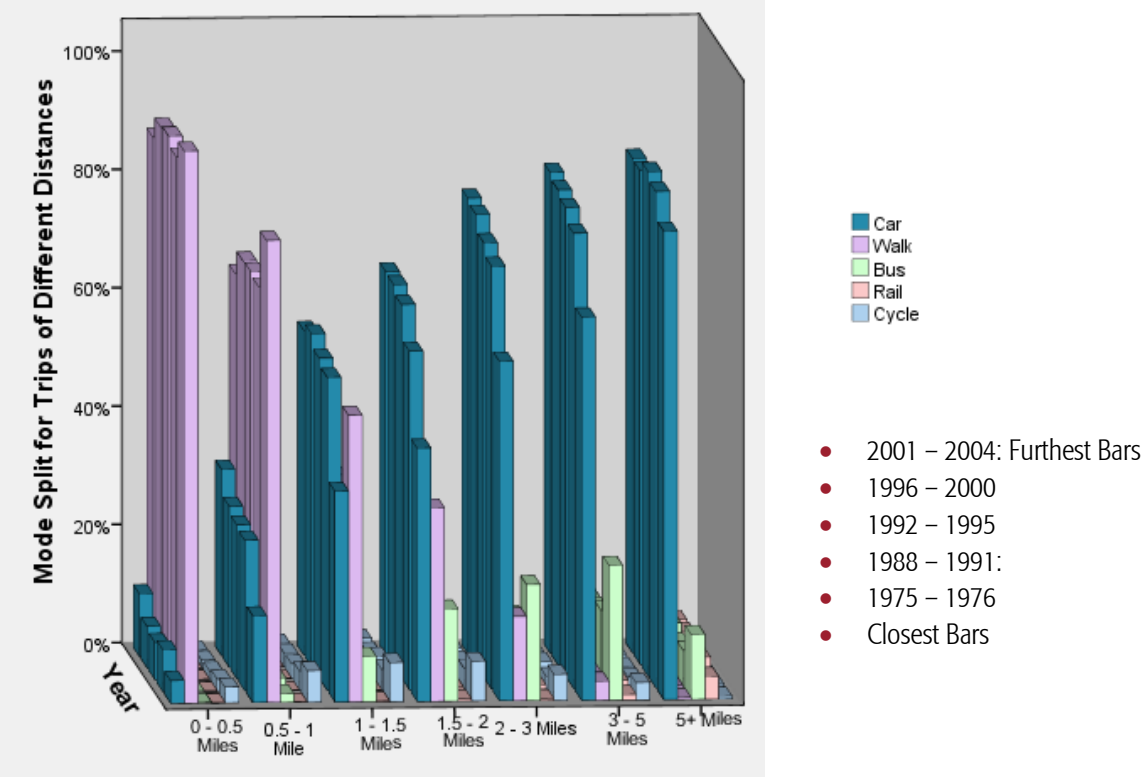

Figure 4.5 Modal Shares by Trip Length, 1989/91 to 2001/4

Very different trends are occurring amongst young and old drivers. Annual mileage has been decreasing for drivers under 30 years of age, but has grown rapidly for those aged 50 plus.

The uses of cars by different types of drivers are quite varied. Amongst women of child-rearing age, "chauffeuring" trips are very important, while men make more trips for leisure purposes. For drivers who drive relatively little, their driving mileage is evenly-distributed amongst travel purposes, but both commuting and business-related travel are more important for high-mileage drivers.

Of car-owning households, more than nine in ten drive to do their grocery shopping, even with one-car households where "car-time" is at a premium. Further, nearly a quarter of non-car-owning households find a way to do their food shopping by private car, whether by borrowing from a friend or family member or some other means. In the latest NTS households are asked how difficult it would be to switch to a non-car mode for their bulk food shopping. Of those households not owning a car, but accessing a private car for their grocery shopping, 65% said it would be "quite" or "very" difficult to use an alternative means.

The report concludes that this indicates that for those trips for which car use is markedly more attractive than alternatives, such as for transporting bulk groceries, people will go to significant lengths to secure car access.

4.6 In Summary

In many cities, depending on their structure (including density), there is relatively small proportion of residents who are truly car dependant, for whom there is no alternative to using a car if a trip has to be made. However, not all trips that are made by car have to be made, and for very many people there are feasible alternatives for at least some of the trips they now make by car. These might be to walk, cycle or go by public transport, possibly to a different destination, for shopping for example, or to combine a number of separate trips into a longer chain, reducing the total distance travelled.

Thus, although we use the term "car dependence", there is spectrum of dependency, ranging from those for whom there is no feasible alternative to the car through those for whom alternatives exist through to those without a car. However, even some of those without a car are able to get lifts. Towards one end of the spectrum are those for whom few trips could be made other than by car, and towards the other are those who by choice or necessity rarely, if ever, travel by car.
Because of the real and perceived benefits of travel by car – the flexibility, the privacy, the wider range of opportunities available, the use of a sunk cost (the capital and fixed annual costs), the social symbolism – for many people using their car has become a habit, and alternatives are rarely if ever considered even when feasible.

Although car ownership was once a luxury, today it has become a necessity for very many, as cities have developed in ways which make the use of alternatives unattractive, and whilst car ownership among the better off is close to saturation it is still growing among those on lower incomes. However, changes in city structure in response to car availability and use have made it increasingly difficult for those without a car to benefit from the opportunities cities offer, and they often find it hard to get to work, and thus to get and keep a job, or to education or to healthcare.

5. CAN URBAN MOBILITY BE MANAGED?

5.1 The Challenge

There can be little doubt that across Europe, and more widely, we have become too dependent on the car. The case can be made on a number of different grounds, including

- emissions and climate change
- other environmental impacts -both directly and indirectly through the impacts of urban sprawl
- health
- social justice, in particular, reducing social exclusion).

Any one of these might be sufficient by itself to cause us to rethink the extent to which we have allowed our cities to become car dependent. Taken together it can be argued that they make a formidable case. One that society and Governments should heed, with care and a sense of urgency. However, despite evidence that suggests there is a growing awareness of those aspects of car dependency which can adversely affect our communities, and planet, there appears to be a reluctance to recognise the reality of where are today – and where we are heading – and even more to introduce, or allow the introduction of, measures designed to reduce our dependence on the car. That reluctance appears to be shared by most players - within society at large, political circles and the media. Although the desirability of change may be accepted by many, at least in principle, it is rarely easy to reduce a dependence, once established.

That is not to imply that there is a laissez-faire approach everywhere, and in all parts of society and in all governments. Indeed, there are some excellent examples, with Zurich and Freiburg-im-Breisgau among the cities where a wide range of mutually reinforcing measures have been implemented. And many governments have made it clear that they see reducing car use as a key policy need, and there are very many cities where particular initiatives have been pursued. But, in most countries and in most cities there is much that can and should be done.

The challenge is what? What measures

- will prove acceptable to the electorate – and media - and thus politicians?
- can be afforded, in terms of both their implementation and ongoing direct costs, and their wider economic impacts?
- will have the required effects, within the required time?

Acceptability is vital. Few political leaders are willing to promote measures that are likely to prove unpopular and the media often plays a key role both in determining what is acceptable and in making or breaking a

proposal. And there are few politicians that are willing to risk their political future backing a plan the media are against, and which the public – their electorate - don't like.

Cost and economic impacts are fundamental. Cities, transport service providers, businesses and citizens all have limited resources, and those resources are largely dependent on economic success. Thus not only will it prove more difficult to gain acceptance for measures that adversely affect the local economy, but they are also likely to reduce the ability to finance future measures, threatening the integrity of the strategy.

The issue of time is important. Some measures, such as making our cities more compact so that the car is less necessary, will take many years, indeed decades, to be reasonably effective. Others, such as convincing people to use their cars less can be effective quickly, although the evidence suggests that their effect is only limited.

One thing is clear. No single measure is likely to have a significant effect on car dependency. We will need to use a package of synergistic, Win-Win, measures if we really want to have a significant impact on the use of cars within our cities. Central is the need to change behaviour, to change habits, and to do that the measures needed include those that cause or encourage people:

- not to make a trip, or to combine two or more trips, reducing the total distance travelled by car.
- to walk or cycle, possibly to a closer destination - to shop locally rather than in a regional shopping centre, for example
- to use the bus or train rather than their car for trips beyond their immediate locality.

To do this, the measures available to us include:

- changing our cities, using planning measures to avoid further sprawl and developments that depend on access by car
- improving alternatives to the car
- reducing our need to own cars
- using the available convincing (or con-vincing) and information arguments
- using technology to reduce the need to travel
- using pricing to make car use more costly
- using regulation, to make using cars less advantageous, or more difficult.

But we must avoid the use of measures that score well in one respect, whilst creating avoidable adverse effects in others.

There have been a number of initiatives to reduce traffic and congestion in city centres, not least the London and Stockholm congestion charging schemes. However, because of a combination of good public transport and relatively high parking charges, travel to city centres is already much less dependent on the car than travel within the rest of our city regions. Thus, to be effective, measures designed to reduce car dependency

must be effective across the whole city, particularly in the suburbs and exurbs – the areas around the edges of our cities, where car dependency is greatest. And, as we have noted, in developing, implementing and operating policy measures to reduce car use, we cannot ignore the use of trucks and vans.

To a great extent, measures designed to reduce car dependence will reduce greenhouse gas emissions, and vice versa. However, these two policy drivers are not always synergistic. Thus, for example, using smaller more fuel efficient vehicles or replacing fossil fuelled vehicles by those with alternative energy sources can reduce greenhouse gas emissions (depending on the total carbon footprint of any alternative energy source and its use), but will have no impact on reducing car dependence. That said, it is highly likely that the public, media and politicians will be far more sensitive and responsive to measures pursued to reduce greenhouse gases than to reduce car dependence, for the full array of policy rationales underlying that need.

Thus, there is much to be gained by aligning measures designed to reduce car dependence with those designed to meet other policy objectives for which there might be greater political, media ad public support.

Central to successful change are two overriding principles: leadership and community "sign-up". Achieving a significant reduction in car dependency will require a step change from today. It will require a holistic approach, challenging some current governance structures and processes, cutting across traditional administrative domains. It is also likely to require some radical measures. To enable these to be achieved requires leadership, someone willing and able to lead change initiatives successfully. In addition, if the proposed measures are to be acceptable for implementation and to be effective once implemented, they must have the general support of those affected. That requires effective community involvement in identifying the issues that need to be addressed, and in developing appropriate actions.

5.2 Changing our Cities

As we have discussed. liberated by the car from the limits imposed first by walking then by the train, the tram and the bus, our cities have evolved. Whilst not all have sprawled, most have spread out with low density suburbs, and with jobs and key shopping, leisure. health and education facilities in locations difficult for many of those without a car to get to, whether by foot, bicycle or public transport. And in many cases, homes and jobs relating to the city have spread into the freestanding towns beyond the city limits, into its hinterland

Making more jobs and key facilities accessible by foot, bicycle and public transport is central to making our cities less dependent on the car. Easily said, but not so easily done. Buildings have a long life, a new hospital on the city outskirts built in recent years will be there, in use, for many more. We have to recognise the

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critical importance of the links between land use, transport, social exclusion, health, environmental sustainability and climate change. We can no longer think and work in silos, concerned, for example, only with the internal efficiencies of closing local healthcare or education facilities and their replacement with new ones serving larger populations built on green field sites difficult to get to other than by car. Neither can we continue to build edge of town business and industrial parks. We can no longer allow new residential developments on the urban fringes that do not form a part of a balanced community that includes key facilities, including some jobs, within safe walking or cycling distance, and which do not have good public transport links to key parts of the city.

Managing the Whole City Region

We must no longer manage the city and its exurbs independently of each other. We need to work in the context of the whole city region, fully appreciating that its people and businesses rarely recognise boundaries as they go about their daily lives and business. They are much more concerned with the outputs and the costs and effectiveness of local government than with administrative boundaries.

The cities we have today are largely the result of market forces. Where people are willing to live in dense developments, we have medium and high rise flats, or apartments, often with local facilities within easy walking, or cycling distance, because there are enough residents to support shops, schools and health. But as the nature of people's dream homes changes towards living in a detached house on a substantial plot of land, density plummets, as in many parts of the US, as well as the suburban fringes of many European cities, and local services are no longer viable. The same applies to public transport.

Increasing City Density

Thus, reducing car dependency over the longer term, means we need to start by convincing people – and planners, politicians and property developers – that there are advantages in living in tighter communities, where you can walk to a local shop or primary school, and where there is a regular bus service not many minutes walk away, that comes on time, each time. But that means planning ahead – getting the bus services in when people first move into a new area, getting local services and schools open, so the first residents don't have t start by using the car

Accessibility by All Modes

We have to put in place systems that ensure that all new developments can be readily accessed by very many of those intended to be within their catchment area by foot, cycle and public transport; ideally only a minority should have to use their car. And we have to ensure that public transport services are in place when people – residents, workers, students, shoppers, visitors – first move in, so they don't start by having to use their car, creating a habit that we then have to invest resources in, trying to change.

In our larger city regions, we need to consider the development of a network of public transport hubs around which employment centres and other services can be concentrated, with efficient public transport services emanating from them, including links to other hubs.

We need to change from minimum parking requirements to maximum, to encourage developers and occupiers to think about access to, and the use of, other modes – possibly using some form of development or land levy or taxation to cover the public costs.

The Legislative Framework

Central governments can play key roles in achieving change, both through ensuring the necessary legislation and regulations are in place, supported and enforceable, and in promoting ideas through the funding of demonstration projects, allowing cities to test ideas, and to learn from others.

Indeed, sharing ideas and experience between cities, within and between countries is essential to the efficient development of new measures. The EU Civitas network is a good example of this (www.civitas-initiative.net/main.phtml?lan=en)

Smart Growth and New Urbanism

These two terms apply to very similar movements started in the USA, with the objective of creating more sustainable and more sociable areas within cities. To quote New Urbanism, they are about *"Giving people many choices for living an urban lifestyle in sustainable, convenient and enjoyable places, while providing the solutions to peak oil, global warming, and climate change"*

They seek to counter urban sprawl with its associated car dependency, lack of environmental and social sustainability, and all the other adverse impacts of low density cities spreading remorselessly into the surrounding countryside.

A key focus of Smart Growth and New Urbanism is on high levels of local accessibility together with environmental and social sustainability.

They promote the development of compact, balanced neighbourhoods, with mixed land uses, including jobs, schools, and shopping, at medium to high densities and ample public open spaces. Each neighbourhood should contain a variety of housing types, including affordable housing, to provide socially balanced communities with a diversity of income levels.

The neighbourhoods have well defined centres, providing a wide range of local services, and they should have clear outer boundaries to help engender a true sense of local identity. They are designed to encourage movement by foot and cycle, with extensive safe, secure and pleasant networks, ideally separated from the roads, which are designed to control traffic speeds. The neighbourhoods are well connected to other parts of the city region by public transport services.

The principles of Smart Growth, or New Urbanism, apply to both new communities and the regeneration of older areas within cities.

Crucially, the principles are not separable; they are not a menu from which the most convenient ideas can be selected. They must all apply to ensure that the objectives of environmental and social sustainability are achieved and maintained.

5.3 Improving Alternatives to the Car

People choose to travel by car for a complex set of reasons, but as cites have extended and key facilities have moved to green field sites, often on the principle that "bigger-is-better", it has increasingly become because the alternatives are just not feasible. Whilst, as we have discussed, we need to progressively change our cities to make them better suited to reduced car dependency, such changes will be slow. We therefore have to seek to improve alternatives within the areas we have today.

Public Transport

Attitudes of many car users to the use of public transport and the "slow modes", walking and cycling, suggest that this will not be easy. But there are opportunities. At the core of many of them is image.

Although there is no social stigma attached to using public transport in parts of many cities, that is not so everywhere – "public transport is for those who cannot afford a car", "you have to share a seat with someone with a ghetto blaster round their head", and so on. Those perceptions are exacerbated by the view that "I don't know where they go, or when they run, and they are probably always late, having been stuck in traffic"

We can't change the existing users of buses, but we can change the image of buses, by ensuring that they are smart, modern, clean, comfortable vehicles with clear information on their routes and where they stop, that they are warm in the winter and cool in the summer, and that they are not only safe (that passengers riding them are secure from threat or criminal deed). We must recognise the standards car users have come to expect of their vehicles and match them in our buses, as far as it is reasonably possible.

We can also ensure that information on bus services is readily available in a format that is readily understood by the novice – so many timetables are provided in formats and letter sizes that challenge even seasoned users. Having done that, buses must be seen as being regular and reliable, and available when people need them. Drivers must be mines of information, willingly passed on to uncertain travellers.

We also need to recognise the paradox that whilst the bus is often regarded as "down market", the tram and train are much more acceptable to those who avoid buses. So, where there is the demand, new tram lines can do much to get people out of their cars provided they want to go where the tram goes – and that is the challenge of trams, they have to travel on limited fixed routes.

Whilst buses on busways – bus rapid transit - are not as "good" as trams, or light railways, they are better than buses stuck in traffic, and long bus lanes that allow buses to go more quickly than cars, even allowing

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for stops are better than "just a bus". Even better, at least in image terms, is bus rapid transit, cheaper and more flexible than light rail, but with some of its advantages.

Public Transport Integration

Integration is a key word, relating to networks, services and ticketing. Public transport in many cities is a seamless system, providing the user with easy and quick interchange between services, regardless of operator and a single farecard covering all services. But not all systems are integrated, in respect of either services or ticketing, making them more difficult to use, and in some cities there is still much to be done.

So, if car users are to forsake their car for public transport, it must be seen to be good, readily accessed at both ends of the trip, reasonably fast, efficient, reliable, clean, and comfortable. But we need to recognise that in many, if not all, city regions increasing the use of public transport could well have a substantial cost, since most systems operate at a net financial cost to the community, or government. Although increased use without increased supply would reduce the deficit, if use is t be encouraged then supply must also be increased.

Walking and Cycling

For shorter trips, in many countries, much can be done to make walking and cycling more attractive, through the provision of safe and secure routes, well lit and paved and well maintained, and direct. These routes should form networks running across the whole city region, enabling those who use them to get from anywhere to anywhere, safely and easily, ideally away from the side of heavily trafficked roads. Where pedestrian and cycle routes cross roads, they should not be made to go down and up through tunnels or up and down over bridges, imposing a real effort on the users as well as security concerns. They should be given adequate time to cross the road, at grade, safely. Walkers and cyclists should never feel at danger from motor traffic, nor should they need to feel subservient.

5.4 The Car Club – Do We Have to Own a Car to be Able to Use One?

First, there is a crucial difference in terminology. In some countries the term "car sharing" is used in the same context as "car club " in others "car sharing" has very different meaning. Here, we use the term "car sharing" to mean a matching arrangement under which two or more independent individuals with similar trip origins, destinations and timing agree to travel together in one car – also known as car-pooling. This we discuss further in the next Section.

Car clubs, in the context we use here, enable people to have most of the benefits of car ownership without the need own one. They are car owning organisations that rent cars to club members whenever they need

one, whether for an hour, a day or a few days. Car clubs differ from conventional car rental companies in that the cars are only available to members, can be picked up and returned at any time of day, or night, on the principle of self-service, with insurance and fuel included in the hire charges. The cars are held at specific locations throughout the area a car club serves. Reservations are made by phone, over the internet and, increasingly, by SMS text messaging, and clubs provide their members with smartcards to access and return the car.

Most were started by social entrepreneurs, with early examples in Switzerland and Germany. Today, car clubs exist in cities throughout Europe, as well as in Australia. Japan, Singapore and the USA, and many are well financed operations, with both not for profit and for profit based organisations competing in the larger cities.

Charges are relatively modest. In London, for example members pay an annual fee of between 125 and 250, with charges of about 6 for the first one or two hours and 3.50 an hour thereafter and 0.15 per km.

Whilst members have access to a car when they need one, they do not incur the costs and concerns of owning, maintaining and parking their own car. But, because of the need to book, they are less likely to use a car than someone with one sitting outside their home ready to go. Thus car clubs can contribute to reducing car dependency, although the scale of their operations, at present, is quite limited.

Although members of car clubs account for only a very small proportion of city residents, even in the cities were they are most successful, the evidence suggests that those who join them and give up their car, drive fewer km than they used to. However, as with some other policies, encouraging the use of car clubs can have a perverse effect. People who joined a car club not having previously owned a car can see benefits in owning their own, and purchase one, which they are then likely to use more extensively than had they stayed within the club.

5.5. Providing and Using Information: Persuading and Con-vincing

Social Marketing and Con-vincing

The principles of "social marketing", of using marketing and other techniques to achieve behavioural change for the benefit of society, for "social good", are well established. They have been used with mixed success across a wide range of fronts, in order to achieve change, often from firmly established habits. Among the good practices are smoking, in the health sector, and road safety in general and drinking and driving in particular in transport.

Notwithstanding these examples there is growing recognition of increasing differences between opinion and behaviour in society today. If we are to be really successful in the use of social marketing in changing individual behaviour, we need to rethink traditional theories about how we use communications and marketing to achieve social objectives. We need to refocus on society.

This need is emphasised by an increasingly fluid, mobile, society, an increasingly divergent set of pubic opinions on many matters and an increasing lack of trust in government, other institutions and the media. This implies a thorough review of traditional and mainstream integrated marketing communications, in which public relations becomes stakeholder relations and takes the lead from other disciplines, such as advertising, direct response and promotions, taking full account of the great changes brought about by the internet and social media.

Those seeking to achieve sustainable mobility through behavioural change are among those who must take heed of the new paradigm. They must be aware that the objective should no longer be to change or influence or persuade, but to *con*-vince (in the Latin sense) people to change their behaviour regardless of their opinion at that particular point in time. Engaging in direct conversation with the relevant people is a priority no organisation, public or private, should ignore.

If we are to establish a balance between reason and emotion, implying more psychology and less sociology, then policies, products, services, ideas, arguments all need to change, and become an inclusive co-production, stimulated by strong incentives. In doing this, we need to recognise developments in both neuro-sciences and cultural biology.

We do not always need to use our car

It is evident that much of our use of cars is not because there is no alternative, but because we don't think about the alternatives. Often we are not even aware of the alternative, because we have got into a routine, a set of habits, and have no strong motive for change. But when we are made aware of them and understand the options open to us, many of us realise we can use our cars less, and are willing to do so. Sometimes we will walk, cycle or go by public transport instead, possibly to different shops or leisure facilities because we can get to them without using our car. Sometimes, we will combine trips, so reducing the total distance we travel by car.

Travel Information and Smarter Choices

Sophisticated on-line travel information systems and mobility centres provide accurate information on travel options across and involving all modes serving a city. But they only respond to requests for information, by those already seeking information. Travel planning schemes, in all their various forms, seek to first create the need for knowledge, to be informed. Some are designed around the home and the family; others focus on the workplace, school or other major destinations. Travel planning programmes can lead to a reduction in the use of cars by between 10 and 15%, but going as high as 25% with some programmes, for the group of individuals appropriately selected. But there is also evidence that simply presenting information to people and also changing their opinions does not necessarily lead to behavioural change; information is only one element in the complex process of achieving that change.

As we explained in our 2007 Venice Report, the first step is to create an awareness that there is need and possibility for change, and that must be followed by individual acceptance of a personal responsibility to change. Having cleared these key barriers, people need to understand the alternatives available, assess them and then try one, or more. Hopefully, at least one of those tried proves acceptable, and use of it becomes a new habit.

Travel awareness, personalised travel planning and "Smarter Choices" all embrace the principle of encouraging households to use their cars less, with varying degrees of targeting. At their most simple, they are little more than advertising, or traditional marketing campaigns, seeking to raise awareness and also provide information. But they can be very detailed, starting by taking a close look at where, when and how each member of the household travels and than looking at how they might change their habits – or existing patterns – and reduce their car use, tailoring information on opportunities for reduced car use to meet the particular needs of each individual member of the household. Whilst that information is likely to include walk, cycle and public transport possibilities, it will also consider alternative destinations, which either can be reached without using a car, or which involve less driving. Inevitably, they are labour intensive, and relatively expensive, but because they customise the information to the needs of each household, they can be effective and the evidence suggests that they can reduce car use by between 10 and 15%.

Work based travel plans, often required when new sites are developed or redeveloped, focus on the journey to work, encouraging employees to reduce their use of the "drive alone" car and encouraging employers to accommodate cyclists. The evidence suggests that well designed work place travel planning programmes can reduce car use by 10-20%, but where there is reasonably good pubic transport and staff live within walking or cycling distance reductions as high as 30% can be achieved.

In those countries where many parents take their children to school by car, the school run can account for a significant part of the morning peak and afternoon traffic. They do it for a variety of reasons, including

convenience and perceptions of child safety and security. However, not only does the school run add to congestion and harmful emissions, it denies the children within reasonable waking or cycling distance an opportunity for exercise, contributing to obesity and other health concerns. There is ample evidence that when schools work closely with parents they can have a major impact on car use, to everyone's benefit. But, as with so much other travel planning and travel awareness work, the evidence suggests that there is no single approach that is effective in all circumstances, there are no universal formulae. Individual plans have to be developed for each school, matching their particular situation and needs. Typically, school travel plans can give rise to a reduction of in school run traffic of between 8 and 15%, with some schemes achieving as much as a 30% reduction.

Working with schools can have other benefits, by helping to make children aware of the wider challenges of car dependency, using them to help change their families' values, as has been achieved with environmental issues.

Car Sharing and Pooling

Car sharing, car pooling and ride-sharing are all different terms for the same practice, some formalised arrangement under which two or more people from different households, each of which often have their own car, ride together in one car for a specific trip. Van-pooling is the same principle, except that a van (in US) or minibus or people carrier is used, usually provided by the employer, to enable a group of employees to drive together to and from work.

Car sharing can be an informal arrangement between colleagues or neighbours. Aware of each other's needs and of opportunities to ride together rather than each use their own car, some people will just decide to share cars for their journey to work, or to go elsewhere, and people will offer to help those without a car when a need arises.

But there is also a formal sector, with its roots in the car and van pooling commutes of the USA, often encouraged by the existence of High Occupancy Vehicle (HOV) lanes, and more recently HOT[2] lanes, on freeways and preferential parking spaces at work. HOV lanes have also led to the creation of an informal sector, where people wait for a lift at parking lots enabling drive alone drivers to use the preferential lanes. The formal sector is predominantly managed by internet based organisations, many of which are not for profit, that match travellers, whether for regular journeys – to work or hospital, for example – or for one-off events.

2 HOT lanes are free for high occupancy vehicles - the definition of which varies between US schemes - and tolled for al others – High Occupancy/Toll.

There can be little doubt that car sharing, whether informal or formal, is most successful when there is an incentive, such as that provided by HOV lanes and preferential parking spaces, or in saving costs.

Getting the Message Across

Sharp focus, customising the message and information to directly meet the interests of those receiving it is key to the effective use of persuasion. The evidence suggests that using the general media to try to get a message about changing behaviour across has little if any effect. If we want to persuade people to change what they do, we need to be very targeted.

The personalised travel planning team member who sits down with the family is one way of achieving change. Another is peer pressure and social norms, reinforced by a sense of "doing better". Attitudes towards drink and driving demonstrate this well. What had been acceptable in many societies became unacceptable; those who broke the new moral code became pariahs. Leadership by a widely recognised and respected personality can also be influential.

Many of our travel decisions are based on habit, built up over many years, and habits are not always easily changed. One of the best opportunities to secure "change" in travel choices is when there is more fundamental change – when people move home or jobs, or have a child. Having an action team that identifies such changes and targets the family with a personalised travel plan at this key time in their life can be very effective.

Whilst it is hoped that changes brought about by travel planning - measures become habit, the evidence suggests that there is need for periodic refreshment. It is therefore a continuing exercise, progressively working through the city in waves, first creating the initiative and then following it up a few years later.

Incentives can also be offered to help encourage people to "try" – free public transport cards are one example. "Pay as you drive" insurance, relating costs directly to how much you drive, as well as where and when, could also be used to help change habits, as could direct road pricing, which we discuss in Section 5.7.

5.6 Using Technology – Reducing the Need for Travel

Some of the journeys we make can be avoided through the use of information and communications technology, ICT, in three key areas: teleworking, teleconferencing and buying on-line.

Teleworking

Teleworking has long been seen as having potential to substantially reduce the daily commute, and is growing rapidly, facilitated by portable computing power and the ubiquitous availability of high speed communications and encouraged by the frustrations of the journey to work at peak times. There is some evidence that suggests that teleworking does not have net benefits in terms of traffic reductions, because the car used for the commute becomes available for use by other household members, the telecommuter takes a break from work by driving somewhere during the day, or the possibility of teleworking enables the telecommuter to live further from their place of work, incurring extra km when they do go to it.. However, on balance the evidence suggests that teleworking does result in a net reduction in car km travelled.

Tele-Conferencing

Technology for teleconferencing is becoming increasingly sophisticated and costs are now within the reach of medium sized businesses, who are adopting it to save the time and costs involved in travelling to face-to-face meetings. The main travel benefits are in reducing inter-city travel, rather than that within cities, where the benefits of face-to-face meetings are seen to be important, reinforcing the "agglomeration" effects of mutually supporting businesses that are close together; bankers, lawyers, high security delivery services and the like, for example.

Home Shopping

Although home shopping over the internet is becoming increasingly common, there is some uncertainty about its net impact on traffic. There is some evidence that people still go to shops, but to window shop before buying over the internet, and the delivery of the goods purchased has led to an increase in van traffic. However, it is argued that the one van delivering groceries bought on line by the many households who no longer drive to the supermarket represents a useful reduction in traffic, and that buying groceries on line has the potential to cut grocery shopping trip vehicle km by about 10%.

5.7 Using Price

There is a widely held view among transport economists as well as environmentalists that the costs of car use in most Western countries are too low, particularly when roads are congested and n those countries were fuel taxes and other use based levies are low, such as the USA. These low costs have fostered today's car

dependency, by enabling people to use their cars more extensively than they would if they had to pay the full socio-economic costs of each individual trip, reflecting where and when they are travelling.

However, with the notable exception of Singapore[3] and the plans for the Netherlands[4], suggestions that some form of road user pricing should be introduced to provide a more rational cost structure, and hence travel decision making. have proved very unpopular.
We also need to be wary of possible adverse effects. Since the most congested roads tend to be in and around our cities, if we charge on the basis of socio-economic costs, charging more to use congested roads and less to use those without congestion, we will encourage people and business to move away from our cities to the countryside and smaller cities and towns, where road use is cheaper. A move that is likely to exacerbate car dependence, not reduce it.

Parking is another element of the journey by car that can be, and often is, controlled by price. Yet, in many cities, the cost and availability of parking in their central areas has encouraged the flight of jobs and shops to the suburbs and the exurbs, around and beyond the city fringes, where parking is usually both free and in ample supply. The argument of the property developers is that it is not free, its costs are included in the property costs but, crucially, it is free to the users. One of the biggest challenges we face in addressing car use is whether it should remain free, or whether some direct form of user charge is required, and even if it is, whether it is a truly feasible policy option. Rather than a direct user charge, the city authorities in Nottingham are about to introduce a levy on parking spaces at work places, collected from the employers, who might decide to pass them on to their staff.

In parts of the USA, employees provided with a parking space at work can be given a cash lump sum if they give that parking space up. The intention of such "cash-out" schemes is to encourage staff to carpool, walk, cycle or travel by public transport instead of driving alone.

Price can also be used to affect car ownership, through taxes on purchase and ownership. Singapore and Hong Kong are two examples of where taxes have been used to great effect in managing increasing car ownership. Whilst the current policy trend is away from ownership taxes towards user taxes, there is also a trend to increasing ownership taxes on those vehicles with the highest damaging emissions. Whilst switching from ownership to use taxation might discourage some travel, particularly if the charges are related to congestion, emissions based taxes are intended to affect the type of car owned, rather than the number owned, or their use.

3 Although congestion charging has proved acceptable for both central London and central Stockholm, these schemes are different in concept to the principle of a full socio-economic road user charge over a city wide road network as would be necessary to reduce car use in the suburbs and exurbs.
4 The Dutch Government is planning to introduce a nationwide road pricing scheme, starting with trucks in 2012.

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However, there is evidence that suggests that car dependency is closely related to car ownership, in that the more cars there are per car driver within a household, the less the members of that household are likely to consider, or even know about, alternatives. Thus, increasing the costs of ownership to the extent sufficient to affect car ownership levels in multi-car owning households could reduce car dependency. However, such a measure would also impact on all other households, including, and most seriously, those with lower incomes for whom a car is essential for employment or other key purposes.

One potential advantage of using price measures is that they can generate revenues for investment in improved facilities and services that provide alternatives to the car. However, pricing is not necessarily a funding panacea. Not all pricing measures are efficient, the costs of collection and enforcement can be high relative to the revenues leaving little, if any, surplus.

5.8 Using Edict

Edict, "you will not ..", is always possible, and indeed is often used for traffic and transport. Parking controls, speed controls, bus lanes, pedestrianisation are all typical of the variety of regulatory measures to control traffic that are in general use. In addition, there are physical measures such as speed humps and other traffic calming measures, with the "woonerf" as the ultimate. Here the car, cyclist, pedestrian and child at play all occupy the same shared space, and the car has to be driven at a pace compatible with that of other users.

People often object when confronted by the possibility of new restrictions on what they see as their right, or which they fear might impact on their business. Change is a risk, with potential downsides as well benefits. But many measures that have limited the use of cars – and vans and trucks – have proved successful. Residents in Dutch woonerfen, shoppers and businesses in pedestriansied city and local centres like them. The citizens of Zurich accept the use of traffic signals to control the flow of traffic towards the city centre. Most people agree that parking controls – properly enforced – are necessary even if they would like to be able to park wherever they want, for as long as they want, and Americans accept the idea of preferential treatment of car and van pools on both the highway – though HOV and HOT lanes – and in the allocation of parking spaces at their workplace.

So, the principle of controlling the use of cars is accepted. Could we use regulations more extensively to make the car less attractive relative to some of the alternatives? The answer must, most surely, be "yes".

However, although there is a very wide range of regulatory measures in use in different cities around the world, we need to understand which reduce car use and which simply change where or when we use our cars, only using the latter when there are other good reasons. That said, there can be little doubt that

controlling the speed of cars within residential areas, around schools and other places where children should be able to walk, cycle and play safely must be beneficial, as are measures which limit the availability of direct routes for cars within residential areas. Not only do such schemes give a better balance to such areas, but they also make the car less attractive for short journeys, and walking more appealing. They keep traffic that has no need to be there away.

5.9 Moving Forwards

If our city regions are to become less dependent on the car – and van and truck - politicians, city authorities, transport providers, businesses, the media and, crucially, the people will have to be persuaded that change is necessary and that change is good. That persuasion must start by factual information, and a clear description of alterative futures, and it must recognise that many actors and stakeholders have quite short term perspectives, and little concern for what might happen later.

We are going to have to change our institutions so they are empowered and willing to take a holistic approach, bringing together all the different elements of city governance and management that impact on the need to move around, people, goods and services. We may well need to change the criteria against which policies, programmes and projects are evaluated, particularly when established processes, including – some might say particularly - economic appraisal, would inhibit the introduction of those essential to achieving the necessary changes.

And we need success in promoting the message that change is necessary and that change is good. Good for the individual, good for the community, good for the planet.

Achieving change requires leadership. In our 2008 Venice paper we identified a number of key characteristics for change leadership. These included:

- commitment to delivery
- a willingness to take political risks to achieve what is believed to be necessary
- a determination to take decisive and timely action
- policy vision based on sound research, planning and design, with clearly defined objectives
- the legal and regulatory powers necessary for efficient and effective implementation and operation
- committed and adequate funding, available when required
- open public engagement
- informative public and stakeholder communications, based on simple, clear messages
- first rate project management,

supported by a political commitment to change in the context of either a stable political consensus or political stability into the medium term.

5.10 In Conclusion

There can be no doubt that there is very much that can be done to reduce the current levels of car dependence found in cities around the world. We really can make both cities and their citizens less dependent on the car in their economic well being and in their daily lives.

A key challenge for those responsible for governing our cities is balance policies that address the multiple degrees of car dependence across the whole of the city region

There is little need for invention, as there is a wide range of measures that have been tried and tested somewhere around the world – and proved both effective and acceptable to the different stakeholders. What is needed is a willingness to take and accept action across a broad range of fronts. We need to develop and implement a package of measures that will provide the step change needed for our cities to become better places, with much lower carbon footprints.

Action needs to be taken by regional and city authorities, supported by national governments to strengthen existing measures and to introduce measures that are new to their city.

The media must appreciate the damaging effects of uncontrolled car dependence, and be persuaded that it is responsible to support change.

Residents and businesses alike must also appreciate those effects, and that they have a responsibility in making their city region a better place.

Change is rarely easy, but if we do not start now it will become even more daunting in the future if current trends in car dependency continue

The Mo.Ve Forum is convinced that only if national, regional and local political leaders, the media, transport providers, business and residents all work together in developing, implementing and successfully managing a wide ranging package of measures can our dependence on cars in city regions be successfully managed, greenhouse gas emissions reduced and health improved, whilst also maintaining the economic dynamism on which thriving cities rely.

Freiburg im Breisgau – A Case Study

Germany's Black Forest city of Freiburg has a long established history of successfully managing car use.

An old university city of nearly a quarter of a million people, it has embraced the principles of sustainability, and has a reputation as the ecological capital of Germany. It seeks to achieve its objectives through a balanced mix of policy reform, regulation, incentives and design, based on a long-term commitment. Central to its policies is a determination to reduce CO2 emissions, across the city, with a formal target, the 1996 Climate Protection Concept, to reduce them by 2010 to 25% below the 1992 level.

It is seeking to achieve this through a comprehensive action programme covering all sectors, including building design, community heating and power generation as well as transport, and it is well on its way. In 1997, the average Freiburg citizen produced 10.6 tons of CO2 a year, and by 2003 this had been cut to 9.6 tons.

Although most of this reduction came from the energy sector, much has been achieved in transport, with a city history of seeking to reduce car use going back to the 1970s, with the first major step, creating a car free city centre, penetrated only by the city's tram lines and with restricted car access around its outer fringes. Another key step was the introduction of 30 kph zones in almost all residential streets in 1990, and residents of Vauban, a new suburb for 5,000 people and with 600 jobs connected to the city by a new tram line designed to be a "sustainable model district", are required to commit to living without a car. As with the rest of the city, it is a fairly dense, highly walkable, development.

A part of the 1970s initiatives was the preparation of a city cycling plan, and one third of all journeys within the city are now made by cycle, many of them using a 500 km network of cycle routes. Cycling is also made easier by the very extensive provision of cycle parking facilities, including at tram and bus stops and railway stations – the Central station has space for 1,000 – and they can also be taken on buses, which have special racks.

Public transport use is facilitated by the provision of a low cost, flat-rate, monthly pass covering all bus and tram services within the region; a doubling in use was recorded over the ten years from 1991.

Today, about one third of Freiburg's households do not own a car, and only one third of all trips within the city are made by car. CO2 emissions generated by transport have been reduced by 4.8%, from 413,000 tons in 1993 to 393,000 in 2003.

Zurich, Switzerland - A Case Study

Switzerland's financial centre, Zurich, is a city with 360,000 people, and 330,000 jobs, at the centre of a conurbation of 1 million, that is regularly at or near the top, of the list of the world's most livablee cities.

After its citizens rejected a planned metro system, the City adopted a strategy based on the use of S-Bahn, tram and bus, as well as cycling and walking, while controlling traffic and parking.

A 1977 referendum approved a SFr200 million for projects to speed up public transport, and in 1979 the City Council issued a directive that in any conflict involving the various modes, precedence had to be given to public transport.

A further key step was taken in 1987, when the City decided to strengthen its commitment to five key transport policy goals

- promote public transport
- reduce motor vehicle traffic
- channel motor vehicle traffic on to key routes, restraining it within residential areas
- reduce the number of parking places available for commuters
- guarantee mobility for those cycling and walking.

This was followed in 2001 by a new mobility policy, based on five guidelines:

- optimising and integrating the transport system to make the existing transport network more efficient, with close connections between the different modes, encouraging multi-modal use.
- developing and supporting new innovations, such as ITS, car sharing, city logistics, collect-call taxis
- restricting the provision of new infrastructure to that necessary to maintain the capacity of the transport network as a whole, or to reduce excessive impacts on citizens
- ensuring full transparency of transport costs, with users paying the real costs.

Within Zurich, trams have dedicated tracks and buses bus lanes, and on-street parking is prohibited along roads with trams and major bus services. The city has developed a traffic control signal control system that provides full priority to trams and buses, whilst also restricting the flow of traffic approaching the city to deter car use. It has controlled the provision of parking in the city centre, and has implemented 30 km/h speed limit zones within its residential areas.

Yet the car is still the dominant mode, accounting for neatly one half of all trips made within the city, with public transport accounting for about one quarter.

Perth, Western Australia – A Case Study

Perth, the state capital of Western Australia, was one of the core cities studied by Newman and Kenworthy in their work described in Chapter 3. Together with its neighbouring city, Peel, it has a population of 1.46 million and is expected to grow to 2.22 million by 2030. Newman and Kenworthy reported it as having the third highest km of highway per capita among all the cities around the world that they studied, and over 80% of all trips within the region are made by car.

Given that high level of car dependency, the state Government has made a commitment to limit urban sprawl by requiring 60 percent of new housing to be provided within the existing urban areas, and to encourage the use of public transport, walking and cycling. To help achieve this, the following planning principles have been developed:

- Accommodate urban growth primarily within a Network city pattern, incorporating communities:
  - create medium and high density urban villages to support viable public transport corridors.
- Align transport systems and land use to optimize accessibility and amenity:
  - build higher density town centres around public transport nodes (especially railway stations) and
  - protect freight routes and reserve land for future freight routes.
- Deliver a safe, reliable and energy-efficient transport system that provides travel choice by:
  - improving the efficiency and management of the existing transport network rather than building more roads
  - providing a wide range of high quality transport options including rail, bus, ferries, pedestrian, cycle and other options; and
  - reducing car dependence through improving, promoting, informing and providing inducement to use travel alternatives, and enhancing proximity to employment and services ensuring a resilience in the face of uncertain future energy challenges

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Key Actions Required to Reduce Car Dependence within City Regions

A central objective for city governments should be that they seek to ensure that citizens can live just as easily without a car as with one"

The actions that need to be taken to reduce car dependence within city regions include:

- Reform local government to provide one authority for a complete city region, or at least a single authority responsible for transport and land-use
- Restructure local government to ensure that transport, land use and economic development, at least, are managed holistically
- Ensure that all necessary legislation and regulations are in place
- Set out a clear vision for change and a viable programme for achieving it
- Work with all sectors of the community to achieve buy-in to the need for change, the vision and the ways of achieving it
- Good, appropriate data, collected regularly over the whole city region
- Monitor and regularly report on progress
- Ensure all new development provides locally balanced communities with jobs and key facilities readily accessed by foot, cycle and public transport
- Encourage the use of information and communications technology to reduce the need to travel, whether to work or on work, or to shop
- Encourage the formation and use of Car Clubs, including the provision of appropriate legislative and taxation structure and incentives
- Ensure public transport services are regular, reliable, secure, clean, comfortable
- Ensure information on public transport services is easy to understand and easily found
- Increase the intensity of public transport services
- Give priority to buses over other vehicles, through bus lanes and signal pre-emption
- Provide safe, secure, pleasant and interconnected pedestrian and cycle networks
- Ensure employers provide facilities at work for cyclists – including safe and secure storage, and shower and changing facilities
- Ensure that safe, secure and accessible cycle parking facilities are available at all other destinations
- Reconfigure roads in residential areas to create spaces shared between pedestrians, cyclists and moor vehicles, with motor vehicles travelling at speeds compatible with that of the other users
- Use the full range of travel planning techniques to change car use habits
- Use pricing - parking and/or road pricing - to encourage reduced car use

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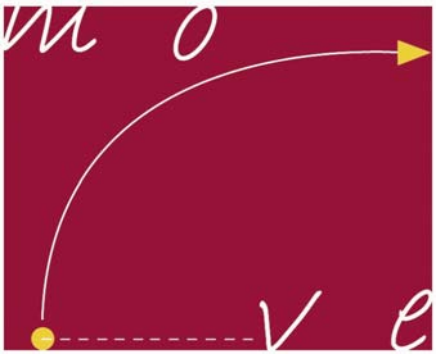

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