Department of Sociology

LANCASTER UNIVERSITY

Cars, Cities, Futures

KINGSLEY DENNIS[1]

Let your community be small, with only a few people;
Keep tools in abundance, but do not depend upon them;
Appreciate your life and be content with your home;
Sail boats and ride horses, but don't go too far;
Keep weapons and armour, but do not employ them;
Let everyone read and write,
Eat well and make beautiful things.

Live peacefully and delight in your own society;

[1] Centre for Mobilities Research (CeMoRe), Lancaster University, Lancaster, LA1 4YL, UK - k.dennis1@lancaster.ac.uk

Dwell within cock-crow of your neighbours,
But maintain your independence from them.

Tao Te Ching (No 80)

'One thing is sure. The earth is now more cultivated and developed than ever before. There is more farming with pure force, swamps are drying up, and cities are springing up on unprecedented scale. We've become a burden to our planet. Resources are becoming scarce, and soon nature will no longer be able to satisfy our needs'

Quintus Septimus Florens Tertullianus, Roman theologian, 200 B.C.

'The new mobility culture considers not only transit but also health, education, housing, waste, and social needs. No transportation system is an island; it must coordinate all shared systems for maximum effect'

Bruce Mau, Designer

'Cars are our mechanical mothers-in-law. You have to have a good relationship with your mother-in-law, but you cannot allow her to conduct your life'

Jaime Lerner - ex-mayor of Curitiba, Brazil

Introduction

The relationship between cars and car ownership has long been an ambiguous one. As Jaime Lerner expressed in the opening quote, they are like our 'mechanical mothers-in-law', a relationship in which the car should not control us. Similarly, Austrian transport planner Hermann Knoflacher notes that 'because humans plan, build and operate transport systems it is assumed that they are also in control of them, but unfortunately this has proved to be a fundamental misjudgement' (cited in Girardet, 2004: 133). Cars are objects of obsession, possession, and are simultaneously the modern world's saviours of individuality and carriages of *car-nage*.

Some figures estimate that 1.2 million people die each year from traffic accidents, and many more are seriously injured; so far 'more than a million people have died from traffic accidents within the European Union over the last 20 years and more than 30 million have been injured and/or permanently handicapped' (Newman, 1999: 177). Figures also show that by the end of the twentieth century in the US alone more than 40,000 people were being killed each year in road accidents. It is estimated that every year road traffic accidents cost US$518 billion globally with traffic injuries predicted to become the third-largest contributor to the global burden of ill-health and physical impairment by 2020 (Mau, 2004: 48). Further, studies predict that road traffic deaths are set to increase by 83% in low-income and middle-income countries, and to decrease by 27% in high-income countries: an overall predicted global increase of 67% by 2020 (Mau, 2004: 48).

Various countries outside of Europe and the US, such as Thailand, Kuwait and Venezuela, have a higher fatality rate per person than most European countries. And car ownership, along with the desire for car ownership, is increasing in African and Asian regions that are simultaneously experiencing population increase and industrial growth. As Newman points out, in most cities in Africa, Asia and Latin America, the growth in the supply of public transport is slower than their population growth (1999). If individuals in these countries, especially on the back of rising economies, desire for western levels of private car ownership, then this would place enormous strain not only upon domestic transport infrastructures and road safety, but also upon global world fuel resources and environmental degradation.

For example, if China reached the USA's per capital level of car ownership 'it would have some 970 million cars, 50 per cent more than the entire worldwide car fleet in 2003' and 'by 2010 it is expected to import half its oil' (Girardet, 2004: 136). The figures for car growth are high given the rapid urbanisation and industrialisation in the emerging markets of Asia and Africa, and in China and India especially.

Another point to mention is that increases in private car ownership are not always linked to personal income or national prosperity as 'cities like Bangkok have lower levels of wealth than their neighbours in Singapore, Tokyo, and Hong Kong, yet have higher levels of car use' (Pinderhughes, 2004: 130). Often this is explained by state policy initiatives that advantage and support private car ownership over public transport. An example here is China where the use of bicycles is rapidly in decline and being replaced by private car ownership, encouraged by the state authorities who have a vested interest in the automobile industry. Chinese officials are banning bicycles from some of the busiest urban roads – eg. In Shanghai, 'the city has banned bicycles on more than fifty major roads and made no provisions for workers to ride or carry their bikes over the Huangpu River to Pudong, where the city's new financial and industrial centre is located' (Pinderhughes, 2004: 131).

Worldwide, car possession is catering for both convenience and obsession. As Pinderhughes notes:

> People increasingly desire automobiles…based on the perception that they provide riders with efficiency, speed, unprecedented freedom, privacy, convenience, location control, security, and status… individual users are attracted to the door-to-door flexibility, twenty-four-hour availability, and passenger and goods transport capacity that the automobile provides. (2004: 133)

In 2000 there were more car owners in the US than registered voters; and in 2002 the average adult in the US made 86% of their travel trips by car, and travelled 13, 500 miles per person/per year (Pinderhughes, 2004: 132). Between 1971 and 1992 the number of private cars in the UK alone increased by 93%, with Denmark being the only industrial country in Europe that is shifting away from automobile use (Pinderhughes, 2004: 132). Even in ex-communist states such as Poland there are dramatic increases in car ownership where between 1995 and 1996 new car sales in Poland rose by 40%' (Pinderhughes, 2004: 132). In many cases it seems that the more market orientated a country's economy is, and especially with a rapidly expanding EU and related subsidies, the more likely it is to engage in highway construction projects that favour increased car use.

However, people's relationships with their cars is still ambiguous, and this fragile truce with the 'mechanical mother-in-law' is set to be further flamed or appeased according to how the car becomes situated within the city urbanscape. Because of several significant factors such as foreign oil dependence and resource insecurities, environmental and climatic concerns, and urban growth, car dependence is not a sustainable option. As such, certain alternatives 'beyond the car' are emerging in relation to urban-mobilities.

In this paper I examine some of these mobility projects, focusing on the car and the city, with reference to 'new urbanism' - urban density, sprawl, and smart growth – and also transit orientated development. I then focus on some examples where these new mobility systems have been established, with reference to sustainable practices. I conclude by theorising what these developments imply for the 'future of the car'.

The City & The Car

In the early part of the twentieth century urban historian Lewis Mumford wrote that most western 'metropolis' had encouraged the 'wholesale invasion of the automobile' and had thus suffered from the degenerative effects of traffic queues, personal frustrations, excessive noise, and polluted air (Mumford, 1964/1953). Mumford went on to say that 'human purpose should govern the choice of the means of transportation'; and that what was needed was better transportation *systems*, not just more roads being built (Mumford, 1964/1953: 180). It seems, however, that Mumford's call has not been heeded for in July 2007 it was confirmed by the UK's Highways Agency that the go-ahead had been given for the widening of the M6 motorway along a 51-mile stretch between Birmingham and Manchester which, according to the Highways Agency's own figures, expected to cost £2.9bn: a cost of £1000 per inch of road (Vidal and Milmo, 2007). Widening a 51-mile stretch of road by just one lane will cost twice as much money as Britain gives to Africa in a year. Rebecca Lush, a campaigner with Transport 2000, argues that

> This must be the most expensive roadworks in history. Britain is spending £13bn on new roads and next to nothing on reducing road traffic or railways. This is a complete waste of resources which will only increase the numbers of cars on the road and make climate change worse. £1,000 an inch is a scandal. The money should be put towards rail schemes or projects which would reduce climate change emissions rather than increase them. (Vidal and Milmo, 2007)

In Germany researchers have established that each car, taking up an average surface area of six square metres, is 'responsible for 200 square metres of tarmac and concrete and produces some 44.3 tonnes of carbon dioxide throughout its life' (Girardet, 2004: 136). It has been estimated that the typical car requires 680kg of steel, 230 kg of iron, 90kg of plastics, 45 kg of rubber, and 45kg of aluminium; also, that between 8000 –

28000 kilowatt hours of energy are needed to produce a single motor vehicle (Pinderhughes, 2004: 137). Each car then is not a separate entity – or 'iron cage' – but is instead a node within a much larger system of production and consumption. As such, the environmental impacts of the car stem from 'the *entire* life cycle of the vehicle and all related infrastructure support systems, including extraction of raw materials, construction and maintenance related to road infrastructure, vehicle production, operation, maintenance, and disposal' (Pinderhughes, 2004: 137). In this regard, the car user does not pay the full cost for their road travel as environmental and public health costs are not embedded into car use.

Increasingly urbanised areas not only too easily accommodate the 'tarmac and concrete' required for road users but also contribute to their own carbon emissions through industrial and domestic waste, coupled with 'city heating' through lack of greenery. The city, like transport, is its own homeostatic yet dynamic 'system', just as it is a node within a global network of cities.

Castells' work on the 'network society' (Castells, 1996;1997;1998) has done much to theorise global networks of transportation and communications, and to conceptualise the 'global city' as being within a developing system and architecture of nodes and networks. Castells frames the 'global city' as a process, a network, of which major urban centres play a part as they are integrated within 'actual' local space, and also are linked through transnational networks of communication and transportation. Castells has recently framed some of the issues involved in the metropolitan 'city' as high density; public space; planning of mobility and connectivity through what he terms 'inter modality' (integrative systems); environmental planning as a systemic

process towards increasing quality of life; and an urban design that creates meaning through its use of space, creating a new 'social identity'.[2]

Castells's call for urban 'livable high density' finds sympathy with an increasing number of urban architects, designers and planners. As I will describe in this paper, the density model is influencing the trend towards a new urbanism that favours 'smart growth' and transit-oriented development. Peter Newman and Jeff Kenworthy, both from the University of Perth, Australia, have shown in their research that there is a direct correlation between low urban density and high use of motor cars: 'in low-density cities "designed by the car", personal transport is clearly favoured over public transport. Automobile dependence and convenience go hand in hand. But the huge cost of providing the road infrastructure can generate substantial public debts' (cited in Girardet, 2004: 138). In terms of low urban density the main culprits have been North America and Australia due to their available land mass. In comparison, European cities have remained more compact in their planning and urban density. As Girardet explains, the main reasons for this are:

- Many cities date back to before the era of the motor car
- Urban growth was closely linked to the development of public transport
- The price of fuel and the cost of car use are much higher
- Planning restrictions have limited urban growth (Girardet, 2004: 145)

Girardet maintains that a good public transport system, especially within urban areas, is important in contributing towards a cohesive society, especially in terms of providing all people fair access to services, jobs, education and social connections

[2] Taken from a 2004 lecture on the 'City' – lecture notes available at: http://www.peterme.com/archives/000413.html

(Girardet, 2004). However, throughout the growth of the automobile industry during the twentieth century, the ideological 'luxury' of personal freedom has come to epitomise western capitalistic thinking, which even now is spreading to emerging non-western markets. Yet architect and designer Bruce Mau considers there to be contestation in the 'personal freedom' paradigm inherent within mobility discourse.

Mau argues that the world 'hasn't embraced secular democracy, but it has embraced traffic. The radical success of the car has brought about its failure' (Mau, 2004: 49). In part, this failure has been the inability to successfully integrate the 'car system' into a city/urban 'mobility system' that promotes, maintains, and coordinates a network of mobility alternatives that can deliver freedom of movement without forcing the individual into an 'iron cage' of unsustainable anti-social individualism. As was expressed by Mau in one of the opening quotes of the paper, the new mobility culture must considers not only 'transit mobility' but also other supporting vectors within the system such as housing, environmental, and social needs. As Mau rightly points out, 'no transportation system is an island; it must coordinate all shared systems for maximum effect' (Mau, 2004: 57). I argue that for the car to be a legitimate, sustainable, and productive mobility vehicle of the future, it needs to be re-configured within an 'organic' mobility system that integrates multiple transit means.

Jaime Lerner, the ex-mayor of Curitiba, Brazil, noted this when he said that 'the most important thing to work on right now is the mobility system, which is not only a system of transport; it's the whole understanding of a city. The more we create an integration of functions, the better a city will become' (cited in Mau, 2004: 59). Already various personal mobility projects are underway worldwide that seek not

only to integrate with various urbanscapes and transit modes but also to deliver maximum freedom with minimal environmental impact. I turn now to examine some of these mobility projects within the discourse of a 'new urbanism'.

New Urbanism: From Sprawl to Small

The sense of hypermobility that the car provides for many users can also create a false perception that the car is 'convenient, safe, comfortable, fast, dependable, affordable, obtainable, and, finally, essential to a high quality of life' (Pinderhughes, 2004: 133). However, these ideals are increasingly becoming eroded by urban lifestyles that are no longer able to offer such conveniences and qualities. Much of the car use in built-up urban areas in northern territories, especially in North America, is a result of a necessary dependence stemming from a lack of adequate urban mass transit. One of the contributing factors is an urban form frequently described as 'sprawl'. Sprawl is characterized by 'low density, large scale single function districts such as office parks, retails malls, and single family housing tracts' (Siembab, 2005). This type of urban form is based on dispersed suburban areas which can be difficult to serve with public transport. As such, the urban architecture creates the demand for personalised and individual car use. Several urban architects (Mau, 2004;Rogers, 1997;Siembab, 2005) are attempting to re-invent urban metropolitan mobility systems through notions of density and the 'compact city'. One of the key ideas behind this architectural urban vision is that of smart growth, or smart sprawl, which sees the reconstruction of urban centres into more dense mixed-use areas that encourage a combination of walking within the center and public transport to and between the centers. Siembab defines *smart sprawl* as

> a suburb of any density that has been retrofit so that residents can shop, obtain services and work (at least a day or two a week) all within a mile or two of their home, and where those relatively short trips are completed using transit or vehicles that do not consume gasoline or other carbon-based fuels. (2005)

Siembab views smart sprawl as a way of reducing car dependence and shifting onto supporting local suburban economies and neighborhoods. Similarly, Girardet notes how in the USA the remedy for sprawl is called 'smart growth' which refers to housing development that is dense enough to reduce the need for private car use (Girardet, 2004). According to Girardet, researchers 'found that 17 dwellings per hectare support a fairly frequent bus service, 22 support a light railway network and 37 support an express bus service that people can reach from their homes on foot' (2004: 141). A dense urban environment then may be advantageous to city mobility rather than mobility being seen as a means to escape from the urbanscape into *distances* and *farscapes*. Architect Bruce Mau views density as offering hope: 'with nearly half of the world's population living in cities, density is increasingly becoming the global condition. The denser we make our cities, the more we can sustain ecosystems' (2004: 37).

In a similar call for more dense, compact urban centres the UK Foresight 'Urban Colonies' scenario outlines a potential future where

> Changes in infrastructure have had a significant part to play as cities have invested in public transport and cycle paths, and more people are getting out of their cars as the overall image of public transport improves. Transport innovation came at the local level rather than the national: as with the alternative food movement, and indeed with energy in the early part of the 21st century, local agencies were simply more responsive to innovation. (Foresight, 2006: 31)

In order to better highlight the comparisons between an 'urban sprawl' and the 'compact city' vision, I reproduce below some of the differences as outlined in the UK Foresight report:

SPRAWL	**vs.**	**COMPACT CITY**
Low density		High density
Zoned development		Mixed-use development
Segregation of functions for living, working, recreation		Integration of functions for living, working, recreation
Segregation of demographic and economic groups		Mixed-income communities
Car dependence		Predominance of pedestrians and cyclists
Disconnected public spaces		Interconnected walkable network of large and small-scale public spaces
High-speed transport networks and increased road infrastructure		Minimised need for transport and planning for walking and cycling
Parking, buildings and freeways		Parks, landscaping and cycle paths
'Minimum parking spaces'		Parking space capping requirement
Sense of anonymity		Sense of community
US urban model		European/Asian model
Developed from about 100 yrs ago		Developed from about 9,000 yrs ago
Large Scale Developments		Neighbourhood/human scale developments
Superstores and big shopping areas, shopping complexes		Corner shops, local shopping farmer's markets
Mass housing and commercial/industrial districts. Unlimited retail space per occupier		Capping of allowable space for groceries and retailers to preserve neighbourhood scale
Driven by market forces		Driven by vision and masterplan
High energy		Low energy

High CO2 emissions Low CO2 emissions

(Foresight, 2006: 34)

However, the shift from 'sprawl to small' in terms of urban-auto-mobilities still contains inherent difficulties. As Newman notes:

> Much of the advice on solving the problem is still within the automobile-dependent model in the form of plans that spread cities outwards in reduced densities and in the building of freeways that usually bring an enormous displacement of people. These just create further automobile dependence. (1999: 195)

Automobilities are a significant aspect of city lives and sustainable ecosystems, and cannot, or should not, be configured as separate entities and concerns. Individualised and mass forms of mobility are not discrete objects, separated from their surroundings. In systemic parlance, they are open systems, concurrent and interactive with their environments, lacking firm boundaries or interiors.

Within these urban-mobility scapes, and assisting smart growth, are new technologies, specifically transport and network technologies. By overlaying digital networks over existing physical infrastructures no new major building is required and so can 'be deployed immediately to retrofit the urban form so that it can produce the conditions required by the new transportation technologies' (Siembab, 2005). The aim of smart growth is thus to establish an urban network of nodes that service a public transit infrastructure that connects various suburbs and neighbourhoods, such that residents will be able to walk, or take mass transit; there being, in theory, a couple of choices within a short distance from home. The advantage of smart sprawl

is that it is not a 'techno-fix' since it 'primarily involves soft changes to the way society is organized with few hard changes to how cities are built' (Siembab, 2005).

Alex Steffen views such 'forces of compactness and precision' as 'commingling and reinforcing each other'. Steffen states that

> where we used to search for things by going and looking for them, and we now often drive long distances to get what we want: very soon, we will know where things are because they know where they are, and where they are will usually be close at hand - the information equivalent of compact communities. (Steffen, 2005)

In this scenario, 'smart places' may begin to converge with 'smart growth' to treat goods as services, such as rental and car-sharing schemes. If a smart environment can emerge as a facet of smart growth then it could create urban-information-mobility scapes where 'objects know where they are, where you are, and when your schedules are likely to coincide' (Steffen, 2005) making it much easier to share hard goods and services with others. Steffen envisions this possible future scenario as improving forms of urban sociability:

> the physical, the neighborly, the visceral and urban and the virtual, the connected, the digital and networked - these are symbiants, not competitors. The public square and wifi compliment each other. Public transportation and high density go extremely well with the kind of highly networked, extremely social lives which digital people live today. (Steffen, 2005)

Several urban schemes have already implemented the 'smart places, smart growth' paradigm, as will be examined further in this paper. The signs of these occurring shifts can be seen in various European cities which have implemented a variety of different practices in order to better accommodate mobility within a dense urban environment, and to shift people away from car dependence. Examples of such cities

are highlighted on the UN 'Best Practices' Database.[3] In the case of Vienna the major urban-mobility changes that were implemented are:

- Provision of multistorey car parks to increase road space
- Reduction of parking space on the streets
- Regular monitoring of the public parking spaces
- Additional park and ride facilities on the periphery of the city (Girardet, 2004: 147)

Similarly, Zurich has implemented several measures within the city perimeters in order to encourage the use of fuel-efficient cars as well as to reduce daily car commuting. These measures include:

- Training in fuel-efficient driving
- Promotion of fuel-efficient cars
- Encouragement of fuel-efficient freight transport
- Private parking management to reduce daily car commuting
- Combined use of concessionary public transport tickets (Girardet, 2004: 149)

Zurich has recently expanded upon these measures and introduced new transport policies which seek to guarantee a transport access point within 300 metres of working and living places; a maximum waiting time of 30 minutes for any public transport; the introduction of extended routes so less changing for passengers; the use of a single ticket for designated journeys; better parking facilities for both off-street vehicles and bicycles; and preferential treatment for smaller cars (Pinderhughes, 2004: 149).

Cities such as Vienna and Zurich, as well as others on the UN 'Best Practices' Database, share similar urban-mobility concerns and have variously implemented measures that reduce individual car dependence and promote public transport; support traffic restrictions within built-up residential areas; reduce public on-street car parking

[3] See http://www.bestpractices.org/

spaces; and encourage the use of environmentally sustainable mobility practices. Similarly, policies proposed by Dutch planners include auto-free pedestrian zones; pedestrian and bicycle traffic lights; intersection modifications; one-way streets for cars, two-way for bicycles; reserved bus lanes for cyclists to use; short cuts in city centre for bikes; and priority for bikes at crossings and intersections (Pinderhughes, 2004: 159). And these 'post-car' transit policies are not limited to European cities either.

Singapore and Hong Kong, both which have high-density urban development, have closely integrated their cities around the transit system (Newman, 1999: 187). In North America too, in Toronto and Portland especially, transit-orientated development has been, it seems, successfully implemented (Dittmar and Ohland, 2004). However, in many larger cities in Africa, Asia and Latin America, there are still increasingly high levels of car ownership related to population (Newman, 1999: 187). Yet trends in new re-configurations in urban mobility are growing in influence, and recently prompted the creation, in 2001, of the *Charter of the New Urbanism.* The *Charter of the New Urbanism* states that:

> We advocate the restructuring of public policy and development practices to support the following principles: neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice.[4]

The movement *NewUrbanism.org*[5] was established online in 1998, and has grown to promote 'good urbanism, smart transportation, transit oriented development, and

[4] Available online at - http://cnu.org/sites/files/charter_english.pdf
[5] See http://www.newurbanism.org/newurbanism.html

sustainability'.[6] The organisation promotes, as a way of solving growing urban-mobility problems, policies for national and local governments to revitalise and 'densify' many existing cities and towns into 'walkable, mixed-use communities, with pedestrians and bicycles given top priority over automobiles, and a serious focus on bicycles and trains as the major forms of transportation.[7] Out of this 'new urbanism' movement has also emerged a trend in urban development called *Transit Oriented Developmen*t, or TOD.

Transit Oriented Development advocates the creation of 'compact, walkable communities' based around forms of mass public transit, in order for people 'to live a higher quality life without complete dependence on a car for mobility and survival'.[8] According to their website the TOD movement promotes itself as a 'major solution to the serious and growing problems of ***peak oil*** and ***global warming*** by creating dense, walkable communities connected to a train line that greatly reduce the need for driving and the burning of fossil fuels'.[9] In this can be seen a framework for conceptualising urban-mobilities *after the car*; that is, providing for mobility and movement within urbanscapes which does not rely upon pre-existing forms of unsustainable individualised and autonomous fossil fuel vehicles. Not only are the resources of travel under re-configuration (i.e. new fuel developments) but also the behaviours inherent in car dependence are under scrutiny, especially when more beneficial means of mass transit are available and workable.

Transit Oriented Development highlights the following components:

[6] See http://www.newurbanism.org/newurbanism.html
[7] See http://www.newurbanism.org/newurbanism.html
[8] See http://www.transitorienteddevelopment.org/
[9] See http://www.transitorienteddevelopment.org/

- Walkable design with pedestrian as the highest priority
- Train station as prominent feature of town center
- A regional node containing a mixture of uses in close proximity including office, residential, retail, and civic uses
- High density, high-quality development within 10-minute walk circle surrounding train station
- Support transit systems including trolleys, streetcars, light rail, and buses, etc
- Designed to include the easy use of bicycles, scooters, and rollerblades as daily support transportation systems
- Reduced and managed parking inside 10-minute walk circle around town center/train station

The TOD movement cites the following benefits to their design plans:

- Higher quality of life
- Better places to live, work, and play
- Greater mobility with ease of moving around
- Increased transit ridership
- Reduced traffic congestion and driving
- Reduced car accidents and injuries
- Reduced household spending on transportation
- Healthier lifestyle with more walking, and less stress
- Increased foot traffic and customers for area businesses
- Greatly reduced dependence on foreign oil
- Greatly reduced pollution and environmental destruction
- Reduced incentive to sprawl, increased incentive for compact development
- Less expensive than building roads and sprawl
- Enhanced ability to maintain economic competitiveness[10]

The need to greatly reduce dependence on foreign oil as well as reducing pollution and environmental damage are all significant concerns that are driving analysts, industry, policy makers, architects, and concerned citizens, to consider options and strategies for moving beyond present car dependence, especially in terms of urban-mobility. It is my argument in this paper that continued car dependence is not a sustainable option, and as such certain alternatives 'beyond the car' – or car futures - are important to consider in relation to the shifting events mentioned above.

[10] See http://www.transitorienteddevelopment.org/

I turn now to two examples in urban-mobility developments that have demonstrated successful transport integration towards a possible post-car future.

A Transport Integration Strategy in Bremen, Germany

The city of Bremen's Department for Building and Environment has a full-time Senior Project Manager for sustainable mobility, currently Michael Glotz-Richter. Under the sustainable mobility project Bremen has been developing a transportation system that is, according to their report, 'integrated, clean, smart, and customer-oriented'. Elements of the urban mobility system include:

- Multimodal hubs linking transit, cycling, carsharing, and taxis
- Carsharing services and residential developments with built-in carsharing
- Traffic calming to favour bicycles
- Bike and ride facilities
- Intelligent tramways
- An integrated smart card for transit, carsharing, and banking
- An integrated central station for all modes
- One umbrella organization for all 35 transit operators in the region (Glotz-Richter, 2003)

Recent statistics provided by the Bremen Department for Building and Environment state that more than 60% of trips in Bremen are made by environmentally-friendly modes including cycling (23%), public transport (17%), and walking (20%) (Glotz-Richter, 2003). The high percentage of bike users is credited to the Bremen system which provides a central bike station (Radstation) located at a place which has become the major interchange between public transport and the bike. Thus, commuters can leave their bike on their way to work or on the way home as the 'Radstation' houses 1,500 guarded storage units as well as providing services such as bike repair, bike rental, and bike wash.

Another example of Bremen's 'Intermodal Integrated Transportation' system are the so called 'traffic cells' which is a system of one-way streets which 'dis-attract cars from the area' in a bid to attract cyclists. Also, the one-way streets are two-way for cyclists, creating an inner-urban 'closed system' for cars users. Within this urban transport architecture has been integrated a tram network which Bremen authorities consider to be the 'backbone' of their public transport system. The tram system makes use of 'intelligent' traffic lights that recognize when the tram is present, calculates the usual time for boarding and disembarkment, and then changes to allow the tram to continue as a road priority. The tram system also provides real time information for passengers at all its stops. In order to facilitate ease of mobility the Bremen authorities introduced a new card that combines a bank card, electronic transit ticket, as well as being an access key to the city's car sharing scheme.

The card, somewhat tongue-in-cheek, is called the 'eierlegendewollmilchsau', a German term that means 'egg-laying-wool-milk-sow'; in other words, it denotes 'something that brings things together in an unexpected way, or one card fits all' (Glotz-Richter, 2003). The 'egg-laying-wool-milk-sow' card can be used for booking cars in the carsharing scheme, with cars being booked in 'real time' since the booking office is available 24 hours a day. The car sharing operator Cambio has approximately forty stations around the city:

> Over one hundred vehicles are in the fleet, with over 2,750 customers using the service. Each carshare automobile replaces four to eight private cars, so Cambio has replaced approximately 700 privately owned cars, and eliminated the need for close to 700 parking spaces. (Glotz-Richter, 2003)

Further, part of Bremen's integrated mobility strategy is to combine carsharing with housing developments in a bid to reduce resident parking space by one third. As I

shall explain shortly, a similar scheme is operating in Beddington, England (the second example in this paper).

Finally, as part of Bremen's 'integrated mobility strategy' the city has erected what it calls 'Mobil.punkt' stations which are combined public transit hubs that bring together carsharing, taxis, cycling, and public transit. Each 'Mobil.punkt' station serves as a terminal that provides travel information, such as various taxi price calculations to main city locations. As Senior Project Manager Michael Glotz-Richter says, 'no single element plays the main role, rather the interaction between the various agents form an integrated transport policy and integrated urban development policy' (Glotz-Richter, 2003).

Bremen's 'integrated mobility strategy' has been designed not to eradicate the car but to integrate its function into a more sustainable network of alternative transit options in a way that sensibly, and naturally, limits the need for car dependence. Similarly, a scheme in Beddington, England has created an integrated approach to living and mobility needs, to which I now turn.

BedZED - Beddington Zero Energy Development

The Beddington Zero Energy Development (BedZED) was developed by the Peabody Trust[11] to be the UK's largest 'carbon-neutral eco-community', which is described as 'the first of its kind in this country' by its developers.[12] The Peabody Trust view BedZED as 'a mixed-use, mixed-tenure development that incorporates innovative

[11] In partnership with Bill Dunster Architects and BioRegional Development Group, environmental consultants
[12] See http://www.peabody.org.uk/pages/GetPage.aspx?id=179

approaches to energy conservation and environmental sustainability'. The primary design concept behind this eco-urban community was to create a net-zero energy environment such that renewable sources will produce as much energy as the community consumes. Further, energy from renewable sources will ensure that BedZED is a 'carbon neutral development', making the urban experiment an environmentally sustainable one, with the use of roof gardens, sunlight/solar energy, and waste water recycling.

The BedZED community comprises of 82 residential homes (of mixed tenures and sizes), as well as commercial buildings, an exhibition centre, and a children's nursery. According to the BedZED website:

> The buildings are constructed from thermally massive materials that store heat during warm conditions and release heat at cooler times. In addition, all buildings are enclosed in a 300mm insulation jacket. BedZED houses are arranged in south facing terraces to maximise heat gain from the sun, known as passive solar gain. Each terrace is backed by north facing offices, where minimal solar gain reduces the tendency to overheat and the need for energy hungry air conditioning.[13]

As part of a move towards what may be termed 'responsible urban citizenship', BedZED residents will be able to keep track of their heat and electricity use by meters that are fitted in each home and office; thus relying on a feedback mechanism of responsible usage. On top of this, all homes and offices are fitted with low energy lighting and energy efficient appliances.

Specific to BedZED will be a small-scale 'combined heat and power plant' (CHP) which harnesses the heat that is produced as a by-product of generating electricity and

[13] See http://www.peabody.org.uk/pages/GetPage.aspx?id=179

puts this to further use. The heat from the CHP, it is claimed, provides hot water for BedZED residents, with each home or office having a domestic hot water tank that doubles as a radiator for peak times. As a further nod towards environmental sustainability, the CHP plant is powered by off-cuts from tree surgery waste, which is itself a carbon neutral fuel. It appears that on an architectural level BedZED addresses environmental, social and economic needs. In terms of urban mobility the developers behind BedZED have also focused upon realisable ways to reduce car use and dependency.

The Peabody Trust who are behind the BedZED project wish to demonstrate that it is possible to reduce urban car dependence and as such have introduced the first legally binding Green Transport Plan as a condition of planning permission. This green transport plan 'promotes walking, cycling and use of public transport. A car pool for residents has been established, and all these initiatives have helped to provide a strategic and integrated approach to transport issues'.[14] The experimental BedZED community has been designed to encourage alternatives to car use with their being good local public transport links, including two railway stations, two bus routes and a tramlink. BedZED is promoted as targeting 'a 50% reduction in fossil-fuel consumption by private car use over the next ten years compared with a conventional development'.[15] This ambitious drive is principally being developed around an onsite Car Club called 'ZEDcars'. Significantly, BedZED was the first zero-energy housing development in the UK to incorporate a car club. Yet mobility practises in BedZED are not just about vehicle transport; it is an integrative approach to combining

[14] See http://www.peabody.org.uk/pages/GetPage.aspx?id=179
[15] See http://www.peabody.org.uk/pages/GetPage.aspx?id=179

pedestrian needs, travel flexibility, sustainable energy practices, and overall community well-being. Part of this all-round policy includes

> A 'pedestrian first' policy with good lighting, drop kerbs for prams and wheelchairs and a road layout that keeps vehicles to walking speed. On-site charging points for electric cars and a free public electric vehicle charging point is already available in Sutton town centre. BedZED's 10-year target is to produce enough electricity from photovoltaic panels (which convert sunlight into energy) to power 40 electric vehicles. It is hoped that a mixture of private cars and vehicles available through the car club will minimise fossil fuel use as the community settles. For owners of electric vehicles energy and parking will be free of charge.[16]

The integrative transport-lifestyle project that BedZED has initiated, which is similar in parts to the Bremen scheme, enables residents to live a sustainable lifestyle around modern networking and mobility requirements.

What both BedZED and Bremen demonstrate is a shift in urban policy and planning that sees the city and the car as being part of a crucial urban-mobility relationship in how to envision, and work towards, a sustainable future that provides and nurtures a supply-demand need without being dragged headlong into unsustainable consumption patterns. Clearly, the car should not be conceived as a separate ‘iron cage’ that careers along concrete highways that carve up, and carve into, environmental concerns; nor should urbanscapes have to be an abstract asphalt jungle that either acquiesces to or antagonises with the car. The future, if it is to be believed, is one where the car and the city demonstrate, at least in richer northern territories, a shift towards a kind of symbiotic relationship; one which is sustainable, flexible, yet adaptable to mobility needs. It is with ‘car futures’ that the final part of this paper now concerns itself.

[16] See http://www.peabody.org.uk/pages/GetPage.aspx?id=179

Future of the Car

The term 'future of the car' may seem somewhat a misnomer when examining the many statements and reports that foresee a change in the present-day fossil-fuel car. In this paper, however, I have highlighted those voices and visions that are not harbingers of the 'end of the car' but instead are working towards integrating the car *as a system* into future transit mobilities. In particular, how the car is an embedded and adaptable part of the urban environment as a networked system. The future of the car then is not about the *end of the car* but rather about the transformation of the car as a system *within different systems* according to the environment and transit needs. In other words, dense urban centres have different mobility needs than do more sparse residential areas. There can be no one overall system for automobility, just as the transit options in London differ from those of Amsterdam or Lagos. Yet there can be a similarity in how car futures are approached, and one of the priorities must surely be based upon the sustainability issue in regards to environmental pollution and energy resource concerns.

One of the tactics then may be to 'make visible the invisible'; by this I mean to make prominent the fact both users and producers are part of an elaborate and increasingly sophisticated infrastructure apparatus. As Bruce Mau states, 'most of the time, we live our lives within these invisible systems, blissfully unaware of the artificial life, the intensely designed infrastructures that support them' (2004: iii). The question concerning the future of automobility may revolve around how the 'automobile' may be better integrated into various mobility systems rather than being dominant as an individualised and personalised vehicle of place and space. Again, Mau writes how new design developments 'create a synthesis among energy, manufacturing,

computing, and materials that promises to revolutionize movement…our new economies of movement are reconfiguring the urban and colonizing what remains of the natural terrain (2004: 47). What remains of the natural terrain then may need to undergo a form of 'colonisation' that integrates 'machinic' physical-digital infrastructures into natural environments/landscapes in order to develop more integrated mobility systems. Such interventions will include, as Mau stated, new developments in computing, manufacturing/materials, energy, in order to bring about this transformation of movement. BedZED and Bremen are good examples of such integration projects.

Curitiba, Brazil is also a fine example of how a dense urban environment can re-model its transit mobilities, as was demonstrated through the introduction of its bus rapid transit system. Jaime Lerner, the ex-mayor of Curitiba, is on the record as saying that 'the future of mobility has to be considered in terms of integrated systems, where each piece – bikes, cars, taxis, subways, buses – never competes in the space of another' (cited in Mau, 2004 : 58). The challenge for car futures is to integrate various mobility components into urban development. These urban centres can then act as nodes within a larger national and international transit network. The issue still remains, however, whether to adopt a 'compact city' approach or not, as several urban architects (Mau, 2004;Rogers, 1997;Siembab, 2005) wish to re-invent urban metropolitan mobility systems through notions of density and the 'compact city'. Similarly, Girardet notes that the 'challenge for the decades to come is to combine the best features of compact urban development, effective use of public transport and new vehicle technologies to create a mix of key components that will lead to truly liveable cities' (2004 : 152). Girardet believes that any car future must by necessity be

developed alongside a sustainable energy system that would make more use of renewable energies, break away from fossil-fuel dependency, and 'help to re-establish the crucial connections between energy, human well-being and the local environment' (2004: 194).

Principle questions over the 'future of the car' no longer are isolated with car matters alone - for *more than the car matters* in any future mobility scenario. The future of personal auto-mobility then is also a question, in Girardet's words, of energy, human well-being and the local environment. Partly because of these emerging issues the car is undergoing, in some urban projects, a transformation towards that of a 'shared unit of transit' rather than as a readily available 24-7 personal vehicle. Yet a balance needs to be struck between mobility needs and what can be offered by urban transit. Blowers notes that

> the notion of balance remains at the heart of policy making. A transport policy that is compatible with sustainable development objectives is one which strikes the right balance between serving economic development and protecting the environment and the future ability to sustain quality of life (cited in Pinderhughes, 2004: 128)

Quality of life is likely to be a prime public concern within a global context of rising oil prices, increasing resource-conflict, and climatic uncertainties and disruptions. For the richer northern territories at least the right to posses an individual car, or two, may shift towards being able to afford a luxury item that entails increased taxes, cost-as-you-go policies, and rising expenditure.

To conclude, from trends outlined so far in this paper I have argued that for the car to be a legitimate, sustainable, and productive mobility vehicle of the future, it needs to be re-configured within a mobility system that works integral to other transit means,

especially as part of an urbanscape that is integrated with work, living, and leisure needs. I have also stressed that the 'car' should be constructed around practicalities of energy and environmental sustainability. In this case it may be that the 'future of the car' is one where urban-network-mobilities as a *system* become the major force in transit providers, including a combination of private/shared car and/or carpool; trams; buses; bikes/rented bikes; metro; and pedestrian features. Such a system is also likely to offer real-time information as well as booking/hiring through digital means as well as providing, like Bremen, smartcard options for multiple travel alternatives. These urban-hubs, it is estimated, will be connected to other national and international nodes on a global transit network through various transit corridors, such as long-range train networks; 'intelligent' highways that sensor traffic and monitor car use; and various air and sea corridors. Travel between major 'hubs' will be made increasingly efficient by the introduction of advanced 'intelligent transport systems' (ITS) that help to guide transit to and from the urban centres. Once within an 'urban hub', it is likely that a local integrated transport system will take over and offer a range of transit options to complete the journey. Aspects of this scenario are already in place (EU, 2001;2005;2006;House-of-Commons, 2004).

However, a missing element here is the need to provide a 'car future' for rural and smaller communities less connected to major transit corridors. At present it is difficult to find working projects that focus on this issue; one of the reasons being that less urban, more rural environments have a greater need and reliance upon individualised car mobility. One option that has been discussed by the UK government is to bring all UK car movement into a digitised car-tracking scheme that will cost users according to the time and routes of their movements. In this manner financial incentives can be

placed upon car drivers to manage their car use more effectively and efficiently as particular routes and usage will be costed by energy and environmental factors (House-of-Commons, 2004).

One thing that can be stated about a probable car future is that, as part of a transport, energy, environmental, urban, well-being network, *more than the car matters*. A fitting way to frame this is by referring to the words of architect Bruce Mau: 'When everything is connected to everything else, for better or worse, everything matters' (2004: 129). In a globally networked world of increasing integration, the future of cars and cities will prove to be a future also of how differing societies manage their futures of sustainable growth, resilient balance, and dynamic well-being, as the actions of each social partner influences a greater social, global whole.

Bibliography

Castells, M. (1996) *The Rise of the Network Society. Vol. 1 of The Information Age: Economy, Society, and Culture*. Oxford: Blackwell.

Castells, M. (1997) *The Power of Identity*. Cambridge, Mass ; Oxford: Blackwell.

Castells, M. (1998) *End of Millennium*. Malden, MA: Blackwell Publishers.

Dittmar, H. and Ohland, G. (Eds.) (2004) *The New Transit Town: Best Practices in Transit-Orientated Development.* Washington, DC: Island Press.

EU (2001) *European transport policy for 2010:time to decide*. EUROPEAN COMMISSION: (pp. 1-126)

EU (2005) *TRANS-EUROPEAN TRANSPORT NETWORK: TEN-T priority axes and projects 2005*. EUROPEAN COMMISSION: (pp. 1-73)

EU (2006) *Keep Europe moving - Sustainable mobility for our continent*. COMMISSION OF THE EUROPEAN COMMUNITIES: (pp. 1-29)

Foresight (2006) *Intelligent Infrastructure Futures The Scenarios – Towards 2055*. Office of Science and Technology, Dept for Trade and Industry:

Girardet, H. (2004) *CitiesPeoplePlanet*. Chichester: Wiley-Academy.

Glotz-Richter, M. (2003) 'Moving the City: A Guided Tour of the Transport Integration Strategy in Bremen, Germany' http://www.communauto.com/images/03.coupures_de_presse/video_summary.pdf (accessed 17/07/07)

House-of-Commons (2004) *Cars of the Future: Seventeenth Report of Session 2003-04 (HC 319-I)*. House of Commons Transport Committee: (pp. 1-54)

Mau, B. (2004) *Massive Change*. London: Phaidon Press.

Mumford, L. (1964/1953) *The Highway and the City*. London: Secker & Warburg.

Newman, P. (1999) 'Transport: Reducing Automobile Dependence' In *The Earthscan Reader in Sustainable Cities*. Satterthwaite, D. (Ed) London: Earthscan Publications Ltd.

Pinderhughes, R. (2004) *Alternative Urban Futures: Planning for Sustainable Development in Cities throughout the World*. New York: Rowman & Littlefield Publishers.

Rogers, R. (1997) *Cities for a Small Planet*. London: Faber and Faber.

Siembab, W. (2005) 'The Smart Sprawl Strategy or How to Avoid Cannibalism in Our Cities' http://www.siembab.com/docs/smartsprawl.pdf (accessed 22/07/07)

Steffen, A. (2005) 'Smart Growth, Smart Places and Bright Green Cities' http://www.worldchanging.com/archives/001920.html (accessed 27/07/07)

Vidal, J. and Milmo, D. (2007) *Are these the world's costliest roadworks? The M6 widening - at £1,000 an inch*. The Guardian: Tuesday July 31, 2007