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Parking Management Policy:

its potential in improving
urban traffic flows

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Stephen Ison

Loughborough University



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1.

Introduction



The basic purpose of Transport Demand Management (TDM) is to influence individual travel behaviour (Ison and Rye 2008). Meyer (1999 p.576) sees TDM as ‘any action or set of actions aimed at influencing people’s travel behaviour in such a way that alternative mobility options are presented and/or congestion is reduced’. **TABLE 1** details a number of TDM measures aimed at impacting on travel behaviour and that thus seek to address the urban traffic-related issues of congestion, emissions, land take, safety and urban economic development.

Table 1 **Transport Demand Management Measures**

SOURCE ADAPTED FROM ISON AND RYE (2008)

TYPE	MEASURES
ECONOMIC MEASURES	<ul style="list-style-type: none"> — Fuel Tax — Road pricing — Parking charges — Public transport subsidisation
LAND USE	<ul style="list-style-type: none"> — Land use and transportation strategy: Car free development, location of new developments — Park and Ride facilities
INFORMATION FOR TRAVELLERS	<ul style="list-style-type: none"> — Travel information before a trip is taken — Car sharing
SUBSTITUTION OF COMMUNICATIONS FOR TRAVEL	<ul style="list-style-type: none"> — Teleworking — E-shopping
REGULATION MEASURES	<ul style="list-style-type: none"> — Parking controls — Pedestrianised zones

The measures listed in table 1 are not exhaustive but illustrate the range of measures available to transport planners as a means of bringing about change in travel behaviour. As can be seen, parking features both as an economic and a regulatory measure.

In the UK in 2011, 655 billion passenger kilometres were undertaken by cars, vans and taxis, which represented 83% of all passenger kilometres travelled (TSGB 2012). This compared with 313 billion passenger kilometres in 1971, representing a 100% increase in a 40 year period. The UK Department for Transport forecasts that vehicle kilometres travelled by car will rise by 21% by 2025 and 36% by 2035. The UK is not unusual in this respect, and every road/car journey, irrespective of its duration, location or reason, requires a parking space at its destination.

The cost and availability of a parking space are important factors in determining whether an individual makes the decision to drive to a particular location, chooses an alternative mode of travel, or decides whether to own a car in the first place. It is no coincidence that in many urban areas, levels of car ownership are relatively lower than in rural areas, which in addition to the availability of public transport is to a certain extent the result of limited on-street parking (Rye and Koglin, 2014). Weinberger et al (2009) similarly state that the provision of parking stimulates more trips by car, in addition to encouraging car ownership. On the other hand, where on-street parking is constrained, as in many cities throughout Europe, then the owners of vehicles are likely to undertake trips not involving the car, and are more likely to walk.

According to Bates and Leibling (2012), on average the car spends in the region of 80% of its time parked at the owners’ home, 3-4% on the move and 16% parked elsewhere. This 16% is likely to involve substantial time spent in urban areas occupying land which could be used for other purposes, reinforcing the view that there is no such thing as ‘free parking’ (Shoup 2005). Parking has a major role to play in terms of improving urban traffic flow. According to Marsden (2014), it is “one of the key land-uses that glues together the land-use and the transport system ... [which] sits at the heart of an integrated land-use and transport strategy”. Parking facilities are a major component of the transport system, and the management of parking is a complex issue both in terms of supply and in managing the demand. When seeking to develop a coherent parking policy, there is a need to consider work, retail, leisure, education and residential parking, as well as changing population demographics, mobility patterns, levels of car ownership and public transport provision. Since parking is the result of different activities, whether workplace parking, parking at a retail outlet or a school, for example, then it invariably involves different parking policies. As stated by the IHT (2005 p.20), “Control over the availability of parking spaces is a key policy instrument in limiting car trips and, for the time being, is the most widely available and readily accepted method of doing so”.

According to the House of Commons Transport Committee (2013 p.5), “Effective parking strategies help to reconcile the competing demands of different road users. Parking restrictions are used to manage congestion and ensure that there is clear and fair access to public roads. The enforcement of parking restrictions should help to ensure that the needs of residents, shops and businesses are met. Local authorities have primary responsibility for setting parking policy and enforcement strategies on local roads”.

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The aim of this paper is to investigate the role of parking as a means of managing urban transport and improving urban traffic flows. The following section defines parking management. Section 3 details the types of parking available in urban areas, section 4 the reasons for employing parking management, section 5 the conflicting interests of stakeholders, section 6 the various approaches to managing parking in urban areas and section 7 parking and consultation. Conclusions are presented in section 8.

2.

What is meant by parking management?



In terms of defining parking management, Litman (2013 p.2) states that “Parking management refers to policies and programs that result in more efficient use of parking resources. Parking management includes several specific strategies ... [and] when appropriately applied parking management can significantly reduce the number of parking spaces required in a particular situation, providing a variety of economic, social and environmental benefits”. According to the US Environmental Protection Agency, “parking management can be an effective tool for local government to reduce traffic and associated emissions in congested areas by encouraging travellers to use modes other than driving alone” (p.1). The aim of parking management varies depending on the provider. For example, for local authorities addressing congestion, a source of revenue and regeneration could be seen as central, whereas for private providers revenue and profit are all important, and at the organisational level, such as airports, then access and revenue are key.

Local authorities, at least in the UK, have direct control over the use of kerb-space (other than on trunk roads) in their areas, and therefore of the supply and price of on-street parking. Many authorities also own public off-street car parks, thus having direct influence over the use and price of such spaces. In saying this, the extent to which they are a provider of public off-street parking varies between authorities.

In terms of demand management, parking policies are often seen as a second best option when compared to road pricing. Parking policies, however, tend to achieve broader public acceptance, are easier to implement and are an option that has been extensively used in a demand management role over many years, most notably in larger towns and cities. There can, however, often be a conflict between the quantity and availability of parking, the price of parking and economic development. As stated by Rye et al (2008 p.387),

parking “is clearly an area of policy conflict since using it to manage demand may reduce revenue generation, or (be perceived to) damage the local economy. In terms of on-street and off-street parking, there are a wide range of users who often have conflicting opinions which have to be taken into account in its management”.

PARKING OBJECTIVES

Clarity of objectives is an important aspect of parking management policy. In fact, there needs to be a clear, rational and understandable link between parking strategy and the type of problem to be addressed. Is the objective one of reducing congestion, addressing the issue of air pollution, rationing available parking space among competing users or indeed, raising revenue for infrastructure investment? There is clearly an overlap in terms of some of these objectives. Depending on the balance of objectives that an authority chooses to pursue, then there could be differences in parking scheme design, the technology used and the optimal charging level. Clearly, each authority will have its own objectives and priorities in terms of traffic management, and parking will be an integral part of that. The local and political situation in a given urban area will dictate the overall objective/s of a parking scheme.

Overall, parking management can be used as part of a ‘package’ of measures aimed at addressing congestion and traffic-related pollution in urban areas, in addition to providing a safe means of improving urban traffic flows. The following section outlines the types of parking that can be identified in urban areas.

3.

Types of parking



Car parking spaces are supplied by a number of sources, including local authorities, private providers, companies and residents. **TABLE 2** details the types of parking which are present in the majority of towns and cities of the EU.

Dealing with each in turn:

LOCAL AUTHORITY

Local authorities provide car parking which can be classified as either on-street or off-street.

GENERAL PUBLIC ON-STREET

On-street or kerb-side parking refers to parking on a public road. Local authorities manage this publicly-owned asset and have a direct control over its use in their areas. As such, they can influence both the supply of and, therefore, the demand for such spaces via the price of on-street parking. This means deciding what restrictions, if any, apply taking account of issues such as the needs of the local economy, road safety and emergency service access.

GENERAL PUBLIC, SURFACE OR MULTI-STOREY OFF-STREET

This refers to car parks which are not on the public road and members of the public are able to access. In using this facility, the public will have to comply with various regulations such as a particular price or a maximum period of stay. Many local authorities own public off-street car parking for which they can charge a price, although the level of provision varies from authority to authority. According to Rye and Koglin (2014), off-street parking provides the majority of the parking space that is available in medium to large-sized cities in Europe.

PRIVATELY-OWNED

Privately-owned car parks encompass public and private non-residential parking.

PUBLIC NON-RESIDENTIAL PARKING

These are privately-owned car parks available for public use, such as the NCP car parks in the UK. In terms of controlling the demand for these spaces, possibly via the price mechanism, legislation would be required and, if enacted, would lead to a transfer of monopoly profit from the car park user to the car park operator.

PRIVATE NON-RESIDENTIAL PARKING

This refers to off-street parking directly linked to a specific building and, in particular, business and office developments. They can normally be used for free and are limited in use to those who are connected to the organisation. Parking supply of this type has been the result of local authorities historically requiring developers to provide sufficient parking to meet the needs of any new development, and has been a requirement of planning permission. As such, a substantial proportion of off-street parking in urban areas is both privately-owned and controlled. This type of parking can be seen as a cost to the employer, in terms of the original build, the cost of maintenance and the land-take. The provision can also stimulate private vehicle use, but equally it can be seen as important in terms of employee recruitment and retention with parking being seen as a 'perk' or indeed entitlement of the job (Marsden 2014).

RESIDENTIAL PARKING

Privately-owned residential parking is predominantly associated with private accommodation: houses or flats. Typically only residents use these spaces, although there has been a growing trend in recent years for them to be hired out for use by non-residents in certain locations.

An issue to emerge in recent years has been the appearance of unregulated residential car parking provision. This currently represents a relatively small proportion of overall

Table 2 **Typology of car parking spaces**

SOURCE: Adapted from Enoch and Ison (2006)

OWNERSHIP	USER	ON OR OFF-STREET	CHARGING REGIMES
LOCAL AUTHORITY	General Public [kerb-side or bays]	On-street	Charged and free
	General Public [surface or multi-storey]	Off-street	Mostly charged but can be free
PRIVATELY- OWNED	Public	Off-street	Charged
	Private Non-Residential Parking	Off-street	Free
	Residents	Off-street	Free

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parking supply but it is a growing trend and may become more important in the future. Local authorities need to be aware of the existence of this phenomenon and the challenges and opportunities its growth presents in terms of parking management (Budd et al 2013). Online, virtual parking marketplaces have emerged since residents are seeking to address the needs of those motorists wanting to park, the cost of that parking and the lack of available car parking spaces around major generators of private vehicular traffic, such as airports and hospitals. The main driver is economic as residents offer their driveways to non-residents in order to generate new sources of income.

By applying the parking typology in TABLE 2 to the city of Nottingham in the East Midlands region of the UK (a city covering 7,461 hectares and with a resident population of 306,700), the following various types of parking can be found:

- 1300 public on-street parking spaces;
- 2446 public off-street spaces, local authority-owned;
- 7340 public off-street spaces, privately-owned. This may not however be exhaustive since it only relates to the major providers, such as NCP;
- 60,000-70,000 private non-residential parking spaces. This is an estimate based on the off-street parking audit (OSPA) and the current total number of Workplace Parking spaces used on a regular basis. The total capacity may be around 90,000, again based on the OSPA.

4.

Reasons for parking management



This is an emotive area and there is a common perception that local authorities simply use parking enforcement as a way to raise revenue (HoC 2013). A lack of any form of parking management is likely to lead to a chaotic situation that adversely impacts on congestion, increases local pollution, leads to delays and road rage, and harms the quality of life for local residents.

Parking management should be implemented in order to address parking problems. The management of parking often tends to be somewhat reactive, seeking however to address a situation when it becomes apparent, such as commuters parking in residential areas or overspill parking from major traffic generators, such as hospitals. There are a number of reasons for implementing parking management policies, a selection of which are highlighted in TABLE 3.

Table 3 **Reasons for implementing parking management transport strategy**

SOURCE: ADAPTED FROM RYE AND KOGLIN (2014)

A belief that there is an inadequate supply of, or underutilised, parking in certain localities within a town or city.

There are various competing demands on car parking spaces in urban areas, be it from commuters, residents or shoppers.

Congestion and vehicle emissions are likely to result from vehicles circulating (or cruising) while searching for a parking space (see Shoup 2006).

In high-density, typically older areas of a city, such as back-to-back terrace housing in the UK, there is insufficient on-street parking. This is also a problem in Southern and Eastern Europe with high-density building and a growth in car ownership.

Safety issues as a result of poorly parked vehicles.

Problem of enforcing parking controls, difficulty of payment and collection of fees and fines.

According to the House of Commons Transport Committee (2013), parking enforcement requires a balancing of competing demands. The Report states that local authorities should pay particular attention to:

- managing the traffic network to ensure expeditious movement of traffic, (including pedestrians and cyclists) ...;
- improving road safety;
- improving the local environment;
- improving the quality and accessibility of public transport;
- meeting the needs of disabled people, some of whom will be unable to use public transport systems and depend entirely on the use of a car; and
- managing and reconciling the competing demands for kerb space of residents; shops; businesses; visitors, especially where there are many tourist attractions and hotels; pedestrians; delivery vehicles; buses, taxis, private hire vehicles and coaches; cars; bicycles; and motorcycles.” (HoC 2013 p.9).

COST OF PROVIDING PARKING SPACES

Another reason for parking management is the overall cost of providing parking spaces. A typical parking space can be in the region of 5m x 2.4m, and every parking space involves energy being used in its construction and maintenance. Each space also generates emissions over its lifetime arising from attracting vehicles to the parking spaces, thereby increasing vehicle miles travelled and levels of local air pollution.

Litman (2013) describes the cost of parking provision in the following way:

- The land take. This is not only the size of the space itself but also the off-street requirement for driveways which connect the car park to the road and access lanes. In addition, since car parking needs to be conveniently situated, it invariably occupies land which has a high real estate value.
- On-street parking uses less space than off-street, but has a high opportunity cost. This is land take that could be used for traffic, bus or bicycle lanes, walkways or indeed green space.
- Construction costs, with underground parking spaces typically costing double that of above ground constructed parking, such as multi-storey car park facilities. Costs include planning, design, financing and the allocation of permits.
- Operation and maintenance, which includes lighting, repair, cleaning, security provision, access control, enforcement, labour and administrative costs.
- Transaction costs, which include signs and parking meters.

SEARCHING FOR ON-STREET PARKING SPACES

Searching for on-street parking has implications both for the motorist and the urban environment in terms of additional vehicle miles travelled on the transport network. As detailed in TABLE 4, there is an environmental and economic impact as a result of an increased volume of traffic and the

associated congestion, air pollution and noise. There is also the opportunity cost in terms of time delays as a result of slower vehicle speeds and the related safety impact.

PARKING GUIDANCE AND INFORMATION SYSTEMS

One way of dealing with the search for parking issue is through Parking Guidance and Information (PGI) Systems which are normally situated on arterial routes in urban areas. They provide the driver with dynamic information on parking in particular areas, most typically in an urban environment but also as a means of promoting Park and Ride.

The aim is to:

- enhance the motorists decision-making process;
- reduce parking search time by directing motorists to car parks where there are vacant spaces;
- reduce excessive queues at multi-storey car parks;
- reduce congestion on the surrounding road network;
- reduce traffic-related emissions;
- provide information for those unfamiliar with the area such as visitors and tourists;
- improve driver safety;
- improve the utilisation of off-street car parking facilities and also the accessibility to short stay on-street parking.

PGI systems are the most efficient in a situation where demand for off-street parking equates to supply (Department for Transport 2003). If the demand for off-street parking far exceeds supply, then PGI is not likely to have any

Table 4 **Quantification of the Impacts of Parking-Search**

SOURCE: Adapted from Brooke et al (2014)

CATEGORY	IMPACT	QUANTIFICATION
ENVIRONMENTAL	Increased network traffic flow and congestion	It has been estimated that cars searching for parking constitute 14% of traffic density (Arnott and Rowse 2009); In a review of sixteen studies conducted in eleven cities in the USA, on average 30% of traffic was searching for parking (Shoup 2005, 2006).
	Noise and air pollution	It is likely that the increase in traffic congestion levels arising through vehicles searching for parking will increase noise and pollutant emissions.
ECONOMIC	Time delays	It has been estimated that cars searching for parking spaces constitute 14% of traffic density and generate a 50% increase in congestion-related time loss (Arnott and Rowse 2009); In a review of sixteen studies conducted in eleven cities in the US, search time was an average of 8.1 minutes (Shoup 2005, 2006); Estimated commuting time increased approximately 20% due to parking search time (van Ommeren et al 2011).

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impact. Equally, if supply outstrips demand, then search time is not an issue and thus PGI provides little benefit. One of the benefits of PGI, which is not entirely quantifiable, is the improvement in public image both in terms of car park management and reduced driver frustration (DfT 2003). Information provided includes the number of vacant spaces or more basic but important information such as 'Full' or 'Closed'. The information can be 'grouped' into zones relating to specific car parks, so as to reduce the amount of information that is presented on one sign.

Provision of PGI prior to undertaking a journey has clear advantages in terms of impacting on car parking demand and reducing the environmental impact of traffic. Clearly, the information provided has to be as accurate as possible so that the motorist has confidence in what is being provided. This requires a robust system of collecting car park ingress and egress information.

5.

Conflicting interests of stakeholders



Parking management policy is complex with many stakeholders involved, most notably:

- Motorists, who are seeking a convenient parking space, with a reduced walking distance to the final destination and minimal search time;
- Commuters, shoppers and occasional visitors such as tourists for whom the value of time will vary;
- Car park owners, who are seeking to make or maximise their profits;
- Local authorities, aiming to manage demand so as to control congestion and effectively manage their own car parking asset;
- Residents, who are increasingly regarding their off-street parking as an asset to be exploited; and
- Organisations, who are seeking to manage constrained site locations and view car parking management as a means of achieving that aim.

In terms of conflicting interests in seeking to reduce congestion and vehicle CO₂ emissions, the supply of car parking spaces in a city centre may need to be reduced. However, this may impact on local economic activity.

In order to offset this, the supply of short stay spaces might be increased at the expense of long stay commuter spaces, but this is likely to generate traffic given the increased circulation and potential occurrence of searching for parking. In addition, private car park operators may be seeking to maximise their profits which will mean pricing

at a particular rate, but local authority provision might be aimed at encouraging shoppers and tourists. Clearly, there is a balance to be struck and it is difficult, if not impossible, for the needs of all users to be met (HoC 2013 p10). Furthermore, parking needs will vary from location to location. For example, in town and city centres, delivery vehicle parking and on-street short stay parking for shoppers is likely to take priority, whereas in residential areas, local residents are likely to be of prime importance.

In terms of through- and terminating traffic, Roth stated over 40 years ago in relation to parking restraint "there is a strong case for the removal of parking subsidies of all kinds. But the idea that parking should be subject to restraints above the costs of providing the parking space is a completely different proposition ... measures to relieve traffic congestion by parking restrictions would favour those whose vehicles pass through city centres without parking there, and would restrict only those who live, work or trade in the area under restriction ... When the effects of city activity are taken into account, it becomes difficult to understand how anybody, who wishes the city to survive as a centre of trade and amenity, can advocate encouraging through traffic at the expense of parking traffic ... The policy of relieving congestion in the streets by parking restriction is thus of doubtful value" (Roth 1967).

6.

Parking management approaches



There are number of parking management approaches, and these will impact on individual urban transport stakeholders as well as having an effect on the economic and environmental aspects of a city. **TABLE 5** details a range of approaches that can and have been utilised by city authorities when aiming to deal with congestion to reduce traffic-related pollution and to improve the traffic flow in urban areas.

REGULATION OF ON-STREET PARKING

In many respects, on-street parking is the easiest to control since it can be undertaken by the use of parking meters, the introduction of yellow lines and red routes or permissive parking, for example loading bays. The removal of spaces has a dual effect in that it makes the road wider as well as limiting the number of termination points for a journey (Enoch and Ison 2006). Local authorities decide on the parking regulations that are enacted. In this regard, on-street parking regulations have a tendency to be more restrictive nearer the centre of towns and cities, given the level of demand. On-street parking restrictions are introduced for a number of reasons, namely to:

- ease the flow of traffic, particularly at peak periods;
- increase the capacity of the road and to raise revenue;
- reduce the number of termination points;
- increase the turnover of parking spaces as a means of encouraging retail while discouraging commuter traffic;
- stop parking at certain locations for safety reasons (such as junctions, pedestrian crossings and the like);
- prevent informal park and ride.

Regulatory measures aimed at limiting parking duration, the arrival times from which a motorist is allowed to park, or specifying individuals who are permitted to park (such as those with disabilities) can result in car drivers increasing their search times, thus imposing a greater problem for those arriving later [see section 4].

Since April 2011, technological solutions aimed at increasing the availability of parking spaces, so as to meet demand and reduce the need for parking search, have been utilised in such developments as the SFPark area in San Francisco. This scheme has embedded sensors installed in on-street parking spaces indicating real-time parking occupancy of each space, and dynamically variable parking charges according to demand for on-street metered parking spaces (Pierce and Shoup 2013).

ON-STREET PARKING PRICING

In terms of on-street pricing, the use of parking meters has been extensively used. These have normally involved the purchase of a ticket from a road-side machine, involving the use of cash. More recently, this has been replaced by mobile phone payment and use of number plates, rather than tickets, to show that a driver has paid the parking fee (Rye and Koglin 2014).

In addition, what are known as area wide controls or Controlled Parking Zones (CPZ) could be introduced. These give preference to local residents, who need to buy a permit in order to park in the CPZ, and thereby seek to impact on commuters. Visitors and shoppers may be able to park in CPZ for a short period of time at a charge per hour. Controlled Parking Zones or preferential parking regulations make it easier for both residents and their visitors to find a parking space near to their place of residence by the issuing of permits. The permit tends to be only valid for a specific licenced number plate and is not transferable to any other vehicle.

Table 5 Parking management approaches

	REGULATION	PRICING
ON-STREET PARKING	Parking management: – Yellow lines – Red routes – Permissive parking – Limitation of parking duration – Controlled Parking Zones	– Parking meters – Pay and Display – Purchase of permits
OFF-STREET PARKING	– Removal of parking spaces	– On-site payment – Workplace Parking Levy – Park and Ride

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When obtaining a permit proof of residency, such as a utility bill or a bank statement is normally required. CPZs used with resident permits have a number of advantages and disadvantages namely:

Advantages:

- the removal of commuter parking from the controlled zone;
- the freeing up of space for residents and short stay visitors and guests.

Disadvantages:

- the cost of the permit;
- a limit on the number of permits issued. Clearly, supply of permits needs to be less than demand, otherwise there would be no need for the scheme. However, rationing in this way can result in difficulties for certain households;
- no guarantee of a space, simply the right to search for a space;
- enforcement costs.

An alternative is to do nothing, but then this does not address the parking problem. Any CPZ must be a “compromise between managing the competition for parking space between residents and others (and therefore commuter cars travel into those areas) and ensuring that the new operation is also self-financing” (Rye et al 2006 p77). However, another issue is that the extension of CPZs displaces on-street commuter parking into areas further from the city centre. This can lead to the development of informal park and ride in areas surrounding the best-served public transport routes. It could also result in park and cycle. See Rye et al (2006) for more detail on the influence CPZs have on modal split.

In terms of parking, on-street spaces should be more expensive than off-street car parks so as to encourage motorists to park off-street and discourage parking search, given its implications for congestion, traffic-related emissions and cruising time.

OFF-STREET PRIVATE NON-RESIDENTIAL PARKING

In terms of managing parking at the workplace, there are a number of options:

- Parking on-site for free, with parking provided as part of the employment package. For example at Heathrow Airport, tenant companies buy parking permits and many offer them free to their employees as a benefit of the job. Clearly, the assumption is that there is sufficient parking to cater for demand.
- Parking on-site but paid for by employees is often to be found where sites are constrained, typically in central urban areas. In addition to charging for parking, more innovative schemes, such as the parking cash-out scheme,

could be introduced where employees are offered a financial incentive to use their car less or to relinquish their parking permit (Shoup 1997).

- Parking can be off-site and based on the company undertaking a rental agreement with a private parking provider.

One way of addressing the environmental impact of traffic is the development and adoption of vehicles that use less fuel or indeed emit less carbon. This could be achieved by improved fuel efficiency, hybrid vehicles, plug-in electric power or alternative fuels. Progress has been made through government fiscal and regulatory measures aimed at encouraging lower carbon vehicles and impacting on the carbon emissions of UK vehicles. This includes measures such as graduated vehicle excise duty and the EU regulatory requirement to reduce CO2 emissions on new car sales by 2015 (RAC 2011). The RAC feels that local authorities can aid in the adoption of lower carbon vehicles, not least through their parking policy. While it might be the case that electric vehicles may have only a small contribution to make in terms of the reduction of carbon over the foreseeable future, local authorities can aid in providing low carbon incentives via their public parking schemes. This could be residential on-street and public off-street parking local authorities installing electric points for recharging vehicles.

PARKING AND THE PROMOTION OF CLEAN MOBILITY

Parking management can be used as a means of promoting the use of clean mobility. Take for example the Civitas initiative, co-financed by the European Union, relating to subsidised parking for clean vehicles (CIVITAS 2014). This initiative took place in Malmo over the period 2005 - 2008 with the owners of clean vehicles (those less than three years old complying with a clean vehicle definition, namely gas, ethanol, hybrid or pure electric) being able to apply for permission to park their vehicles at a reduced cost. Permission involved a fee but this allowed the first hour to be parked free of charge. Clearly, the idea behind this initiative was to improve the attractiveness of owning and using a clean vehicle. One of the findings of the initiative, however, was that it was probably functioning largely as a bonus for those who had already decided to purchase a clean vehicle.

COMPANY SITE PARKING MANAGEMENT

Employers may seek to implement a site-based parking management policy. This is likely when location is constrained (often in urban areas), where congestion is an issue or where parking management measures are considered as part of an overall site travel plan. This could involve limiting the number of staff car parking spaces (rationing) or charging for parking at work. This is becoming more widespread in the UK, but despite increasing prevalence, parking manage-

ment remains an unpopular measure, particularly during the implementation phase (see Rye and Ison 2005).

Rye and Ison (2005) detail justifications for this approach in order to make it more acceptable:

- Problems that require attention need to be correctly identified, most notably congestion in and around the site or inadequate car parking supply. Hospitals are a case in point in this regard.
- Alternative modes of transport should be identified for access to work and/or facilities made available on-site, such as cycle racks and showers for those who cycle.
- Senior staff should be treated in the same manner as all other staff. This reinforces a perception of fairness and equity.
- It should be made clear how the money raised from the introduction of car parking charges will be utilised. If the revenue is used to improve car parking facilities, lighting, CCTV and the like, then this will improve acceptance.
- Consultation should be undertaken on issues, such as the level of the charge and how it is calculated as well as the allocation of permits.
- Some parking management schemes charge staff based on their car emissions or salary grade, in that the higher grade the higher the charge. It can also be based on engine size, CO₂ emissions and whether employees car share.

CAR SHARING

Car sharing is where two or more individuals undertake a car journey in a privately-owned vehicle in travel to the workplace. An employee may decide to car share without employer assistance, although there can be incentives as a means of encouraging sharing. There are a number of incentives which can be put in place, such as the reduced cost or in fact free parking, preferential parking or indeed being entered into a prize draw. Employers can aid in the forming of car sharing via the establishing of a rideshare database which can aid in terms of locating potential rideshare individuals who live close by and have similar work schedules. There are a number of benefits associated with car sharing both from the employer and employee side, most notably:

Employee:

- sharing the cost of commuting;
- reducing the wear and tear on the vehicle;
- potential for discussing work related issues;
- saving of time in areas that operate high-occupancy vehicle lanes.

Employer:

- need for fewer car parking spaces. The reduced demand for car parking spaces is clearly an important factor with savings being made in terms of the reduced number of parking spaces required. This land is then freed up for more profitable purposes;
- less commute-related stress on the part of the employee;
- potentially improved productivity;
- reduced congestion in and around the site;
- reduced emissions.

There are however a number of potential difficulties with car sharing, not least in terms of the:

- administrative cost and the time taken in setting up and maintaining a car share database matching potential car sharing partners;
- high turnover of staff in certain organisations will impact on the effectiveness of the scheme;
- potential issue of trust and safety associated with car sharing. As such, an official car sharing scheme incorporating all the necessary checks is more likely to avoid any potential difficulty in this regard;
- reliability of the car sharers in that failure to arrive at the workplace on time could create real difficulties for certain types of employment. In fact, by far the most effective car sharing approach is where the sharers arrive and depart at the same time;
- fear by some employees that they will lose flexibility in their travel decisions if they car share, such as not being able to return home relatively quickly if there is a domestic issue;
- employment that involves different shift patterns. In such a situation, it could be difficult to sustain a car sharing arrangement;
- loss of car parking revenue which is the result of offering incentives, or in fact free parking, to those car sharing;
- enforcement of car parking in the preferential parking bays. As with any scheme, there is always the potential for fraud which may include registration of car sharing partners who do not actually car share, or reporting a car share journey when in fact it involved a lone driver.

Car sharing is likely to be more prevalent in locations where there is higher residential density and large single site employers. As such, many car sharing programmes are to be found in universities and hospitals. The effectiveness of such schemes depends to a great extent on:

- the 'designated spaces' being as close as possible to the final destination place of work;
- there being a reduction in the cost of parking, over and above that already obtained through the act of sharing. In fact, car sharing could involve parking for free.

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As a follow-on from car sharing, there could be an opportunity to introduce a 'parking cash out' scheme. Here an employer will offer its employees cash in lieu of a parking space (see Shoup 1997).

THE WORKPLACE PARKING LEVY, NOTTINGHAM, UK

There is growing interest in workplace parking levies, which are schemes designed to charge a levy on the provision of parking at the workplace.

In the UK, the workplace parking levy was first proposed in the UK Government's White Paper on the Future of Transport, *A New Deal for Transport: Better for Everyone* (1998) which led to the Transport Bill (2000), giving power to local authorities to implement either a Road User Charge (RUC) and/or a Workplace Parking Levy (WPL). The UK Government was of the expectation that a number of local authorities would be interested in implementing a workplace parking levy, not least since the revenue would be hypothecated for transport infrastructure improvements. Since then, however, only one city, Nottingham, has decided to introduce a WPL. Nottingham City Council considered two demand management measures, namely road user charging and the workplace parking levy. The WPL was chosen on the basis that a significant proportion of peak-hour congestion is a result of the journey to work, and many workplaces offered free parking (Ison and Mulley 2013). Moreover, a WPL could be introduced over a shorter time period than a road pricing scheme. In addition, road pricing as a concept was seen as being more politically sensitive, as revealed in the metropolitan cities of Edinburgh and Manchester where schemes were rejected following 'no' votes in a referendum.

From October 2011, employers within the city were required to obtain a licence for the number of employee parking places they provide. Initially, all employers received a 100% discount, with charging for those employers providing 11 or more employee parking places coming into force in April 2012. Initially the charge was £288 per parking place per annum with a planned phased increase in the levy year on year; such that, from 1st April 2013 - 31st March 2014, the cost of the WPL increased to £334, to an estimated £363 in 2014/15 and £380 in 2015. In future years, it will increase in line with inflation. The phasing of the WPL introduction was to allow planned public transport improvements to be developed prior to the main part of the charge being implemented (Nottingham City Council 2008). Commuters account for 70% of peak period congestion (Nottingham City Council 2009), and it could be argued that employers should contribute to addressing this problem by paying a levy which provides for alternatives to the private car. Employers with 10 or fewer parking places will continue to receive a 100% discount on the levy.

The identified objectives of the WPL are to:

- Tackle congestion by encouraging employers to reduce the parking available to employees so as to reduce their WPL bill (or become exempt) and by reducing the number of termination points for an employee;
- Help secure 'high quality sustainable public transport' that offers 'realistic alternatives' to the private car. The improvements consist of extending Nottingham's tram system (NET Phase 2), improving bus services and modernising the railway station;
- Encourage assistance to businesses in terms of developing 'smarter travel choices', travel plans and on/off-street parking management schemes;
- Provide no significant negative impact on business investment decisions in the City;
- Create no significant displaced parking problems.

There is strong support for building on the success of Phase 1 of the NET, and Phase 2 is seen as important for the development of Nottingham city centre. The government approved funding for approximately 75% of the estimated cost of the NET Phase 2, and the remaining 25% needed to be raised from local funding (Nottingham City Council 2007). This was not attainable through existing revenue streams and as such, new funding was required, hence the motivation for the development of the WPL.

PARK AND RIDE

Park & Ride has proved very popular as a means of tackling traffic congestion, with the P&R sites situated mainly on the routes into town and city centres. The idea behind P&R is that they seek to divert traffic which is bound for the city centre off radial routes and into car parks where designated public transport is available to complete the journey. Clearly, for P&R to achieve its objective it requires:

- A frequent, reliable and fast service, since motorists have diverted from their normal route in order to take advantage of the P&R site. In terms of a fast service, users will weigh up the wait and bus journey-time in comparison to the journey solely via car.
- Provision of real-time information.
- The cost, as perceived by motorists, to be lower than that of the cost of fuel and parking in the city centre.
- Access to the P&R site to be relatively easy and convenient.
- Capacity to be such that it provides for the level of demand. Failure to do so will result in the P&R site becoming less desirable for motorists. Equally, if the P&R site is too large, it may result in greater walking to access the public transport provision for those using the site.
- Use of CCTV to alleviate concerns over users' personal safety and vehicle security.

- P&R to be part of an overall parking strategy which should include a reduction in city centre parking and an increase in relative price.

The provision of P&R can lead to effects that were not envisaged. For example, the P&R service might attract users who, before the service was available, undertook their entire journey by public transport, but who now drive to the P&R site. The result of this is that the existing public service might become unsustainable. In addition, when making the travel decisions, motorists may drive to the P&R site that is more convenient in terms of their final destination, and as such, this may involve a longer journey and impact adversely on congestion and emission levels.

7.

Consultation



Consultation is all-important in terms of parking policy, not least in order to obtain public acceptance. Consultation can be undertaken at a number of levels whether it be at a national or local level. For example, at the national level, between December 2013 and February 2014, the UK government undertook consultation on local authority parking and its enforcement so as to ensure that parking strategies both complemented and enhanced the attractiveness of city centres (gov.uk 2013). The view is that Local authority parking strategies should not act as a disincentive to shoppers wanting to visit town centres, and should be linked to local objectives and circumstances. As part of the consultation, the UK government was seeking views on a range of issues, including the use of CCTV cameras for on-street parking enforcement and giving local communities the right to require local authorities to review parts of their parking strategy, most notably the level of charges and the appropriate use of double yellow lines.

Consultation could be more local, such as seeking views on proposals for residents parking or the introduction of Controlled Parking Zones, perhaps with a leaflet giving details of the proposals and a questionnaire sent to all households and businesses in a particular area. The consultation could be wider, for example prior to the introduction of a scheme such as the WPL. As part of the lead up to the introduction of the WPL, there was a formal public consultation on the proposed WPL so as to understand the views of Nottingham residents.

For the various stakeholders to understand the scheme, a specific website was developed, providing background information on how it would operate and its likely impact on employers, employees and residents. In addition, there was a draft business case and frequently asked questions' (Nottingham City Council, 2007). This website allowed members of the public and businesses to submit responses regarding the WPL and all documents that were generated by the WPL scheme. The public consultation was made available to be downloaded from the website.

In addition to the website, a dedicated telephone hotline was available throughout the consultation period so as to answer any basic queries regarding the scheme.

A leaflet distributed to employers in Nottingham. Just under 10,000 copies of these leaflets were sent alongside 'a formal consultation letter to businesses within the Nottingham City Council administrative area' (Nottingham City Council, 2007). In addition to the employer leaflets, 113,500 A4-page residential leaflets, designed specifically for Nottingham residents, were distributed.

While the direct mailings would have informed some of the key stakeholders the details regarding the scheme, Nottingham City Council felt it was important to advertise and communicate information through the media with an additional campaign, so that a larger audience were informed. This campaign involved advertising in newspapers, on the radio, poster displays and the TV. Representations were received and accepted via letter, email or the website.

The responses from the consultation formed part of the public examination, which lasted five days and included key council members as well as stakeholders who expressed an interest in attending the examination session. Following the Public Examination, the scheme was re-evaluated. The major barrier to the implementation of any parking scheme is that of public acceptance (Frost and Ison 2009), and this is closely linked to the issue of political risk for the decision makers and the role of consultation.

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8.

Conclusion



Parking management, comprising the efficient utilisation of this important resource, is a significant element of transport policy, and can be used more widely as a means of managing urban transport and improving network traffic flows, in addition to the specific focus of managing parking. This can involve the use of the price mechanism, whereby motorists are encouraged to make a reasoned choice of parking place or even whether or not to drive, based on the price charged for parking. Over time, there has been an increase in on-street parking controls in the form of time restrictions or varied pricing tariffs, in order to encourage certain users, such as shoppers, while discouraging others, for instance, commuters. Meanwhile, the introduction of schemes, such as the Workplace Parking Levy in Nottingham and the more widespread Park and Ride now present in many cities, have been put forward as strategies to attempt to manage parking and to lessen congestion and other environmental and economic impacts arising from an increasing number of vehicles requiring parking spaces in urban areas.

An increase in car ownership within the majority of EU member states heightened the issue of demand management and the role of parking regulation and pricing. According to Rye and Koglin (2014), there are three emerging parking management issues:

- The challenge of providing residential on-street parking where demand outweighs supply.
- The initial construction and on-going operating costs of supplying off-street parking facilities.
- The issue of implementing on-street parking management often in localities outside the city centre, in particular where parking management has not been enacted before.

Parking policy is a complex and controversial issue, and one in which incremental change is more likely to gain public and political acceptance than large step changes. Central to the implementation of an acceptable and long-lasting parking management strategy is the support of motorists. This requires the use of clear and effective communication of any parking changes and their relative benefits, creating and publicising viable alternatives to the private car (such as Park and Ride) in advance of any significant change to parking policy, ensuring that revenue raised is utilised in a transparent, efficient and equitable manner, and that enforcement is seen as fair and consistent. For as long as travel by private car remains for many individuals their preferred transport mode, associated demand for parking will persist, and parking management strategies will remain at the forefront of controlling this important yet limited resource.

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ACEA

**Association des Constructeurs
Européens d'Automobiles**

**European Automobile
Manufacturers Association**

Avenue des Nerviens 85
B – 1040 Bruxelles
Belgium

T +32 2 732 55 50

F +32 2 738 73 10

www.acea.be