Parking Management:
A Contribution Towards Liveable Cities

Module 2c

Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

OVERVIEW OF THE SOURCEBOOK

Sustainable Transport:
A Sourcebook for Policy-Makers in Developing Cities

What is the Sourcebook?

This *Sourcebook* on Sustainable Urban Transport addresses the key areas of a sustainable transport policy framework for a developing city. The *Sourcebook* consists of more than 30 modules mentioned on the following pages. It is also complemented by a series of training documents and other material available from http://www.sutp.org (and http://www.sutp.cn for Chinese users).

Who is it for?

The *Sourcebook* is intended for policy-makers in developing cities, and their advisors. This target audience is reflected in the content, which provides policy tools appropriate for application in a range of developing cities. The academic sector (*e.g.* universities) has also benefited from this material.

How is it supposed to be used?

The *Sourcebook* can be used in a number of ways. If printed, it should be kept in one location, and the different modules provided to officials involved in urban transport. The *Sourcebook* can be easily adapted to fit a formal short course training event, or can serve as a guide for developing a curriculum or other training program in the area of urban transport. GTZ has and is still further elaborating training packages for selected modules, all available since October 2004 from http://www.sutp.org or http://www.sutp.cn.

What are some of the key features?

The key features of the *Sourcebook* include:

- A practical orientation, focusing on best practices in planning and regulation and, where possible, successful experiences in developing cities.
- Contributors are leading experts in their fields.
- An attractive and easy-to-read, colour layout.
- Non-technical language (to the extent possible), with technical terms explained.
- Updates via the Internet.

How do I get a copy?

Electronic versions (pdf) of the modules are available at http://www.sutp.org or http://www.sutp.cn. Due to the updating of all modules print versions of the English language edition are no longer available. A print version of the first 20 modules in Chinese language is sold throughout China by Communication Press and a compilation of selected modules is being sold by McMillan, India, in South Asia. Any questions regarding the use of the modules can be directed to sutp@sutp.org or transport@gtz.de.

Comments or feedback?

We would welcome any of your comments or suggestions, on any aspect of the *Sourcebook*, by e-mail to sutp@sutp.org and transport@gtz.de, or by surface mail to:

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Further modules and resources

Further modules are under preparation in the areas of *Energy Efficiency for Urban Transport* and *Public Transport Integration*.

Additional resources are being developed, and Urban Transport Photo CD-ROMs and DVD are available (some photos have been uploaded in http://www.sutp.org – photo section). You will also find relevant links, bibliographical references and more than 400 documents and presentations under http://www.sutp.org, (http://www.sutp.cn for Chinese users).

Modules and contributors

(i) *Sourcebook Overview and Cross-cutting Issues of Urban Transport* (GTZ)

Institutional and policy orientation

1a. *The Role of Transport in Urban Development Policy* (Enrique Peñalosa)

1b. *Urban Transport Institutions* (Richard Meakin)

1c. *Private Sector Participation in Urban Transport Infrastructure Provision* (Christopher Zegras, MIT)

1d. *Economic Instruments* (Manfred Breithaupt, GTZ)

1e. *Raising Public Awareness about Sustainable Urban Transport* (Karl Fjellstrom, Carlos F. Pardo, GTZ)

1f. *Financing Sustainable Urban Transport* (Ko Sakamoto, TRL)

1g. *Urban Freight in Developing Cities* (Bernhard O. Herzog)

Land use planning and demand management

2a. *Land Use Planning and Urban Transport* (Rudolf Petersen, Wuppertal Institute)

2b. *Mobility Management* (Todd Litman, VTPI)

2c. *Parking Management: A Contribution Towards Liveable Cities* (Tom Rye)

Transit, walking and cycling

3a. *Mass Transit Options* (Lloyd Wright, ITDP; Karl Fjellstrom, GTZ)

3b. *Bus Rapid Transit* (Lloyd Wright, ITDP)

3c. *Bus Regulation & Planning* (Richard Meakin)

3d. *Preserving and Expanding the Role of Non-motorised Transport* (Walter Hook, ITDP)

3e. *Car-Free Development* (Lloyd Wright, ITDP)

Vehicles and fuels

4a. *Cleaner Fuels and Vehicle Technologies* (Michael Walsh; Reinhard Kolke, Umweltbundesamt – UBA)

4b. *Inspection & Maintenance and Roadworthiness* (Reinhard Kolke, UBA)

4c. *Two- and Three-Wheelers* (Jitendra Shah, World Bank; N.V. Iyer, Bajaj Auto)

4d. *Natural Gas Vehicles* (MVV InnoTec)

4e. *Intelligent Transport Systems* (Phil Sayeg, TRA; Phil Charles, University of Queensland)

4f. *EcoDriving* (VTL; Manfred Breithaupt, Oliver Eberz, GTZ)

Environmental and health impacts

5a. *Air Quality Management* (Dietrich Schwela, World Health Organization)

5b. *Urban Road Safety* (Jacqueline Lacroix, DVR; David Silcock, GRSP)

5c. *Noise and its Abatement* (Civic Exchange Hong Kong; GTZ; UBA)

5d. *The CDM in the Transport Sector* (Jürg M. Grütter)

5e. *Transport and Climate Change* (Holger Dalkmann; Charlotte Brannigan, C4S)

5f. *Adapting Urban Transport to Climate Change* (Urda Eichhorst, Wuppertal Institute)

Resources

6. *Resources for Policy-makers* (GTZ)

Social and cross-cutting issues on urban transport

7a. *Gender and Urban Transport: Smart and Affordable* (Mika Kunieda; Aimée Gauthier)

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About the author

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Parking Management: A Contribution Towards Liveable Cities

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1. Introduction

1.1 Why should you read this module?

Every car that is on the road needs a place to be parked: it is a key issue in almost all urban areas. Cars take up space when they are moving but for an average of 23 hours of the day they are parked, and if they were to be used for all journeys then they would need a parking space at both ends of every trip – so many spaces are required for every car. A parked car takes up around 8 square metres when parked and often the same again in manoeuvring space – a huge amount in dense urban areas where land is expensive. Often, cars get more space to park than humans have to live in!

This module offers measures to address parking problems. It is aimed primarily at stakeholders in local, regional or national governments and anybody with an interest in this issue This includes not only traffic engineers but also policy makers, land use planners, transport planners, urban designers and in general anyone who has an interest in making parking more efficient and more sustainable.

1.2 Why is parking so important?

The availability and cost of a parking space is an important determinant of whether or not people choose to drive to a particular destination, and also whether they choose to own a car at all. It is likely that the relatively lower levels of car ownership in many inner cities in developed countries, such as Munich or London, are – in spite of their greater wealth relative to other areas – partly a result of the lack of on-street parking (so nowhere to put a car), as well as the above average levels of public transport accessibility and service.

Local authorities have direct control over the use of kerbspace (other than on national roads) in their areas, and therefore of the supply and price of on-street parking. In some cases, this extends to public off-street car parks. The extent to which local authorities are the provider of public off-street parking varies from locality to locality. In many developing country cities, there may be very little formal off-street parking available, whether owned by the municipality or not. Through the development control process for new buildings, local governments can also have some control over the level of parking that is provided in new developments. This is called "parking bundling", which might not be justified to all the income groups.

Whilst parking controls and prices are rarely popular with the public, they are policy options that are relatively well-known and accepted even in many cities in developing countries. If there is an obvious shortage of parking spaces then many people may accept that there is a need for parking controls. Parking controls and pricing are transport demand management measures implemented frequently by local authorities, yet little of the academic literature deals with experience of this policy, preferring instead to concentrate on the politically "more lucrative" topic of congestion charging. This module attempts to redress that balance a little.

1.3 What's wrong with parking in many towns and cities?

"Parking spaces attract cars; so they generate car traffic. Parking needs space, which is not available for other street uses. Nothing else has changed the traditional streetscape as dramatically as parked cars have done during the last few decades."

Hartmut H. Topp, Professor at the University of Kaiserslautern, Germany

There are examples of cities in developing countries that do have some parking management in place. However, in many towns and cities parking is not managed at all, mismanaged or managed only in very limited areas. Some of the typical problems faced by cities all around the world, but particularly in developing countries include the following:

- The people who get to use parking spaces are those that arrive there first, but this might not be the most beneficial use where parking spaces are scarce. Who contributes more to the local economy: the shopkeeper parking outside his shop all day, or the eight people

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Figure 1
Chaotic traffic due to parked cars and taxis.

Photo courtesy of Walid A. Noori, Kabul, Afghanistan, 2007

Figures 2a, b
Parked cars and lack of walkways forces pedestrians to walk on the street.

Photos by Santhosh Kodukula, Delhi, India, 2008 (left) and Armin Wagner, Nis, Serbia, 2007 (right)

who park for an hour each in the same space and shop at local shops?

■ On-street parking causes safety and congestion problems by blocking one or two traffic lanes, narrowing streets to one lane, reducing visibility and forcing pedestrians to walk in the road if no proper footpaths are provided. In addition, it may obstruct access for emergency services.

■ Poor management of on-street parking and/or lack of information about parking availability in areas of high demand lead to large amounts of traffic circulating looking for a parking space, contributing to congestion and pollution.

■ Parking regulations are not enforced, or poorly enforced, and enforcement and management is sometimes informal and/or corrupt.

■ Parking on pedestrian areas (footpaths, across street corners) makes streets inaccessible to parents with push-chairs, physically challenged people, and discourages people from walking. This renders the urban environment less attractive and hence reduces the economic activity. In return, it makes people more car-dependent.

■ Where on-street parking is priced, it is often cheaper than off-street parking. As a result, people look for a scarce space on the street whilst off-street car parks lie half empty.

■ The fact that there is some parking available in city centres encourages people to drive there, while congestion and pollution could be reduced by having less parking in town to encourage people to use other modes of transport instead.

■ Town and city centres are concerned about losing custom to edge of town developments with lots of parking, so they respond by trying to make it easier to park.

This module offers a range of measures to better manage such problems. They are tailored to the needs of developing country cities, based on case studies around the world. It draws on examples of good practice from the developing world as well as from Europe and North America. The main message emerging from those examples is: *it is possible to better manage parking and solve parking problems!*

1.4 Ten common myths about parking[1]

Parking management offers a broad and open field of discussions. It is not possible just to copy a set of actions which proved to be successful in a specific situation to another setting. Parking management has to be adapted to the specific situation and solutions have to be introduced which meet the respective specific requirements. Very often the different stakeholders affected by parking management use the same arguments against it which show up as myths that cannot be verified when we have a closer view on it. In this section the following most common ten myths of parking will be discussed.

Box 1:
Ten common myths about parking
- Successful cities have abundant parking.
- It's difficult to find parking in the neighbourhood. We need to build more parking facilities.
- Parking should be offered free.
- All motorists are created equal.
- People do not like to walk. Parking needs to be right in front of the door.
- Having fewer parking spaces means that people will just drive around looking for space.
- Parking ratios can be easily looked up in a manual.
- All households, even low-income ones, need parking.
- Fewer parking spaces would be fine, if only we had decent public transport.
- Parking isn't just unglamorous, it's unimportant.

Successful cities have abundant parking

No, it were the successful cities which were faced first with parking problems since they attract too many commuters, shoppers, visitors. A successful city recognizes that urban quality is much more than offering abundant parking, but requires a balanced supply of roads, parking, public transport, bike and pedestrian facilities and open spaces. The contribution of parking to find this balance is to define the "Qualified

[1] Based on "The Mythology of parking", by Jeffery Tumlin and Adam Millard-Gall, published on http://www.hyde-park.org/transit/parkingwoes.htm

Figure 3
Parking spaces are a scarce good in many cities.
Photo by Dominik Schmid, Paris, France, 2006

Demand" and to adjust the parking supply to this qualified demand by offering only as much parking spaces as necessary and introducing a rational pricing policy that charges more for the most desirable, most scarce parking spaces.

It is difficult to find parking in the neighbourhood. We need to build more parking facilities.

Motorists aren't interested in how many parking spaces a neighbourhood has. What matters is how easily they can find one – the only one they just need at a specific time and location. Maintaining availability is therefore a key goal, but building more spaces is only one way to achieve it. And usually this is quite an expensive way. Most of the time, it will be far cheaper to free up spaces by using demand management strategies. To introduce parking charges or to increase them will encourage some motorists to carpool, to use public transport, to walk, or to cycle. It's also important to discuss the perceptions of parking shortages. Often, people complain of parking problems when actual counts show that only 60–75 % of the spaces are occupied. The key is to use pricing and time limits to free up the spaces for those users who really need it. Dynamic information systems can offer the motorists real-time information about where spaces are available.

Parking should be offered free.

Parking is often provided free of charge to motorists. Every space, however, entails

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significant costs for developers, owners, tenants, and/or taxpayers. So while parking fees are often subsumed ("bundled") into rents, lease fees, or sale prices, the costs are borne by everyone, including those who don't own a car, choose to walk, to use public transport or to cycle. And these costs are substantial.

All motorists are created equal.

Yes, but not all motorists have the same needs at each location. And, not only motorists have requirements to specific locations. Residents, shoppers, visitors, users of other means of transport, even "the general public" have also their needs. If, as usual, not all needs can be fulfilled, balanced solutions have to be developed including parking management strategies. Even motorists have different views on their needs, depending if they are just driving along or looking for a parking space. Hence, providing parking concentrating on the motorist will be a narrow vision where the vulnerable road users are neglected.

People do not like to walk. Parking needs to be right in front of the door.

Yes, but physically not all parking spaces can be provided in front of a building – or behind, or lateral, or under. And again, there exist a lot of other needs from other users to the limited available space. Parking management measures (such as the number of on- and off-street parking spaces, parking charges, maximum allowed parking time, preferred user groups) helps to balance out this several needs. Of course, parking for people who need support, like disabled people, has to be provided at preferred locations.

Having fewer parking spaces means that people will just drive around looking for space.

Often, additional traffic caused by motorists looking for a parking space is an important concern. However, in many cases this reflects poor management, rather than the number of spaces available. If motorists know that in a specific area there will be no "free" (no charge, no time limit) parking they will not look for it in that location. This could trigger a modal shift in the motorists travel behaviour. Additionally, dynamic real-time information that directs

motorists to facilities with available space is also an effective way to reduce this orientation traffic. At the same time having control on the supply of parking spaces is necessary.

Parking ratios can be easily looked up in a manual.

Parking standards for private parking supply are set by local jurisdictions reflecting average situations. Usually they are based on mono-functional use and do neither reflect the possibilities of multiple use nor the possibilities of the usage of alternative modes of transport. Therefore the application of these standards leads very often to a surplus of parking spaces. More importantly, the amount of parking needed is primarily a value judgement, rather than a technical exercise. Developers, administration and politicians must ask, at what point do the benefits of ample parking outweigh the negative consequences? Is there enough roadway capacity to serve an increase in parking? Does additional parking or greater investment in transit fit better with the values of the community?

All households, even low-income ones, need parking.

Not each household owns a car. There always will be households, which will not own a car. Rather there is a specific group of households which tends to avoid owning a car. And, mainly related to the income of the household, some households own only one car, while other own more. These aspects should be considered when planning parking for housing. There is the possibility to provide housing without car parks, *e.g.* in mixed-use areas or near to attractive public transports stops, but in other areas there might be the need to provide two or even more car parks per household. The costs of these car parks have to be paid by those who use them and not by the whole community.

Fewer parking spaces would be fine, if only we had decent public transport.

Yes, to reduce the parking supply means to have appropriate alternatives. Very often these alternatives exist but they are not known by the car users. Therefore along with the introduction of a parking management scheme the information about alternatives is necessary. If there is

no acceptable public transport available at the origins of the trips, Park and Ride will help to ensure the accessibility of the areas.

Parking isn't just unglamorous, it's unimportant.

Parking is important and has a crucial meaning to ensure the liveability of our settlements. But parking is only one of several needs of the urban society. Therefore in each situation it has to be balanced out which parking supply meets best the qualified demand for the respective area.

1.5 Conclusion

This chapter has set out the reasons for reading this book and some common myths about parking. The message is that parking is a vital urban and transport resource that needs to be efficiently managed. Proper parking management would reduce the need to travel longer distances, reduce the amount of short trips and also initiate a modal shift to other climate friendly modes of travel. The next chapters explain how parking can be efficiently managed.

Further resources

- **Reinventing Parking**: A key aim of this blog is to help inform the parking policy choices confronting decision-makers and communities. Blog by Paul Barter:
  http://www.reinventingparking.org

- **The High Cost of Free Parking**: Detailed analysis of parking problems and comprehensive overview of solutions. More on:
  http://shoup.bol.ucla.edu

- **U.S. Parking Policies**: An Overview of Management Strategies: This report identifies core sustainable parking principles and illustrates how smarter parking management can benefit consumers and businesses. Download:
  http://www.itdp.org/documents/ITDP_US_Parking_Report.pdf

2. Parking: some definitions

This chapter introduces some basic concepts and definitions in parking. It also discusses different types of policies that can be pursued by local authorities to manage parking.

2.1 Parking Demand

The necessity for a car to be parked is called Parking Demand. If the number of cars in a locality, neighborhood or a city increases, so does the demand for parking spaces. The demand further grows when a majority of the cars in the locality are in transit, as they need more than one parking place. In many developing countries, the proportion of the population that has access to a car is small: for example, in Istanbul, the number of cars per 1,000 population is 134 (Gercek, 2005), and in South Asia, 10 (World Bank 2006)[2]. Nonetheless, the density of the population of many lower and middle income cities, often combined with little off-street parking, means that the impacts of parked cars on the streets in the more affluent parts of such cities is enormous. In addition, the growth rates in car ownership in the developing world are much higher than in wealthy countries: according to the World Bank (op cit), the number of motor vehicles per thousand people in low and middle income countries combined rose from 25 in 1990 to 47 in 2003. This constitutes an 88 % increase, compared to "just" 25 % in high income countries.

In 2000, there were more than 750 million cars and light duty vans in the world, a number growing at about 2 % per year. There are only two places where these vehicles can be found: they are either on-street or off-street. If they are on-street, they can be considered to be parked, searching for parking or in transit. Almost all cars that are off-street will be parked. Estimates show that cars spend more than 95 % of their lives parked (Collins 1991).

Parking problems begin to arise when demand for parking space exceeds supply. Typically,

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[2] http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/0,,contentMDK:21822014~menuPK:5253500~pagePK:210058~piPK:210062~theSitePK:337116,00.html

town and city centres are where these problems occur first, and then they spread outwards from there. In some former Soviet countries in Eastern Europe and Central Asia, very rapid motorisation since the collapse of the former USSR has also generated immense residential parking problems in dense post-war housing areas that were built without any residential parking on the assumption of very low levels of car ownership.

2.2 Qualified demand

It is common in medium and larger cities that in certain places at certain times demand for parking exceeds supply. In this situation, the question arises: which users should have access to the limited parking available? A typical approach of many Western cities, which is also seen to some extent in the most developed Chinese cities such as Beijing and Shenzen, is the following:

■ Residents are often top of the priority list, due to their political importance at the local level. Residents will be given preferential access to on-street parking and/or reduced rate access to off-street parking.

Figure 4
On-street parking in a residential street in Bangkok.

Photo by Carlos Felipe Pardo, Bangkok, Thailand, 2006

■ Business visitors, tourists and shoppers are next in line for access to space, although – where charging exists – they will be expected to pay more than residents.
■ Commuters are last in line for access to on-street parking especially, because they are seen to contribute most to rush hour congestion.
■ Deliveries also need kerbspace which means giving them access to the kerb at some time of day, although this can be negotiated – it might be at night, or early in the morning (for further information on parking issues in urban freight deliveries, see GTZ *Sourcebook* Module 1g: *Urban Freight in Developing Cities*).

2.3 Types of parking

There are four main types of parking. These are:
■ *On-street*. As its name suggests, a parking space on the public road – although this may become somewhat blurred if a road, or the side of the road, is only semi-public. On-street parking often takes place, either legally or not, on space at the side of the road that is nominally reserved for pedestrians. (Figure 4)
■ *Public off-street*. A car park not on the public road, in which any member of the public can park their car, subject to complying with any regulations (*e.g.* maximum stay (in hours), or paying a fee). This kind of car park may be owned and/or operated by the public and/or private sector.
■ *Private non-residential (PNR) off-street*. This is car parking that is associated with a particular building or land-use. Examples include parking for a shopping centre, or an office building. Only people who are connected with that building or land-use should, in theory, be able to use the parking, and the

Table 1: Parking type and the sector controlling and/or supplying it

Location	On-Street				Off-Street				
Use	Public				Private	Public			
Owned	Public				Private	Private	Public		
Operated	Public or private				Private	Private	Private	Public	
Type	Free	Priced	Permit	Duration Control	Free	Priced	Priced	Free	Priced

land-owner has control over this use –within relevant legal constraints (Figure 5).

■ *Private residential parking*. This usually refers to off-street parking associated with houses or flats. In theory, only the residents of these houses or flats should be able to use the parking (Table 1).

2.4 On-street Parking

On-street parking is almost always publicly owned and is provided by local authorities under the general guidance of central government In some capital cities, special rules made by central government apply. Normally, though, local authorities determine which restrictions should apply in specified streets, within central government guidelines. They take into account the national and local pressures for road safety, traffic flow, public transport provision and movement, the functioning of the local economy, the needs of residents and access for emergency services. In many countries, the local community needs to be involved in the process of introducing parking restrictions. Any changes must be communicated effectively to local road users. This topic will be addressed later in the document when we consider how to build acceptance for parking policy changes.

In some countries, such as Russia, no public authority has any power to regulate the use of on-street parking, to charge for its use and/or to penalise motorists who do not comply with regulations. There are some self-enforcing physical measures that can be used to manage parking in some situations in such countries but essentially it is imperative that in such countries legislation to enable at least the option of the regulation of parking is passed, otherwise it will remain impossible to manage in any strategic way.

The extent to which unregulated kerbspace is used for parking is also determined by the demand of the area and the availability of off-street alternatives. Parking restrictions will generally only be considered when supply is exceeded by demand in a particular area (Balcombe and York, 1993), or where safety problems are caused by parking (*e.g.* sightlines at junctions are restricted). Parking management is not found in every city in the developing world but it is much more widespread than might be

imagined: for example 31 major Chinese cities in all except one province have implemented at least some areas of paid on-street parking to deal with problems of demand exceeding supply – so to see parking management as solely the preserve of wealthy western cities is a fallacy (Figure 6).

Figure 5
PNR parking in a commercial area.
Photo by Santhosh Kodukula, Bangkok, Thailand, 2008

Figure 6
On-street parking restrictions are a key issue in parking management.
Photo courtesy of Walid A. Noori, Kabul, Afghanistan, 2008

3. Parking management strategies

3.1 Introduction:
matching problems and solutions

The following table is a form of decision support guide. On the left is a list of typical parking problems. On the right are some actions that can be taken to deal with these issues and references to further information later in this module.

Table 2: Decision support guide

Problem	Responses and examples
The people who get to use parking spaces are those that arrive there first but this might not be the most beneficial use where parking spaces are scarce.	■ Restrict maximum length of stay in some parking spaces. Example: Shiraz, Kampala. ■ Price: if priced, cheaper per hour for short stays than long stays. Example: Delhi. ■ Provide and/or make people more aware of off-street parking. Example: Shiraz.
On-street parking causes safety and congestion problems.	■ Restrict parking on main roads at congested times. Example: Kampala, Beijing, Bogotá. ■ Restrict parking where it causes safety problems. ■ Price/advertise off-street parking to make it more attractive. Example: Beijing.
Poor management of on-street parking and/or lack of information about parking availability in areas of high demand leads to large amounts of traffic circulating looking for a parking space contributing to congestion and pollution.	■ Provide more information. ■ Price/advertise off-street parking to make it more attractive. Example: Beijing. ■ Park and ride. Example: Istanbul.
Parking regulations are not enforced or poorly enforced and enforcement and management is sometimes informal and/or corrupt.	■ Improve enforcement. Examples: Accra, Beijing. ■ Change organisational practices. ■ Change institutional structure. Examples: Kampala, Istanbul.
Parking on pedestrian areas (footways across street corners) makes streets inaccessible to pedestrians.	■ Better enforcement. Example: Bogotá. ■ Self enforcing measures. Example: Sarajevo.
Where on-street parking is priced then it is often cheaper than off-street parking so people look for a scarce space on street whilst off-street car parks lie half empty.	■ Change pricing structures. Example: Beijing. ■ Better advertise off-street parking. ■ Improve quality of off-street parking.
The fact that there is some (free) parking available in city centres encourages people to drive there.	■ Gradually reduce supply of and/or increase price of parking in town/city centre. Example: Shenzen. ■ Park and ride as alternative to city centre parking. Example: Prague. ■ Limit maximum lengths of stay to encourage short stay parking but to discourage commuters. Example: Istanbul.
Town and city centres are concerned about losing custom to edge of town developments with lots of parking so they respond by trying to make it easier to park.	■ Providing more, cheaper parking can encourage more people to drive thus making the city centre even more congested. ■ Use space-efficient modes *e.g.* BRT to improve relative accessibility of city centre instead. Example: Bogotá, Curitiba. ■ Use pedestrianisation and parking management to improve the city centre environment so that people enjoy the city centre more and come there more often. Example: Bogotá.

Table 3: Parking policies worldwide (I)

	Instruments	Africa		Asia						Australia/ Pacific			Europe				
		Cape Town*	Johannesburg*	Beijing	Hong Kong	Seoul	Tokyo	Singapore	Mumbai	Melbourne	Sydney	Auckalnd	Frankfurt (Main)	Munich	Brussels	Paris	London
Regulation	On-street parking regulation	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
Regulation	Off-street parking regulation			✔	✔		✔	✔	✔		✔	✔	✔	✔		✔	✔
Regulation	Limits for maximum length of stay						✔			✔		✔				✔	✔
Regulation	Improved enforcement	✔								✔	✔					✔	
Economic incentives	On-street parking pricing	✔		✔		✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	
Economic incentives	Off-street parking pricing			✔			✔	✔	✔	✔	✔	✔	✔	✔		✔	
Economic incentives	Smart Pricing			✔						✔	✔	✔				✔	
Planning	Dedicated Residential parking areas					✔					✔		✔			✔	
Planning	Maximum parking standards for new buildings	✔				✔		✔		✔		✔		✔		✔	
Planning	Park&Ride facilities			✔	(✔)							✔	✔	✔	✔		✔
Planning	Parking guidance system							✔		(✔)			✔	✔	✔	✔	
Others	Evaluation of supply and demand for parking facilities	✔								✔		✔					

Please note:

(✔) *indicates a measure currently only evaluated or in a very early planning stage;*

★ *indicates that a dedicated parking management strategy is currently being developed;*

Source: municipal planning documents. Actual set of measures may be wider than indicated above.

Table 3: Parking policies worldwide (II)

	Instruments	Europe (continued)				North America									
		Madrid	Barcelona	Vienna	Zurich	San Francisco	Chicago	Denver *	Houston	Los Angeles	New York *	Montreal	Ottawa *	Toronto	vancouver
Regulation	On-street parking regulation	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Off-street parking regulation	✔		✔	✔	✔	✔						✔	✔	✔
	Limits for maximum length of stay				✔										✔
	Improved enforcement		✔			✔				✔	✔	✔			
Economic Incentives	On-street parking pricing				✔	✔		✔		✔	✔	✔			✔
	Off-street parking pricing	✔		✔		✔									
	Smart Pricing	(✔)				✔				✔	✔				
Planning	Dedicated Residential parking areas		✔		✔	✔					(✔)			✔	
	Maximum parking standards for new buildings	✔		(✔)		✔	✔			✔		✔	✔		✔
	Park&Ride facilities			✔				✔		✔		✔	✔		
	Parking guidance system			✔	✔						✔	✔			(✔)
Others	Evaluation of supply and demand for parking facilities				✔		✔								

Please note:

(✔) *indicates a measure currently only evaluated or in a very early planning stage;*

∗ *indicates that a dedicated parking management strategy is currently being developed;*
Source: municipal planning documents. Actual set of measures may be wider than indicated above.

The chapter will now look at some of these measures in the context of a parking policy, and how they can be implemented.

3.2 Using parking to achieve transport objectives – developing a parking policy

Introduction

There is a tendency in many cities in developing countries to deal with parking management in a rather reactive way. If a parking problem appears in an area parking management is implemented in that location only to deal with the specific problem. However, if parking is addressed in a more strategic way, then it can be used very effectively as a way to help achieve many environmental, social and economic objectives. National transport policies have remarkably similar objectives across many countries. The following are typical:

■ Developing the local and national economy and making city centres attractive for economic activities;
■ Reducing car use to reduce congestion;
■ Encouraging the use of alternatives to the car;
■ Improving public transport, including its integration with other modes, especially in larger towns and cities;
■ Reducing the environmental impacts of car use;
■ Making sure that transport is fully accessible for all groups of the society.

Developing a *Parking Management Strategy* helps to think in a structured way about how parking can help to achieve these wider objectives. This is not just a feature of parking policy in the west: developing cities like Kampala, Beijing, Shenzen, Delhi, Istanbul and Shiraz (Iran) have thought about parking in a strategic way, considering how it can be managed to help achieve objectives.

Development of a typical parking policy

The report COST 342 (pp. 20–21) sets out a useful chronology of the development of a typical parking policy, referring particularly to on-street parking. It is useful to remember that, generally, parking policies will only start to develop formally when parking demand starts to exceed supply, because that is when problems start to occur. COST's typology starts before this stage:

Stage 1 – no problems, available parking space is gradually used up.

Stage 2 – as demand starts to exceed supply in certain streets, so regulations are introduced in those streets. Parking may be prohibited in some locations, more clearly marked in others.

Stage 3 – as demand further increases, some form of time limit is introduced in towns and city centres, in order to increase the turnover of spaces so that they are more likely to be used by shoppers and visitors, and less by commuters. Disc parking or signed zones may be the initial method used to stimulate turnover, but pricing may then be introduced to further manage the parking stock. Underground and/or off-street parking may also be built at this stage to supplement and replace on-street parking.

Stage 4 – commuters are pushed into surrounding areas. Competition with residents for parking space develops. Residents' zones are introduced to deal with this.

Stage 5 – more and more differentiation of parking tariffs is introduced to target different groups, and to encourage use by one group more than another.

Stage 6 – development of park and ride facilities on edge of town.

Stage 7 – inclusion of parking in transport demand management.

Box 2: Disc parking

Widely used in Western European countries, disc parking reduces the maximum time a vehicle is allowed to spend in a given parking space. Depending on the location and policy, maximum stay times vary from a few minutes only to several hours. This kind of parking restriction is typically enforced by municipal staff, which regularly checks the correct setting of parking discs and issues fines for overstays.

Rules vary from city to city, but the following guidance taken from Harrogate Borough Council, UK, (http://www.harrogate.gov.uk/harrogate-1308) may be considered a typical example:

1. On parking set the disc at the time of arrival.
2. Display the disc inside either the front windscreen or side window which is nearest the kerb.
3. For permitted parking and reparking times refer to the sign at the parking place.
4. You have commited a contravention if:
   - You park and fail to display a disc.
   - You indicate a false time of arrival or subsequently change it.
   - You fail to remove the vehicle on the expiry of the permitted stay time.

Figure 7
Parking disc design in Germany (top, Ankunftszeit = time of arrival), and corresponding indication of a parking disc zone with 2 hours maximum stay.

Kampala, Uganda is an example of a city that has moved through the first stages of this parking policy development.

Box 3: Kampala City, Uganda

Kampala City is the hub of the country's economic, political, and administrative activities. About 80 % of the country's industrial services are located in Kampala and the city generates a big proportion of Uganda's GDP. The economic future of Uganda is thus intrinsically linked to the performance of Kampala, and this highlights the importance of the city's ability to provide social-economic services needed by the residents.

Unfortunately, the city's delivery capabilities have not kept pace with its economic and demographic growth. Deficiencies in its organisation, management and financial and human resource capabilities, and revenue base constrain the council's ability to provide the required levels and quality of services.

Kampala City Councils main problem is the heavy congestion of the city centre, as the rest of Ugandans tends to move to their capital city. Initially the city had been planned for 300,000 people but a census in 2002 showed that there are 1.2 million people residing rising to 2.5 million during day time.

KCC strategy

In order to counter the problem of city congestion a number of initiatives were developed by the city council in cooperation with the Uganda Government, through the ministry of Local Government.

In 1997, Kampala City Council **(KCC)** developed a set of reforms designed to bring a change in **KCC's** approach to service delivery in the city. These reforms were first documented in the **Strategic Framework for Reform (SFR)** document 1997 during which time **KCC's** mission was formulated as being "**to provide and facilitate the delivery of quality, sustainable and customer oriented services effectively and efficiently**". It's through this Framework that a paid on-street parking was introduced.

The contract to run Kampala City on-street parking was awarded, in 1997, to Green Boat

Entertainment after a process of competitive bidding. The contract was to run from 1998 – 2002 after which it would be re-advertised. Kampala City council was to get UGX 70 million per month and any amount extra that remained from the Green Boat Entertainment operations would be taken as profit. Under the contract Green Boat Entertainment was to undertake enforcement and administration of the parking within the city. A new contract was awarded to Multiplex Uganda Limited and runs from 2003 and is renewed every 4 years. **KCC** earns UGX 80 million per month in this contract.

The **Strategic Framework for Reform** is a living document that is updated from time to time. The current version of the **SFR** was adopted by the city council in November 2004 and it spells out the **KCC** vision 2015 goals and objectives.

KCC's mission statement: "To provide and facilitate the delivery of quality, sustainable and customer oriented services efficiently and effectively".

KCC's Vision 2015: "to have a secure, economically vibrant, well managed, sustainable and environmentally pleasant city that anyone would enjoy visiting and living in".

KCC's Goal: "to achieve sustainable urban development through two pillars:

- Good urban management; and
- Good governance.

KCC's Strategic Framework for Reform involved a number of transport and traffic related studies. Two particular studies were included in the **SFR** report and they were a short term **Kampala Urban Traffic Improvement Plan** and a long **Term Greater Metropolitan Area Traffic Management Plan**. These plans were included in The **Kampala Institutional and Infrastructure Development Program (KIIDP)**, a breakdown of **SFR**. Under **KIIDP** a number of City roads were converted into one way streets to try and make way for the paid on street parking.

Parking in Kampala City

The paid on-street parking in Kampala is based in the central business area. The streets include the following:
Lumum Street, William Street, Market Street, Burton Street, Ben Kiwanuka street and Channel street. The paid on-street parking also includes areas of Kampala Road and Jinja road, along the main Kampala Business area. There are also several roads and avenues where paid on-street parking is available. These are areas were car owners are willing to pay for car parking.

The price of parking is UGX 400 UG (about USD 0.17) per hour. A new ticket will have to be purchased for every hour to a maximum of 3 hours per parking lot, after which it's deemed illegal to park. Failure to display a parking ticket on parking results into a fine of UGX 1,500 (about USD 0.65) on top of paying for the ticket (UGX 400). Parking beyond the maximum period of 3 hours also results into the same fine.

The long term Greater Kampala Metropolitan Area Transport Plan involved plans to expand the paid on-street parking to the outskirts of the city centre to include areas along Jinja Road tending to Nakawa, Mulago, Namuwongo, Katwe, Mengo-Kisenyi and Makerere Kivvulu city suburbs. These areas however have low income earners and a high crime rate. It's impossible to imagine one parking in these areas, let alone paying for parking. KCC however hopes to develop these areas as part of its long term projects.

Paid off-street parking

Paid off-street parking is almost none existent in Kampala city. KCC does issue out licences to land owners to provide off-street parking but these facilities are only provided for a limited time after which the land is developed. Paid off-street parking is also very expensive and can only be afforded by a few citizens. There are no standard rates as these vary as per owners wish. It's thus difficult to establish a relationship between on- and off-street parking. The areas where KCC hopes to extend paid on-street parking, (Jinja Road tending to Nakawa, Mulago, Namuwongo, Katwe, Mengo-Kisenyi and Makerere Kivvulu city suburbs) should be used to develop paid off-street parking, as they are near the city centre and would divert traffic from the main city centre.

Benefits of introducing paid on-street parking

Restricting the amount of parking places and adjusting the cost of parking is a good instrument for reducing car traffic in the city centre. In the City of Kampala the capacity to regulate car parking is limited by the small fee charged

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to all motorists and the fact that many of the parking lots are private.

Some of the notable benefits of introduction of paid on-street parking in Kampala include the following:

- Multiple users can now reach multiple destinations within the business area of the city. There was difficulty in accessing some parts of the business area particularly as cars previously parked all day in one spot thus not giving chance to other cars to park. Now there is easy access to the businesses located on the City streets.
- The paid on-street parking creates a buffer between walking pedestrians and moving traffic. As such there is a claim by Uganda Police for a reduction in accidents in the city. Its however very hard to justify these claims due to poor record keeping and administration in Uganda Police.
- A major benefit of the parking is the revenue obtained by KCC. Paid on-street parking was previously not thought of in Kampala City. Its introduction is thus an un-budgeted source of revenue to the City Council.

The lack of space in the city centre still remains a great problem for Kampala City. Although on-street parking uses less land per space as compared to off street parking, the city still has narrow streets that do not allow street parking. There has also been increased congestion as a result of car drivers looking for spaces to park within the city centre. Drivers keep on rotating from street to street looking for spaces thus creating congestion on these streets. On street parking has thus attracted more vehicles into the city than was previously seen.

Further information available at the following sources:
http://www.kampala-city-guide.com, for streets, Avenues and roads in Kampala City
http://www.citycouncilofkampala.go.ug, for several documents such as **SFR** and **KIIDP**.

Author of this case study: Gilbert Okwong

Beneficiaries of a structured parking policy

A parking policy is introduced to improve the transport, environmental and economic situation in a city for most travelers. This does not mean that absolutely everyone will benefit, but generally more people will benefit than will lose out. This is shown in Table 4.

Table 4: Beneficiaries of parking policy, by user group

User group	Parking policy objectives for this group	Parking management measures applied
Residents dependent on on-street parking	To ensure access to on-street parking	Residents' parking zones, with limited access to parking for other user groups;
Commuters	To shift their trips to modes other than car	Time limits and limited amounts of on-street and off-street parking; limited construction of new parking with new offices and factories, park and ride; improved public transport;
Business visitors	To give opportunity to park conveniently for short-term business trips (up to 4 hours) – but may be at a charge	Controlled parking zone, offering some paid on-street parking, priced to maintain turnover and limit maximum stay; Off-street parking priced to deter long stays;
Shoppers and tourists	Same as for business visitors	Same as for business visitors; also improvements to alternative modes, including park and ride;
Disabled people (see also pedestrians)	Maintaining/enhancing accessibility	Within controlled parking zones, ensuring availability and enforcement of disabled parking spaces/areas; Parking standards for new buildings requiring a certain amount of disabled parking.
Pedestrians, cyclists	Increased amount of space	On-street parking controls
Public transport passengers	Increased amount of space to provide public transport priority	On-street parking controls

3.3 Aligning the parking policy with a general Transportation Demand Management strategy

As elaborated, parking management is one powerful tool to address urban development objectives and in that sense to address transport demand. However, it is only one tool among many others. In order to maximise the impact of parking management, the objectives and elements of the parking management strategy need to be closely aligned with other elements of the general Transportation Demand Management (TDM) strategy. Parking management measures can act as PUSH-factors to support the shift to public transport and to avoid unnecessary trips. The table below depicts the full set of PUSH and PULL measures that can form an overall TDM-strategy. For more information on TDM please refer to the GTZ-SUTP training document "Transportation Demand Management", available on http://www.sutp.org.

Figure 8: *Push- and pull-effects.*

Measures with push- and pull-effects
Redistribution of carriageway space to provide cycle lanes, broader sidewalks, planting strips, bus lanes, …, redistribution of time-cycles at traffic lights in favour of public transport and non-motorised modes, public-awareness-concepts, citizens' participation and marketing, enforcement and penalising…
Source: Müller *et al.,* (1992)

Box 4:
Effective parking management in Portland, USA

By combining a variety of innovative off-street parking policies and regulations, Portland has for decades served as a model for effective parking management. The city's investment in extensive, reliable public transit infrastructure has enabled it to wean residents and commuters off private automobiles. Since 1992, the state has mandated that all localities guide their development with transit accessibility goals. The Portland region set the goal of reducing VMT and parking spaces per capita by 10 % over a 20-year period. The outcomes include improved air quality, increased transit ridership, and improved urban form.

Portland's proactive approach began in the early 1970s, when they city's downtown air quality violated federal carbon monoxide standards one out of every three days. This led to a freeze at 45,000 parking spaces in 1972. Thanks in part to this measure and to the improved technology of automobile exhaust systems, downtown Portland has not exceeded the carbon monoxide standard since 1984. In 1997, the city lifted the freeze replacing it with a more flexible system of parking maximums and minimums to manage, rather than prevent, parking space construction. Parking minimums are not applied to developments in the city's densest commercial neighborhoods, including downtown, and neighborhood commercial districts, and central residential districts. Similarly, minimums do not apply to any sites within 500 feet of a transit line that provides service at least every 20 minutes during peak hours. A developer or owner also benefits from reduced minimums if willing to manage parking by arranging space sharing or bike parking in a facility. When the parking demands from two or more uses located near one another occur at different times, the city's zoning code allows a shared parking facility with fewer spaces than the combined, separate requirements for each use. Similarly, bicycle parking may substitute up to 25 % of required car parking spaces. For every five bike parking spaces a developer builds, one fewer car parking space may be constructed. "Limiting the number of spaces allowed promotes efficient use of land, enhances urban form, encourages use of alternative modes of transportation provides for better pedestrian movement, and protects air and water quality," states the city's zoning code. Thus, parking maximums complement minimums in many neighborhoods. The city conducted a study to determine parking demand under different policy scenarios. Taking account of transit capacity, they calibrated parking requirements to meet their travel demand forecasts within the context of the entire transportation system and their land use objectives. Consistent with the city and state's commitment to public transit, the maximums vary according to a site's distance from bus or light rail — closer to transit less parking is permitted. Several neighborhoods are therefore subject to low maximums. Downtown office and retail developments, for example, are limited to one space per 1,000 square feet of floor space, and hotels may provide only one space per hotel room. Given this low limit, developers almost always build up to the maximum; no waivers to build above the maximum have been granted since 1974. Because the city treats parking as a transferable entitlement, however, a developer

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choosing to build below the maximum — or the owner of a historic building that lacks parking — may transfer its parking development rights to another property. In this model a developer may transfer (but not sell) parking rights up to the maximum allowed to another developer as long as the transfer agreement has been completed prior to the laying of the new development's foundation. For pre-existing buildings or for new development where a transfer agreement had not been made prior to the foundation laying the existing building may transfer up to 70 % of the original entitlement to another developer. In return, the transferring property has the right to use its parking entitlement in the facility where the rights have been transferred but they must pay the prevailing rate for the privilege. This policy maintains city control over a district's parking supply yet allows developers the flexibility necessary to finance, build and operate new and existing developments. It also helps to consolidate facilities, reducing the number of curb cuts and intrusions into the pedestrian realm.

The impact of this group of programs and policies has been significant. The city reports that transit use increased from 20–25 % in the early 1970s and to 48 % in the mid-1990s.

Source: Taken from Weinberger *et al.,* 2010, 54.

Table 5: Elements of Transportation Demand Management (TDM)

	PUSH	PULL
Policy/Regulatory/ Economic Measures	**Restrict car access** ■ road pricing ■ congestion pricing ■ sales tax/import duty ■ registration fee/road tax ■ car quota system ■ parking pricing ■ parking management ■ plate restrictions ■ low emission zones ■ 20 km/h zones	**Improve transit services** ■ integrated system and fare structure ■ network of priority transit corridors **Incentives for commuters** ■ parking spot cashout ■ tax reduction for transit pass ■ tax reduction for biking and walking
Physical/Technical Measures	**Reduce car mobility** ■ reduce parking supply ■ traffic cells ■ traffic calming **Road space reallocation** ■ reconnect severed neighbourhoods **Restricted traffic zones** ■ pedestrianonly zones	**Improve quality of transit service** ■ bus rapid transit system ■ bus lanes ■ bus priority ■ light rail and commuter rail services **Improve bus infrastructure** ■ quality vehicles ■ comfortable bus stations ■ easy to find route and timetable information, bus information at bus stops, train arrival information at stations **Improve bicycle infrastructure** ■ bicycle lanes and parking ■ bicycle route signage and maps **Improve pedestrian infrastructure** ■ safe sidewalks and crosswalks ■ pedestrian zone **Improve mobility options** ■ car sharing services ■ shared bicycle services ■ improved taxi and pedicab/rickshaw services
Plan/Design Measures	**Integrated land use planning** ■ regional spatial planning ■ transit oriented development ■ car parking planning standards to ■ complement transport policies	**Planning for non-motorised transport** ■ street design for bicycles/pedestrian traffic ■ connectivity of streets ■ maps and wayfinding aids
Support Measures	**Enforcement** ■ fines, tickets and towing	**Public awareness** ■ marketing transit/explaining need for TDM measures ■ events like Car Free Day

Box 5: Hospital allows employees to "cash out" their parking spots in Rotterdam, Netherlands – The parking policy serves as a PUSH factor for higher public transport use

The Erasmus Medical Centre in Rotterdam employs about 10,000 people. A major renovation of the hospital in 2004 caused a shortage of parking spaces for members of staff, visitors and patients. The reduced the number of parking spots motivated the hospital board to implement a number of measures in reducing car commuting by the personnel.

Before introducing TDM measures, the Medical Centre conducted a mobility survey amongst personnel, visitors and patients. Results showed 80 % of the visitors and patients travelled by car to the hospital, and that 45 % of the employees commuted by car, while 60 % worked during office hours. Of the 700 employees living within 5–6 km from the hospital, a significant share commuted by car. The hospital chose to take measures regarding transport supply and demand for its employees. As for supply, a new car park was constructed. For transport demand, employees were offered two possibilities:

1. '*Car arrangement*' where employees were allowed to travel to work by car, but were required to pay for it. Employees were charged:

➢ EUR 1.50 a day when arriving during peak hours (from Monday to Friday between 6:30 and 13:00)

➢ EUR 4.00 a day when arriving during peak hours (from Monday to Friday between 6:30 and 13:00) and living within 5–6 km from the hospital,

➢ EUR 0.50 a day when arriving during off-peak hours,

➢ No travelling cost expenses paid to employees travelling alone by car.

2. Individual Travelling Budget where employees were credited EUR 0.10 for every km not travelled by car, and the permission to travel 12 times a year by car to work during peak hours, at a value of EUR 1.50 a day.

All measures were communicated to the employees using articles in the internal newsletter, intranet, a leaflet explaining the 'car arrangement' and the 'individual travelling budget', and a service point where employees could ask questions. An evaluation in 2006 showed the hospital's aim to reduce car travelling has been reached. The number of commuters travelling by car has dropped from 45 % in 2003 to 20–25 % in 2006. This decrease meant 700 parking spots could be used by visitors and patients. This means sufficient parking space was created without the construction of new parking spots.

Source: Elke Bossaert, http://www.eltis.org/studies

Relationship between parking and public transport use policies to encourage public transport

It has generally been found that parking policy measures are likely to be relatively more important than many other traffic management measures in influencing how people choose to travel. More specifically, in the limited studies undertaken, the decision to use a car for the journey to work is greatly influenced by the availability and cost of parking (see for example Feeney 1988, NEDO 1991, Shoup and Willson, 1982, COST 342, or Litman, 2006). For example, the 1994 Swiss National Census shows that, of those employees who are provided with a reserved parking space at work, 81 % use their car to get there. The corresponding figure for those without a parking space is 35 %. Chapter 7 of COST 342 provides numerous further examples of ways in which car-based mobility is affected by the provision of a parking space.

The scale of the change in demand for parking when its price is increased is called elasticity of demand. Knowledge of parking price elasticities can help to predict how much parking problems can be solved when a charge is introduced, or increased. Of course parking charging is only one way of managing parking (see Chapter 3 for a full menu of measures), and its impact will vary depending on factors such as whether free parking is available near the charged area, or whether the charge is paid by drivers or by someone else (an employer, for example). However, the table below gives some best estimates of responsiveness to parking price increases derived from an experiment in Seoul. These figures reinforce the point that parking charging can have a major influence on how people choose to travel.

Table 6: Responses to changes in parking charges, Seoul, South Korea

			Mode share before and after introduction of parking fee	Percentage change
USD 33 per month price increase	Car-bus	Car	0.660 to 0.562	-15
		Bus	0.340 to 0.438	+29
	Car-subway	Car	0.576 to 0.502	-13
		Subway	0.424 to 0.498	+18
	Car-bus+subway	Car	0.567 to 0.495	-13
		Bus+subway	0.433 to 0.505	+17
USD 66 per month price increase	Car-bus	Car	0.660 to 0.460	-30
		Bus	0.340 to 0.540	+59
	Car-subway	Car	0.576 to 0.428	-26
		Subway	0.424 to 0.572	+35
	Car-bus+subway	Car	0.567 to 0.423	-25
		Bus+subway	0.433 to 0.577	+33

Table 7 shows elasticities and cross-elasticities for changes in parking prices at various city centre locations, as measured in Sydney, Australia. For example, a 10 % increase in prices at the most preferred city centre car parks is predicted to lead to a 5.41 % reduction in demand there, a 3.63 % increase in Park & Ride trips, a 2.91 % increase in Public Transit trips and a 4.69 % reduction in total trips to the city centre (Table 7).

Table 7: Parking elasticities in Sydney, Australia

	Preferred CBD	Less Preferred CBD	CBD Fringe
Car Trip, Preferred CBD	-0.541	0.205	0.035
Car Trip, Less Preferred CBD	0.837	-0.015	0.043
Car Trip, CBD Fringe	0.965	0.286	-0.476
Park & Ride	0.363	0.136	0.029
Ride Public Transit	0.291	0.104	0.023
Forego CBD Trip	0.469	0.150	0.029

Source 2: Hensher and King (2001, 192)

Supportive vehicle parking policies will be essential to complement other transport initiatives in achieving objectives relating to accessibility and the environment. If there is an excess of city centre parking over demand for it, improvements in public transport alone cannot be expected to result in a change in modal split (Scottish Executive, 2003). Many of the most significant initiatives and policies towards city

centre transport depend for their success on restricting road traffic, and parking policy is one of the most potent yet also publicly accepta- ble means of restriction. From the North Ameri- can context, Pratt (2003) also cites research from Canada by Morrall and Bolger (1996), as presented in Table 8.

Table 8:
Relationship between Downtown Parking Supply and Transit Use in Canadian Cities

City	CBD Share of Area Employment	CBD Office Space (1,000 ft²)	Parking Spaces per 1,000 ft²	Parking Spaces per CBD Employee	AM Peak Hour CBD Transit Share
Saskatoon	20.7%	3,600	3.5	0.79	14.6%
Edmonton	20.2%	15,133	2.1	0.51	32.0%
Calgary	23.4%	31,493	1.3	0.46	38.8%
Montreal	14.9%	87,996	1.0	0.38	48.7%
Winnipeg	26.1%	17,478	1.4	0.36	39.7%
Vancouver	16.3%	n/a	n/a	0.29	46.0%
Toronto	25.3%	61,570	1.5	0.29	64.1%
Ottawa	31.7%	21,024	1.1	0.28	48.8%

Note: Listed in order of decreasing ratios of long-term parking spaces per Central Business District (CBD) employee.

Source: Morrall and Bolger (1996), cited in Pratt (2003).

The city of Shenzen in China recently changed its parking policies for exactly this reason.

Box 6:
Parking policies in Shenzhen, China

After a recent increase in parking fees in Shenzhen, a remarkable 30 % drop in parking demand has been noted. Out of the city's total 350,000 park- ing spaces, 50,000 parking spaces have become costlier. Under the new rules, parking fees in the city center have been increased from less than CNY*) 5 per hour to CNY 15 for the first hour and CNY 1.5 for each additional 30 minutes during peak hours on weekdays. During weekend, the parking fee will be CNY 5 (= USD 0.62) for the first hour and CNY 1 for each additional hour. Now few cars are reported to be using the parking lots in down- town Shenzhen on weekdays. However, parking lots are found to be crowded during weekend, as parking is cheaper. However there is no increase in the monthly parking fees for the 250,000 parking spaces in residential areas and public sector build- ings. Temporary users, however, need to pay an extra CNY 5–10 per day. The government expects traffic flow to decrease by 12 % temporarily and 4 % in the long term due to the parking fee jump, which will alleviate downtown traffic congestion and encourage the use of public transport, said a spokesman for the communications bureau. The new rules could raise local car owners' monthly parking expenses from an average of CNY 534– 694, an increase of 30 %. Parking fees could then account for nearly half the cost of keeping a car. Then in 2007 Shenzen reversed this policy and its central area is now gridlocked.

(Sources: Centre for Science and Environment, 2006, pp. 52–53; Zhuyue Sun, 2008).

* CNY = Renmimbi Yuan

Empirical experience and theoretical work reported in the literature therefore supports intuition: there is a clear link between whether there is a parking space available, and whether people use their car. The difficulty is not in demonstrating this link, but rather in being able to implement policies that use the link to reduce car use. It is to these policies and their implementation that we turn in the next chapter.

3.4 Measures to deliver your parking policy and achieve objectives

The purpose of this part of chapter is to show the changes that can be introduced to achieve parking policy objectives. These will be described in some detail in the following sections, but it is worth remembering that many of the problems that were described in Chapter 1 can begin to be addressed by some relatively straightforward, key practical actions, as follows:

■ Start controls where demand is highest – which may be one or two streets only.
■ Start prices low, but remember that you can increase them from that level until occupancy levels are optimised (with around 85 % of spaces full at peak times – this guarantees that it is relatively easy to find a space).
■ Keep maximum durations 3–4 hours in shopping/business areas so that commuters cannot park there and spaces are used several times a day by different shoppers and business visitors.
■ Decriminalise enforcement (so that it is no longer the responsibility of the police). This is normally found to make enforcement more effective (dealt with in more detail in Chapter 6).
■ Price off-street parking lower than on-street and make people aware of that, so that they are encouraged to use the former.
■ Make clear to people how the revenue generated from parking is used, to increase the acceptability of charging (see also Chapter 9 on how to implement parking strategies).
■ Use self-enforcing measures wherever possible to make enforcement as cheap and effective as possible (dealt with in more detail in Chapter 7).
■ Have maximum but not minimum parking standards for the amount of parking required to be built with new buildings (or do not allow new parking spaces with new developments, *e.g.* in dense urban areas with good public transport accessibility).

These points will now be described in more detail and with reference to case studies.

Regulating and managing on-street parking

Where the legislation to regulate on-street parking exists, it is normally the local authority which decides on the parking regulations. There is a general tendency for on-street parking regulations to become more stringent (restrictive), the closer that one goes to the centres of towns and cities – because these are the areas of greatest demand. The vast majority of on-street spaces in any country remain un-regulated in any way, because demand is less than supply. But, as demand increases, some typical restrictions that might be found include:

■ No parking at any time around the mouths of junctions in order to ensure sightlines for vehicles, and safety and access for pedestrians crossing.
■ Parking restrictions on main roads at peak hours to facilitate traffic flow.
■ Parking restrictions on one side of a narrow road to permit two-way traffic flow.
■ Time limited on-street parking in order to facilitate the turnover of parking spaces – usually to ensure that short term parkers (*e.g.* shoppers) can get a space. Maximum stays might be set at 30 minutes, 1 hour or 2 hours, depending on demand.
■ Parking restrictions in certain areas to provide kerb space so that commercial vehicles can load and unload to service shops and offices alongside the road (see further details in next section).
■ Time limits around stations (*e.g.* no parking 13:00–14:00 on weekdays) to stop informal park and ride if this activity is not desired by city authorities.
■ Use parking as one tool for traffic calming: Parked cars can help to slow down traffic – however, careful implementation in view of traffic safety is needed.
■ Bicycle parking: Require bicycle parking in new development, and allow bicycle parking to substitute for minimum automobile parking in zoning codes.

Where parking problems become more severe, a typical response is to introduce some form of parking restriction to give residents sole or preferential access to limited on-street parking around their homes, with a smaller number of spaces (paid) available to shoppers and other visitors. Such residents' zones, covering parking in a whole neighbourhood, have begun to be introduced in some (south-)eastern European cities such as Belgrade and Krakow, but they

are otherwise not well known outside Japan, Europe, North America and Australasia. In China, too, residential areas tend to have their own on-street parking but these are managed by the residents' associations.

A good example of controlled parking on-street can be found in Graz, Austria. Here, parking in the central and inner city is controlled from 09:00 to 20:00 from Monday to Friday, and on Saturday mornings. The maximum length of stay is 3 hours, unless the driver is a resident and has bought a resident's parking permit, in which case they can park all day. In 2008 the hourly charge for non-residents was EUR 1.20. In areas further from the city centre, a similar system operates, but charges are lower (EUR 0.60/h) and there is no maximum stay. This has reduced the "spillover" effect of the inner controlled zone – before the outer zone was introduced, there was a lot of competition for free all-day parking spaces just outside the inner area. The policy has contributed to keeping Graz economically healthy and to maintaining its high mode share for walking, cycling and public transport (Source: http://www.eltis.org).

How much does it cost to park on in different countries around the world?

"The basic cause of confusion is that our society has not made up its mind whether a parking space should be provided at a market (commercial) price, or as a 'social service'."

G. J. Roth, "Paying for Parking," 1965

Of the factors affecting demand for parking, perhaps the most overlooked is the price. Most parking is provided to users for free, although it is not free to build or operate. Many developed countries have followed the social service approach to parking, with a practice of providing ample and free parking in cities. Parking is routinely provided for free by shop owners, employers, and home developers, meaning that drivers do not take it into account when making travel choices. An oversupply of parking encourages excessive car use and resulting increases in air pollution and traffic congestion. A paradigm

Figure 9
Metered on-street parking.
Photo by Armin Wagner, Nis, Serbia, 2007

Figure 10
Time-sensitive metered on-street parking.
Photo by Thirayoot Limanond, Singapore, 2008
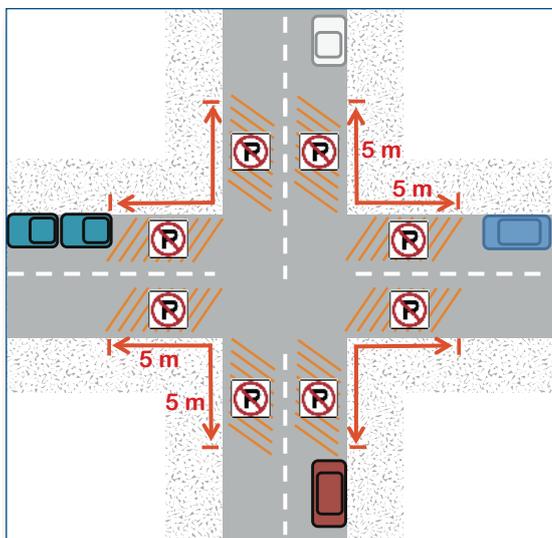
Figure 11
No parking adjacent to junctions as defined in Germany's traffic law (Strassenverkehrsordnung, §12)
Source: Figure prepared by Dominik Schmid

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shift in parking policy is currently underway. Planners and city leaders are starting to see free parking as a hindrance to improving urban quality of life and housing affordability. The new approach to parking policy is as listed in Table 9.

Table 9: Paradigm shift in parking policy

	Old paradigm	New paradigm
Parking considered as	Public good	Commodity
Demand assumed	Fixed/Inelastic	Flexible/Elastic
Supply should	Always grow	Be managed in response to demand
Government regulations	Set minimums and no standards	None/set maximums
Pricing maximises	Utilisation	Availability
Turnover encouraged via	Time limits	Pricing
Costs should be	Bundled with goods	Transparent to users

As we have already seen, it is only in certain parts of larger cities in developing countries that parking fees are charged. With regard to public parking rates, which are normally set by local authorities, some examples are shown below. These all refer to on-street unless otherwise stated. They also show the fine that is levied if someone tries to avoid paying, or overstays the maximum allowed stay.

Table 10: On street parking tariffs

City	Fee per hour (€) (2008)	Fine (€) (2008)
Shiraz, Iran	0.07 to 0.13	6
Chennai, India	0.20 to 0.30	14
Delhi, India	0.20 (off-street)	Not known
Kampala, Uganda	0.17	0.80
Accra, Ghana	0.65	33
Curitiba, Brasil	0.40	26
Beijing (Centre), China	1.10	22
Beijing (other area), China	0.22	22

(source: acknowledged contributors)

On-street parking charges should if possible be higher than off-street charges as this will act as an incentive to people to park off-street, rather than drive round and round looking for a cheaper (as well as more convenient) on-street space. In any case, it is also clear from other analyses that the price of parking per hour increases with city size as well as location within a city.

The figures below compares parking fees in European capitals (in Central Business District, 1 hour on-street parking). Further, single bus fares are indicated as comparison. As a rule-of-thumb parking fees should be higher than a single bus fare in order to encourage the use of public transport (Figure 12).

In order to differentiate parking fees according to demand in various areas of a city, a system of zones can be introduced. Fees are higher the closer the parking space is to attractive destinations.

Loading for commercial vehicles

It is very important for a functioning local economy that commercial vehicles can stop on-street to load and unload deliveries to shops and other businesses that do not have space for loading and unloading within their own building area. Conversely, it is also important for traffic flow, safety and the environment that such vehicles cannot always stop exactly when and where they choose to do so – some compromise is usually required. This is normally in the form of time limited loading (*e.g.* maximum stay 15 minutes) and bans on loading at peak hours, on main roads (to allow traffic to flow), or in main shopping hours (on pedestrianised shopping streets). So it is typical to see loading permitted in off-peak hours or overnight. Such restrictions must be well-signed and companies informed so that they know the restrictions; but good enforcement is also necessary. An interesting case study is presented below. For more detailed information, see the SUTP *Sourcebook* Module 1g: *Urban Freight in Developing Cities*, available online on http://www.sutp.org. (Figure 13)

Managing off-street parking

Formally constructed off-street parking is now a feature of middle income cities such as the first order Chinese conurbations, new member states of the European Union, and cities in Latin America such as Curitiba and Bogotá. However, in many South Asian and African cities it remains something of a rarity, because it is expensive to build and because there are often "gap" sites in urban areas that can be used as long-term temporary car parks. Also the

Chart legend:
- On-street parking/hour (CBD)
- Single bus ticket

Y-axis: US Dollars

City	On-street parking/hour (CBD)	Single bus ticket
London	8.70	2.90
Amsterdam	6.30	2.00
Tallinn	6.00	1.50
Stockholm	4.80	2.40
Kopenhagen	4.80	3.20
Berlin	3.80	2.70
Helsinki	3.80	2.50
Oslo	3.80	3.40
Paris	3.80	2.00
Dublin	3.70	1.50
Brussels	1.90	2.00
Luxembourg	1.90	1.90
Bern	1.70	3.20
Prague	1.70	0.80
Rome	1.50	1.30
Vienna	1.50	2.20
Riga	1.50	0.70
Budapest	1.30	1.30
Athens	1.30	1.00
Ljubljana	1.30	1.30
Vilnius	1.10	0.60
Bratislava	0.90	0.90
Madrid	0.80	1.30
Sofia	0.60	0.90
Warsaw	0.60	0.70
Bucharest	0.40	
Lisbon		1.80
Vaduz		1.70
Valletta		0.60

cost of labour means that it is cost-effective to have valet parking where vehicles can be parked much closer together than in a conventional car park, making more efficient use of costly land.

From the point of view of reducing the visual impact of on-street parking, reducing congestion from search traffic and in some cases reallocating surface street area from parked cars to pedestrians, there are considerable attractions in constructing new off-street public parking, but

the construction costs are significant. Excluding land costs, the following values per parking space are typical for Western Europe:

- Surface space, asphalted, with drainage and lighting – EUR 3,000.
- Space in a parking structure (multi-storey car park) – EUR 15,000 – EUR 20,000.
- Underground space – €40,000.

In addition, there is a maintenance and security charge for each space, which can easily be EUR 150–450 per year. Clearly these costs are reduced in cities in lower income areas of the

Figure 12
Parking fees in European capitals
Source 3: Transpower project, http://www.transpower-rp6.org

Figure 13
A truck blocks one lane of the street during unloading operations.
Photo by Dominik Schmid, Korat, Thailand, 2010

Box 7:
Loading spaces for goods vehicles in D.F., Buenos Aires, Argentina

In the capital district of Buenos Aires, 750 on-street loading spaces have been introduced for goods vehicles that need to deliver to shops, offices and restaurants that have no off-street loading area. The spaces are marked in blue and residents are prohibited from using them at any time. The maximum vehicle length permitted in the "blue boxes" is 8 metres, and the maximum stay is 30 minutes. This has made loading much easier for commercial vehicles and reduced double parking, and hence improved traffic flow.

For further details (in Spanish) see http://www.buenosaires.gov.ar/areas/planeamiento_obras/transito/transporte/plan2008/carga_descarga/caracteristicas_sistema.php?menu_id=29768.

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Table 11: Costs of constructing new off-street parking in India

	Baba Kharak Sing Marg multilevel parking		Hindustan Times Building multilevel parking	
	Parking and commercial	Parking only	Parking and commercial	Parking only
Number of ECS planned	941	780	1,209	1,020
Capital cost Rupees [INR] in million per ECS	0.4 approx.	0.4 approx.	0.4 approx.	0.4 approx.
Total cost INR in (incl. cap. working, taxes, etc.) (Net present Value)	529.00 approx. (INR 18,577.78 per m²)	384.90 approx.	752.30 approx.	531.00 approx.
Revenue – INR in million (NPV)	672.40 approx.	416.80 approx.	935.20 approx.	557.40 approx.
IRR in %	12.68	12.67	12.68	12.69
Parking charges	INR 10 per hour	INR 30.25 per hour	INR 10 per hour	INR 39 per hour

world but they are still considerable. The table below is taken from Centre for Science and Environment (2006, p. 41) and shows costs of constructing new off-street parking in India, in Rupees (1 EUR = 65 INR). The key point to highlight here is that such high charges are required to make a profit on the investment that it is difficult to set a price that is attractive in relation to on-street parking. This means that the off-street car park will have to be subsidised if it is to be used – but the local authority may decide that the subsidy is better targeted at public transport or park and ride (Table 11).

In addition, from a policy point of view, the provision of new off-street car parks in central areas of cities can exacerbate problems of congestion, because the new ease of parking may encourage more people to drive. This means that it makes sense to consider whether it can be replaced by parking further out of town with good public transport links in – park and ride.

How easily off-street parking can be used to achieve policy objectives depends greatly on who owns and controls it. Obviously, the main concern of a private operator of an off-street car park will be to maximise profits, which means that they will set a price that maximises revenue, regardless of the transport impacts of their pricing decision. However, a local authority with a developed parking strategy may have a range of other objectives. They may wish to provide public off-street parking, simply to make sure that visitors to their town or city have somewhere to park. They may also wish to control the price of such parking – perhaps to make it relatively more expensive for long-stay commuters (to reduce peak hour traffic) but cheaper for shoppers, who tend to travel in the off-peak. But the degree to which they have control over public off-street parking depends very much on how much of it they own. Some recommendations about public off-street parking are as follows:

■ Consider carefully whether it is really needed or whether it can be provided instead by parking further out of town (park and ride – see below) and good public transport links.

If the decision is taken to provide public off-street parking in or close to the city centre, then:

■ Make sure it is near to where people want to go – an obvious but often overlooked point.
■ Even if a private operator runs the car park, ensure that the local authority can influence the pricing structure.
■ Set prices lower per hour for short (up to 3–4 hours) and much higher per hour for long stay, to encourage turnover of spaces and to deter commuters.
■ Set prices lower than the price of on-street parking. If on-street parking near the new off-street car park is very cheap or free with no time limits, almost nobody will use the new off-street car park. This happened in Beijing and on-street parking was saturated whilst off-street car parks remained empty, until on-street prices were raised in 2007. Make the new car park as pleasant as possible – nobody likes using them, but make

the experience as good as it can be. Employ security staff and clean and paint the car park regularly.

■ Make sure that traffic to and from the entrances and exits to the car park does not cause congestion, especially for public transport.

■ Once the car park is open, reduce/remove on-street parking to compensate, especially in areas where people searching for car parking and manoeuvring into spaces was causing congestion. Give the space instead to public transport and pedestrians.

Local authorities can control on-street parking. They may also be able to control new private non-residential (PNR) off-street parking by regulating how much is allowed to be built as part of the building permit process (as is the case in Curitiba in Brasil, for example). However, once PNR parking is built, local authorities have no control over it. This is important because they may wish to control PNR as a way of controlling peak hour traffic.

Park and Ride

Towns and cities often adopt park and ride as part of their strategy to tackle traffic congestion, in the main on routes into town and city centres (although there are examples of park and ride sites that serve major workplaces outside city centres). Park and ride is an increasingly important option in middle income cities such as new member states of the European Union. Prague, for example, has an extensive park and ride system which gives the car driver a discount on the standard public transport fare (see http://www.dpp.cz/parkoviste).

Park and ride works by diverting city centre bound trips into a car park en route and taking the drivers onwards from there by public transport. For park and ride to be successful, it is vital that:

■ The public transport route is fast, frequent and reliable. If it is faster than the corresponding car journey (including interchange and wait time), its market will not be limited only to those who have no (free) parking available in the city centre.

■ The frequency of an urban park and ride service should be every 10 minutes or, if possible, more. For services where the last stop

is the park and ride, it is preferable if the service frequency is high enough so that a vehicle is always waiting at the stop. Where it is not the last stop, real time information is helpful to show the actual service frequency.

■ The (perceived) cost of using the site should be lower than the fuel and parking cost of driving into the city centre. Depending on the target market for the park and ride, it may be desirable to price the park and ride ticket for a car full of people (*i.e.* one person pays the same as a family travelling together), as this is the price comparison that people will make when deciding whether or not to use park and ride.

■ Over time, the amount of parking – both private non-residential and public parking – in the town or city centre should be reduced, and it should be more expensive than the park and ride.

■ There should be easy access from the main road network to the park and ride and, preferably, segregated exits from the park and ride for public transport vehicles (if they run on the road).

■ Capacity should be great enough to cater for demand; but not so great that walking distances from the furthest parts of the car park are excessive. This may entail a parking structure (multi-storey) if demand increases beyond a certain point.

■ Security for passengers and their cars at the site should be very high – quality security fencing and a staff presence will increase users' confidence in the service.

■ The facility also needs to serve only people who are going to use the public transit and not for people who want to park for doing errands in the locality.

Middle income cities that have started to use park and ride include Istanbul and Santiago de Chile; the former has park and ride linked to ferry services, and the latter to its growing metro network, one of whose stations will soon been linked to a new 457 space underground car park costing USD 15 million (see http://diario.elmercurio.cl/detalle/index.asp?id=%7b871b23c3-4b81-44aa-9b11-11c37174639e%7d).

An example of how Istanbul uses its car parks to manage public transport use is shown in the pricing structure in different parts of this

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Figure 14
Park and Ride facility at Kassel-Wilhelmshöhe, a major interchange for regional and long-distance public transport.
Photo by Dominik Schmid, Kassel, Germany, 2010

city that straddles the Bosphorus, the waterway that divides Europe and Asia Minor. At Sisli, one of Istanbul's key business locations in the European part of the city, on-street parking costs TL4 (EUR 2.30) per hour to stimulate parking turnover and use by shoppers and business visitors. In the more residential suburb of Bostanci on the Asian side, parking all day next to the ferry terminal (with frequent services to the European side) costs TL3, thus acting as an incentive to park and ride.

Another example of park and ride is in Graz, Austria. Here an edge-of-town shopping centre, Murpark, applied for permission to expand. In partnership with the municipality, the developer built 500 park and ride spaces at the development (which also includes employment and leisure uses as well as shopping), and the municipality extended its Tram Line 4 some 1.2 km to the centre, at a cost of EUR 18 million (opened in 2007). A payment of EUR 5 allows a driver to park all day at the site and also to use the entire Graz municipal public transport system for a day. Therefore, it is easy and fast for them to travel by tram to shop or work in the city centre, supporting its economy. (Source: http://www.eltis.org)

3.5 Costs of managing parking

On-street parking

Managing on-street parking is not expensive. All that is required are signs, paint for lines, and sometimes ticket machines and equipment for enforcement officers to record violations and give fines. However, in Istanbul and Accra, ticket machines were used initially only to be replaced by staff who sell tickets manually, showing that the cost of investing in and maintaining and emptying ticket machines has to be weighed against the cost of paying members of staff to sell tickets. Fines can also be dispensed manually, depending on legislation and records required to be kept. If on-street parking management is self-enforcing then a little more investment is usually required in bollards and/or fences to stop cars driving onto certain areas to park. Nonetheless, the overall message is that on-street parking can be managed cheaply and without any very sophisticated technology.

The construction and maintenance costs of off-street parking have already been mentioned: it is an expensive option, but one that can radically improve the quality of an urban environment if the parking that is on-street is removed and if access/egress to and from the car park are planned carefully to avoid on-street queues for the off-street parking.

The cost of park and ride depends primarily on whether or not dedicated public transport infrastructure (*e.g.* a new tram or railway line) has to be built to serve it; and whether or not the public transport service is existing, entirely new, or an adaptation of an existing service. If not existing, then additional subsidy is likely to be required, at least initially. To these costs must be added the cost of building and maintaining the car park (see earlier section for figures on this), and any staffing costs. Most park and rides in Europe are publicly owned and subsidised. Where the initial investment is public but the service becomes so popular that it is profitable, and where public transport is run by private companies, the public authority may let the operation of the park and ride as a contract and share the profit with the operator. This happens in York and Oxford in the UK, for example (Box 8).

Box 8: Redevelopment of the old city in Sibiu, Romania: new car park system

In 2004, the European Union's 25 ministers of culture designated Sibiu in Transylvania, Romania, the 2007 European Capital of Culture. An impressive achievement, particularly when you take a closer look at Sibiu's recent history. Only ten years ago, its old city was by no means in a condition to make Sibiu a contender for the capital of culture. Many buildings had moisture problems and were unstable. Inadequate repairs and reconstruction work not in keeping with the city's architectural style took their toll on the cityscape. The picturesque squares in the old city were constantly full of parked cars, and many drivers took shortcuts through the city centre's narrow streets.

On behalf of BMZ, GTZ has been supporting the city in its efforts to redevelop its old city since the end of the 1990s. For example, the project team advises residents on how they can keep their homes from deteriorating. However, there is more to redevelopment than just beautiful façades. The public space in its entirety, including streets, squares, shops and the public transport system were all part of the project.

The latest accomplishment is the car park management system that was recently introduced.

GTZ worked on the concept together with the city council from 2003, with the city taking ownership of the project. The city centre was divided into various park zones based on the principle that the closer a zone is to the centre, the more expensive it is. Long-term and resident parking is now very inexpensive. In contrast, short-term parking is more expensive and thus less attractive. Parking your car for 30 minutes in the historic city centre costs as much as it does for an entire day outside the centre.

The success of the system could be seen after only two years. The number of cars in the historic old city had dropped drastically, while there are now over 1,000 new parking spaces outside the city centre. With the parking fees, the city government has already covered half of the original costs, and in a few years the system will have paid for itself. In November 2008, the initiative was awarded the European Commission's ELTIS prize for local transport.

Of course, Sibiu's residents also benefit from the new parking system, as fewer vehicles in the city centre also means less traffic noise and exhaust pollution. Additional steps to improve local public transport should further reduce exhaust emissions and relieve the burden on residents and the environment.

3.6 Using technology for parking management

There is considerable technology available for parking management. This covers, for example:

- Ticket machines.
- Mobile phone based parking payment.
- Barriers for off-street car parks.
- Enforcement – machines capable of recording the details of vehicles violating regulations, photographing the vehicle, issuing a ticket and sending the data about the whole operation back to a base station. These are now used in some first line Chinese cities, and in parts of Serbia, for example.
- Camera enforcement (particularly on buses or on major arterial roads).
- Information technology for record keeping, financial management, monitoring of customer service, fine issuing and management, follow up of non-payment and so on.
- Real time parking guidance systems so that people spend the minimum amount of time searching for a parking space. Such systems have traditionally been used in off-street car park guidance, but in Germany experiments are now underway to guide cars to on-street parking spaces.

Figure 15
Ticket machine in Oslo.
Photo by Andrea Broaddus,
Oslo, Norway, 2007

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Figure 16
Real-time parking guidance system, displaying the number of free parking spaces for different locations.
Photo by Stefan Belka, Dresden, Germany, 2009

Such systems may be useful in cities where labour is expensive and parking management has reached a developed level. In particular, anything that makes payment more convenient and „customer friendly", and anything that makes enforcement more mechanised and therefore less open to fraud, can help to make parking management more publicly acceptable. However, it is a fallacy to believe that a successful parking management strategy depends on a city being able to afford high-tech solutions: this is simply not the case. Low-tech solutions are easier and much cheaper to implement, often more flexible, tend to employ more people (which can be a consideration in cities with high levels of under-employment) and just as effective if they are well enforced.

Figure 17
Efficient utilisation of urban space – Metered parking for two-wheelers in Tokyo, Japan.
Photo by Andrea Broaddus, Tokyo, Japan, 2001

Box 9: Parking management strategies proposed for New Delhi, India

A study was conducted in 2007 to assess New Delhi's parking policy and develop strategies to deal with rapidly growing car use at the city's markets. New Delhi is a densely populated city of 15 million people, with 4 million registered personal vehicles. In 2006, the city added 360,000 new vehicles, or approximately 1,000 per day. This is nearly double the rate from the year 2000, with continued exponential growth expected. With space for parking already scarce, and parking facilities at the city's nine main markets already saturated, Delhi is seeking new parking strategies. Following are the parking recommendations of the study:

Promote efficient utilisation of existing spaces

■ Use currently wasted areas (corners, edges, undeveloped land, etc.), particularly appropriate for small cars, two-wheelers and bicycles.
■ Where there is adequate street width, change from parallel to angled on street parking.
■ Maximise the number of on-street parking spaces by using a kerb lane during off-peak.
■ Use valet parking, particularly during peak time. This can increase parking capacity by 20–40 % compared to users parking their vehicles.
■ Identify sites where on-street parking should be restricted during peak hours or for all day parking.

Review the setting of all proposed multilevel parking structures

■ Develop these as remote parking with park and ride systems and integrate with public transport. They should be located near the interchange points of public transport nodes, or at the periphery of the commercial centres, with free shuttle buses and free transit service.
■ These facilities can also be developed as overflow parking plan and special event management.
■ Taxis and three-wheelers can play an important role in the feeder system for park and ride system.

Improve user information for proper management of existing spaces

■ Develop public information system to inform people about parking availability, regulations and prices.
■ All civic agencies must develop parking inventory for their respective jurisdictions.
■ GIS mapping of parking lots.
■ All civic agencies should review the current contracts and guidelines for development of parking lots, for lower retrieval times, electronic metering for variable parking rates, and other physical planning.

Promote shared parking for maximum utilisation of existing spaces

■ As far as possible parking spaces should be managed as common areas.
■ Discourage dedicated individual spaces to maximise the usage of the available facilities.

Assess parking standards

■ Delhi Development Authority has done upward revision of the parking norms for the Master Plan 2021. It is important to ensure enforcement and contain spill over.
■ Consider flexible need based parking standards in the future.
■ Develop parking inventory, and assess parking utilisation pattern to identify areas of deficit, and then identify specific measures, tasks, responsibilities, budgets and schedule.
■ Plan for capping the maximum parking supply that can be allowed.

Need management coordination

■ Create institutional interface to address parking pricing, management and parking regulations and enforcement across jurisdictions in a composite manner.

Strengthen enforcement

■ Ultimately, the traffic management's authority should be able to effectively enforce a restrictive parking policy, to collect parking fee, and to fine offenders.

Source: "Chock-a-Block: Parking Measures to Leverage Change", draft report from the Centre for Science and Environment, 2007, cited in GTZ (2009, 97).

4. Institutional issues and enforcement

4.1 Institutional issues

International experience shows that a private organisation working under the roof of the public administration seems to be the best form of organisation for parking management. In this setting, the public authority retains control over policy and strategy (*e.g.* the total supply of on- and off-street parking), and over important issues of policy such as the level of fines, and whether fines should vary according to the severity of the parking violation. Examples for such organisations can be found in North America and Canada, *e.g.* in Toronto (http://www.greenp.com).

The tasks of the private organisation should include:
■ Inventories and forecasts for both parking supply and demand.
■ Provision of on-street parking supply (design, road markings, sign posting).
■ Operating public off-street parking facilities/Control on public off-street parking facilities.
■ Definition of terms of use for on-street parking.
■ Operation of controlled on-street parking.
■ Parking enforcement should be handled by a separate organisation which also should be organised as a private company under the roof of the public administration, at least if the national law allows this. If not, this entity has to be part of the local administration.

The tasks of this organisation are:
■ control of parked areas in areas with specific regulations (time restrictions, parking fees),
■ issuing of the fine tickets, and
■ control of the payment of the fines.

The income created due to the fines will be used to finance the enforcement entity. The amount which exceeds the needs of this entity should be used by the parking entity to improve the parking situation.

In many countries in practice enforcement is carried out by the police and the level of fine is set by central or regional government, giving less flexibility and autonomy to local government in controlling these important factors in enforcement. For example, in Shiraz in Iran, money from parking charges goes to a municipal corporation, the Shiraz Transportation Organisation (STO), which ultimately plans to use the income to build off-street car parks as a replacement for on-street parking. However, the STO is dependent on the police for enforcement and money from fines is shared between the Traffic Police and the Ministry of Interior, and it is the latter that sets the level of fine – whilst the STO and municipality set the level of the on-street charge. Clearly, if the STO puts up the hourly charge but the Ministry of Interior does not increase the fine then motorists will be less likely to pay the hourly charge and more likely to risk a fine, as the level of the two converge. For parkers to respect the regulations it is important that the fine is at least ten and preferably 20 times greater than the hourly parking charge, but this is difficult to guarantee where the two charges are controlled by different organisations.

This is one reason why it is recommended that wherever possible enforcement is decriminalised – that is, taken out of the hands of the police and given to municipal enforcers. This move is also recommended because municipal enforcers tend to be more effective (even "enthusiastic") than their police counterparts. This is the case in Kampala, for example, where enforcement is the responsibility of a private contractor that can shares fines and parking revenue with the municipality on a pre-agreed basis. In Curitiba in Brazil, the public-private municipal organisation URBS that manages public transport also employs parking agents who are responsible for enforcing on-street parking.

Organisational issues

The above discussion has shown that the way that a parking operation is organised can have a major impact on its effectiveness. In general, if all aspects of parking policy and operations can be controlled by the municipality and run by the municipality or private companies working under contract to the municipality, experience has shown that this makes the operation more effective. Curitiba, Kampala and Beijing are good examples of this. In contrast, Delhi features a situation where parking policy and

Box 10:
Decriminalising enforcement

Under the 1991 Road Traffic Act, local authorities in the United Kingdom are able to take over responsibility for on-street parking enforcement in their areas from the police, but such Special Parking Areas (SPAs) must be self-funding, with operating costs paid for from fines. Thus, CPZs are normally limited to those areas where it is anticipated that they will run at a profit – mostly areas where demand is significantly greater than supply. The introduction of area wide controls – a CPZ – usually involves some non-essential users such as commuters being displaced to create additional space for essential users such as residents, shoppers and short term business users. Problems may arise if the displaced users continue to park, but just outside the controlled area; this may result in parking pressure near the boundary of the zone.

A CPZ will normally include:

■ Parking spaces for residents only. To park in these, residents' must buy an annual permit, which cost between EUR 15 and EUR 400 per year, depending on the town or city.
■ Pay and display public parking. Parkers must estimate the length of time that they will stay in the space, and buy a ticket for that length of time, as soon as they park, and display it in their car. Hourly rates vary from EUR 0.50 to EUR 7.00.
■ Space for loading, but not parking.
■ Space where no parking or loading is allowed (*e.g.* around junctions, at bus stops).

If a parker contravenes any of the regulations, the local authority (or its contractor) can levy a fine. This varies greatly from place to place – in Edinburgh, UK, it is currently EUR 90, dropping to EUR 45 if the fine is paid within two weeks. The fine is the same, whatever the contravention (*e.g.* staying 35 minutes when you have paid for 30 minutes gets the same fine as parking your car illegally in a bus lane and blocking all the buses). Typically, when a local authority takes over enforcement from the police, the chance of an illegal parker being fined increases by four to six times.

operations are highly fragmented, and at least six different public sector organisations have some responsibility for parking. The Delhi Government, for example, sets parking policy; but municipal and national departments are responsible for its implementation on the street network. However, in many cases they have their own priorities so the policy is not implemented.

4.2 Enforcement

Parking policy does not work without enforcement, and enforcement often seems like an insurmountable issue in developing countries. However, cultures of enforcement can change. For example, in Bogotá until a few years ago people parked with virtual impunity, anywhere they wanted. Then Mayor Penalosa came to power and put resources into enforcement, in particular parking on pedestrian areas and footways (see Box 11). He did this because he wanted to make Bogotá a more attractive place. He completely stopped the practice of parking on footways within a year by installing barriers that stopped cars driving onto them (a self-enforcing physical measure), and did this in spite of strong opposition from shop owners.

This shows the important role that strong political leadership can play, although there are other cases where this has been less important. Since cars were banned from footways, the economic situation of Bogotá has improved significantly and citizens are much happier with their city. This is due to a range of measures including public transport improvements and wider streetscape and greenspace enhancements, but the end of footway parking has also played an important role.

Figure 18
Parking restricted – but not enforced?
Photo by Carlos Felipe Pardo, Mexico City, Mexico, 2007

Box 11: Parking revolution in Bogota, Colombia

Mayor Enrique Peñalosa's main goal during his mandate was to generate equity in the use of public space. He saw that automobiles were taking away almost all space from pedestrians and other public space users, so he sought to recover as much space as possible for people. An even more aggressive and contested method of recovering public space was to reclaim on-street parking space. Even though many citizens were complaining about the invasion of sidewalks and public space by parked cars, it was incredibly difficult to implement such a policy. It faced opposition especially from shop owners along important avenues of the city. However, a survey on one of the city's major avenues found that 80 % of the vehicles parked outside shops were actually owned by shop owners and employees. Only 20 % were of spaces were serving their clients. Furthermore, it was found that in some areas there was actually an oversupply of almost three times the actual parking space use (*e.g.* 166 cars parked in an area that had a total of 479 parking spaces). Backed by these results, the project to remove parking spaces and build wide sidewalks went ahead.

Source: Carlosfelipe Pardo, http://www.reinventingparking. org/2010/10/parking-revolution-in-bogota-golden-era.html

Figure 19
Parked cars block pedestrian walkways.
Foto by Carlos felipe Pardo, Bogotá, Colombia, 2008

In Serbia in the city of Nis, up until 2006 there was virtually no parking enforcement and people parked wherever they wanted, and used cars for very short trips. The city environment and economy were suffering. Two paid parking zones were introduced, with 25 enforcers (employed by a private company contracted to the municipality). Visitors must pay by the hour whilst residents receive preferential long term rates. The situation rapidly improved and gained acceptance because it was clear that the city was a better place to live, work and shop than it had been without parking controls. For more information, see http://www.eltis.org.

Therefore the key point to remember about enforcement is that it can and does improve. Some political will is required but it is normally the case that if enforcement changes a chaotic situation to one that is more orderly, people see the benefit and accept it.

Box 12: Case study: ISPARK, Istanbul, Turkey

With 2.5 million cars, 90 % of which have to park on-street, and economic growth of 10 % per year, Istanbul has major and growing parking problems. In 2005 the Greater Istanbul Municipality created a special parking organisation, Ispark, to introduce on-street parking controls and a more structured parking policy in many of its busiest areas. ISPARK now controls 51 off-street car parks with a total of 17,000 spaces, and 10,000 on-street spaces in 226 different locations.

Background and objectives

Istanbul is a city of 15 million people living at high densities in relatively small areas. Parking demand is intense as car ownership grows from its current level of around 150 per 1,000 people. There is also very little off-street parking, and a tradition of "informal" control of on-street

parking in areas of high demand. Ispark was created to:

- Better manage this difficult parking situation;
- Provide a better service to public parking;
- Use parking to stimulate public transport use;
- Make available additional off-street parking; and
- Begin to change public perceptions of parking control.

ISPARK is an arm's length company regulated by the Greater Istanbul Municipality to manage its parking on behalf of the municipality. Despite the lack of central and local government guidance and having to operate without an official parking strategy for the whole city, ISPARK operates under its own objectives and policies for its parking operations. Another difficulty is that ISPARK has to operate without legal enforcement capability – it is not legally allowed to fine people who violate its regulations, but this is not widely advertised and, because it has improved the parking situation, its regulations are widely accepted.

Implementation

Some 1,500 staff have been employed to manage those car parks and on-street areas controlled by Ispark, some of whom worked previously in "informal" parking management – a key example of how institutional structures can be changed in order to make parking management more effective. There is a recognisable ISPARK brand for staff uniforms, literature and signage, and clear pricing structures for both on- and off-street parking. In general there is an aim to move parking from on-street to off-street in order to create more space for moving traffic and pedestrians. Pricing structures therefore aim to make off-street parking more attractive than on-street. Staff members are trained in traffic safety, personal security and customer service to ensure that the image of the operation is as publicly acceptable as possible. Whilst ticket sales and enforcement are currently manual, ISPARK is developing automatic parking payment by mobile phone. It is also constructing new off-street car parks although this is limited by high land prices and lack of land availability, and construction costs for underground parking that vary between USD 7,500 to USD 12,000 per space.

Source: http://www.eltis.org

5. Implementation

5.1 Gaining acceptance for new parking policies

Parking is always a controversial matter, but this does not mean that changes in parking management practices will not be accepted by the public. Examples from African, Latin American, Asian and Middle Eastern cities all show that change is possible and acceptable. That said, small and/or incremental (step by step) change is likely to be more accepted than a large sudden change. But in any case, the public must be "carried along" with the changes, and whether they are or not will depend to a large degree on the communication that has been carried out. Effective communication involves broad participation of those with an interest in parking in the change process; a monitoring process, so that people know what the effects of parking changes are, as those changes are introduced; management of complaints, as part of communication; and the use of new forms of communication (*e.g.* special meetings between politicians and key stakeholders). For example, in the City of Nis, Serbia, mentioned in the previous chapter, the new parking charges and enforcement were marketed through a series of TV adverts and via leaflets handed out to drivers and others in the areas where charges were to be brought in. This was a major aid in improving public acceptance.

The public's acceptance of parking policy changes will in general depend on whether a number of factors are in place, as follows (after COST 342 pp. 68–70):

- That they know and understand the measures.
- That they perceive that there will be a benefit, in terms of the solution of a problem – and that parking fees and other regulations are related to the scale of this problem.
- That there are alternatives to parking (in the controlled area), such as park and ride, or better public transport services.
- That the revenue will be allocated fairly and transparently (people know where it has gone).
- That the parking regulations will be enforced consistently and fairly, and that fines will not

be excessive (and, ideally, that the fines are related to the seriousness of the offence – for example, overstaying on a parking meter would be a lesser offence than parking illegally in a bus lane).

These are many things to take into account when changing parking policy. However, if they are not taken into account then the parking planner risks a situation where measures may have to be removed and regulations rescinded when a change is made without sufficient communication, and therefore without user acceptance.

5.2 Implementation process

Parking management is not a technically complex thing to implement. It can be introduced in small steps – it is possible to bring in controls on one street, or even one part of one street, test them out and then work out from there. Nonetheless, there are some parts of the process that are important, and not be neglected, as follows:

Data gathering

Important data that needs to be gathered include: Who parks there now, for what purpose, for how long? Are there other groups of people (*e.g.* residents, shoppers) who cannot park? What problems does this cause? Are there safety or congestion issues related to the parking that goes on? Gathering similar data after the implementation of parking management will also help to show that it has relieved the problems that it was intended to solve.

Choice of measures

Measures required to manage parking need to be clearly related to the problem and to achieving objectives. For example, if there is long term commuter parking outside shops then the measure should relate to moving this commuter parking elsewhere to free up kerb space for short term parkers who will contribute to the economic health of the shops. It is also very important to be clear about how the system will operate – what will it cost to park, how much will the fine be, who will do the enforcing, will it be possible to appeal against a fine, and what will the money be used for? People will want to know answers to these questions in the next important stage.

Box 13: The second Parking Demand Study in Hong Kong, China

Following the First Parking Demand Study (PDS-1) conducted in 1995, the Transport Department of the Hong Kong administration commissioned an update in the year 2000 (referred to as PDS-2) to consider recent developments. The Study aimed to identify existing and future parking and loading/unloading problems and to recommend remedial measures to address these problems. The main objectives of the Study were:

- To validate and enrich the existing inventory of parking and loading/unloading facilities for the whole territory and convert it into a spatial format;
- To review and enhance the Parking Demand Model (PDM);
- To assess the present and future parking demand and supply situations;
- To review the HKPSG parking and loading/unloading provision in light of changes since PDS-1;
- To identify the scale of current parking related problems; and
- To review the PDS-1 recommendations, recommend new remedial measures and formulate new initiatives.

An explicit goal was that recommendations from the study were to be compatible with the overall transport strategy "Hong Kong Moving Ahead: A Transport Strategy for the Future" published in 1999.

The different steps for conducting the survey are shown in the figure below. A key task of PDS-2 consisted of collecting data to quantify the existing parking facilities and to characterise parking demand for modeling and analysis. The following techniques were used:

- *Inventory survey*

  This survey comprised parking facilities operated by the public sector and others. The number of available parking spaces was identified.

- *Parking Characteristics Survey*

  This survey focused on both the on-street and off-street usage-related parking and loading/ unloading facilities for different types of vehicles. The aim was to establish the relationship between total trips to/from a particular type of development and the maximum parking demand. This was done by observational surveys and questionnaires

to be filled in by operators of the parking facilities.

■ *Stated Preference Survey*

This was undertaken to determine the factors that influenced a motorist's decision to drive and his/her parking behavior.

■ *Additional surveys on overnight parking demand*, illegal overnight parking as well as newly constructed parking facilities and related issues such as change of land use, and composition of parking types.

The results of the various surveys were incorporated in a Geographic Information System (GIS), used for spatial analysis and

result presentation, as well as in an already existing Parking Demand Model used to forecast peak parking accumulations by district and future demand. In a final step, the study led to a reassessment of existing parking standards and remedial measures. The latter include Park and Ride facilities, the formation of Bicycle Parking Guidelines or the conversion of on-street private car parking spaces to Coach/Taxi Parking and Pick-up/Set-down facilities while providing sufficient off-street parking facilities.
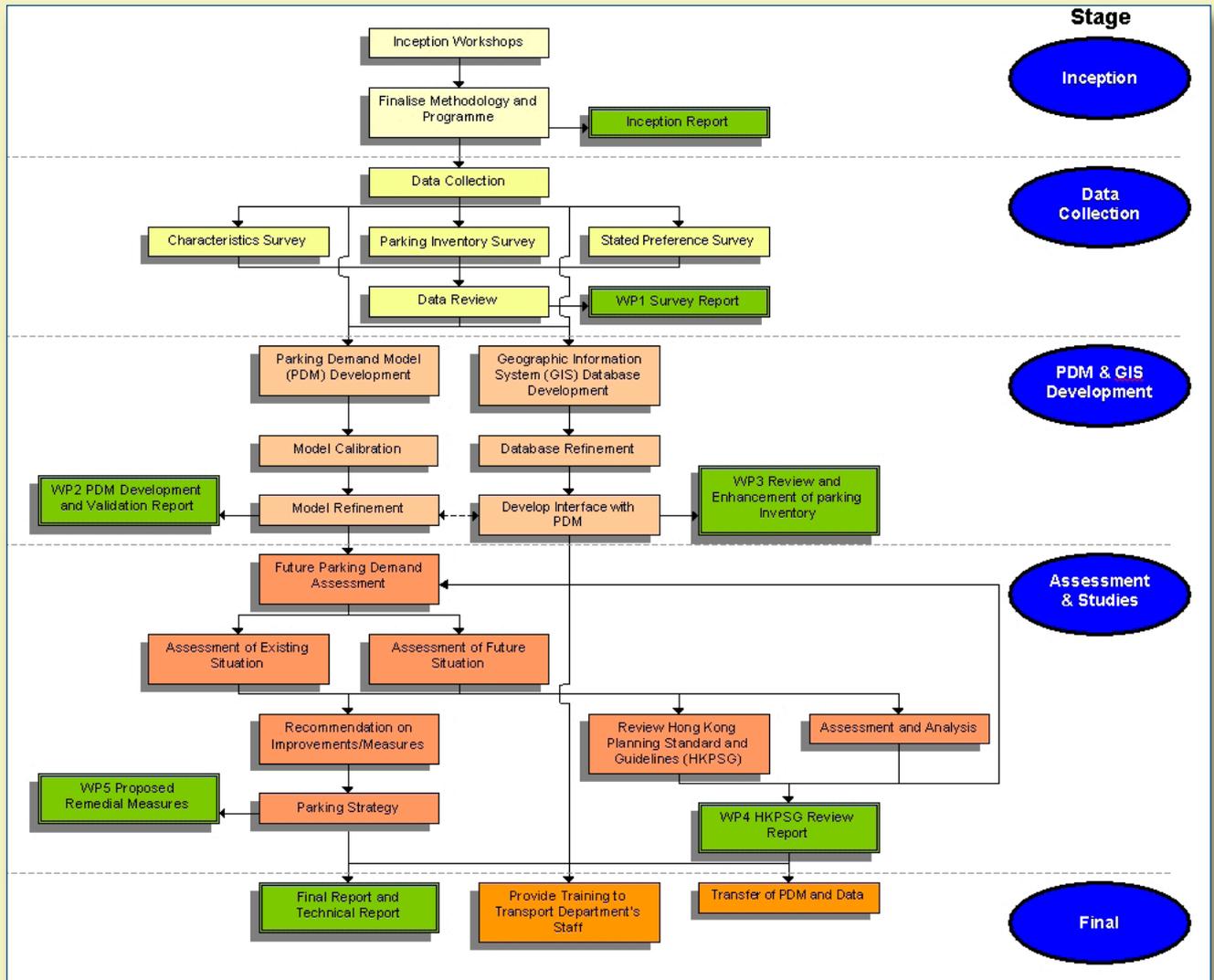
Figure 20
The process of the Second Parking Demand Study in Hong Kong, China.

Source: Ove Arup & Partners Hong Kong Limited, 2002: The Second Parking Demand Study, Final Report.
Available online at http://www.td.gov.hk/en/publications_and_press_releases/publications/free_publications/the_second_parking_demand_study_final_report_/index_t.html (accessed 01.11.10)

Consultation/participation/information about changes

It is very important to keep people informed regarding the forthcoming changes in parking. Parking management in Nis in Serbia was accepted partly because the public information campaign was so effective. However, it is important not to be too influenced by a few loud objections: before something is implemented, a few people will always object to change and to paying for something that was previously free.

Most people will not say much but if questioned will believe that the situation after parking management is introduced has improved.

Beyond that, parking issues faced by developing cities can present unique local challenges. For instance, the city of Yogyakarta in Indonesia has found it necessary to develop a negotiating strategy to deal with the network of informal parking operators that are entrenched in the city's central business district, as described in Box 14:

Box 14: Negotiating with parking operators in Yogyakarta, Indonesia

The city of Yogyakarta in Indonesia has a crowded and chaotic central business district (CBD). Transportation services are largely unregulated. There are about 1,600 buses and 800 taxis operating independently, with little regard for passenger comfort or safety. Conditions for those walking, bicycling, and riding in becaks (cycle rickshaws) is increasingly crowded and slow-going. Those who can prefer to acquire their own vehicles, leading to rapid motorisation. Of Yogyakarta's 260,000 private vehicles, 80% are motorcycles, yet the heavily utilised road network is still carrying 15,000 passenger car units per day, with 40,000 smp per day in the CBD. Respiratory problems are dramatically on the rise, and traffic casualties are the second highest after Central Java. Becak operators are seeing fewer passengers as people fear being mixed in traffic with motorised vehicles. As fewer pedestrians brave the streets, vendors are seeing fewer buyers. As a result, the central area of Malioboro has lost billions of rupiahs (IDR) worth of business. Streets that used to carry 70,000 pedestrians per hour are now down to 25,000 per hour, even during holiday peak season. Traffic conditions that force pedestrians into motorised traffic, along with chaotic parking conditions, especially in rapidly developing areas, are blamed.

A study of the situation revealed that a profitable system of informal parking services operating in the street were largely responsible for blocking pedestrians from the sidewalks. About 270 men working as parking attendants in the city's two central business areas are running parking illegally on the street. They earn an estimated IDR 15,000 per day, which is a good wage, and support families. The city sought to legalise the activities of these men and the parking services by relocating them to underutilised off-street garages and lots. Estimating that the parking attendants could increase their parking income from IDR 450,000 to 2.5 million (USD 37.50 to USD 208.50) per month, city officials thought they had a good offer.

However, the parking attendants held a demonstration in 2005 refusing the deal. Investigating why the parking attendants refused to move their operations revealed an entrenched system of dependencies and payoffs. The main parties were identified in the parking network as parking attendants and their bosses, land owners, and area leaders. It turned out the city had vastly underestimated the profits realised by the illegal parking mob. Parking attendants were able to re-use valid parking tickets and increase their profits to IDR 500,000 (USD 41.70) per month. Bosses overseeing 8 parking attendants could realise a monthly profit of around IDR 1 million (USD 83.40). The bosses in turn had to pay land owners with political power, who could receive up to IDR 1 million (USD 83.40) monthly. And finally, area leaders hidden within the ranks of the police and military service received payoff from land owners, around IDR 500,000 (USD 41.70) per property. Collectively, the political and informal power of this profit structure proved well sufficient to frustrate the aims and efforts of the government to reform parking services. Thus the study concluded that the government must first broadly address the issue of organised crime. The parking attendants are seen as the weakest party which should be protected and aided in providing parking services legally.

Source: "Problems in Reforming Transportation and Parking: A Case Study in Yogyakarta," Cholis Aunorrohman, 2005

Fines and money raised from parking management

If parking management is seen solely as a money-raising exercise it can lose its public acceptability. To avoid this, three actions are necessary:

- Show clearly how much money is raised and where it is spent. Ensure that at least a portion is spent on improving the environment and access in the area where parking management has been introduced.
- Ensuring that the level of charge keeps demand at the right level – about 85 % occupancy. Then people can park easily but streets are not empty of parked cars.
- If possible, varying the fine according to the severity of the violation. For example, overstaying on a parking meter by half an hour is not very serious, but parking in a bus lane where parking is banned all day and holding up several buses is very serious. The fine should be greater in the second case compared to the first.

In conclusion, then, implementation of parking measures is not an easy process but it is not technically complicated and the examples in this book show that it can be done even in areas where there has been little or no parking management previously. In the Serbian and Turkish examples, it is also important to note that unusually strong political leadership (such as that of Mayor Penalosa in Bogotá) was not necessary: political approval was there, but the measures were introduced by administrators and technicians. Parking management is implementable!

Box 15: Checkbox implementation

Parking management is usually implemented by local governments or individual businesses in response to specific parking and traffic problems. Transportation engineers and planners, within public agencies or consultants, are usually responsible for developing parking management plans.

The steps for developing a parking management plan are:

1. Define general problems to be addressed (parking congestion, traffic congestion, excessive parking facility costs, poor pedestrian environments, etc.) and the geographic areas to be considered.
2. Perform parking study that includes:
   - A parking supply inventory (public/private, on/off-street, short/long-term, free/paid, etc.);
   - A parking utilisation study (what portion of each type of parking is used, *i.e.* peak periods);
   - Projections of how parking supply and demand are likely to change in the future;
   - Use this information to identify when and where parking supply is inadequate or excessive.
3. Identify potential measures.
4. Work with all related stakeholders to prioritise options.
5. Develop an integrated parking plan that identifies changes in policies and practices, tasks, responsibilities, budgets, schedules, etc.

Figures 21 a, b
Spot the difference: "Krechatik Avenue" in Kyiv and "Avenue des Champs-Élysées" in Paris, France.
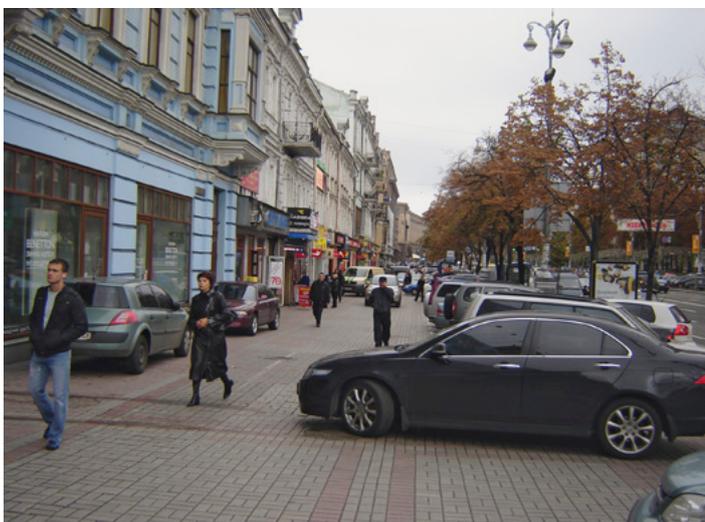
6. Parking, economic development and land use planning

6.1 Introduction

There is an inherent tension in parking policy between three key objectives for local authorities: local economic development (preserving economic vitality); raising revenue from parking charges; and travel demand management. The latter two objectives imply a need to reduce the number of parking spaces and/or charge for their use; the former is often seen to imply that as much parking space as possible should be provided, in order to ensure that no car borne trade or inward investment is deterred from the area in question.

COST 342 (pp. 47 and 48) reports some interesting experiences about attempts to use parking policy to stimulate local economic development. Because of political pressures from retailers in particular, several cities have tried relaxations to their parking restrictions to stimulate greater trade. These include:

In **Oslo**, Norway, weekend parking was made free. Instead of this attracting lots of additional shoppers, fewer people parked for longer (and some of those were shopkeepers). Occupancy rose to almost 100 %, parking duration by 30 % and so there was less turnover and it became more difficult for people to park. Most retailers were negative about the experiment and it was abandoned in 2000.

In **Herford**, Germany, the first half hour of parking was made free. This increase in occupancies, did draw some more short term visitors into town, but also led to a deterioration in the traffic environment.

In **Appeldoorn**, Netherlands, parking fees were increased at the same time as a cheap public transport ticket was introduced. The latter brought an increase in people coming into town, whilst parking occupancy remained as it was before. However, the view of most retailers was that people were choosing where to shop mainly on grounds of the quality of the shops, not the parking opportunities.

In **Madrid**, expensive parking fees have not affected the buoyancy of the retail economy.

On the other hand, a Dutch study (cited in COST 342, p. 48) on regional parking policy argued that:

■ On the one hand, cities and towns with unique quality/features can implement restrictive parking policies with little effect on their retail sector.

■ On the other, where there are a number of quite similar competing towns and cities, with little to choose between them, then parking policy can be a deciding factor for people in deciding where to go and shop.

■ Therefore, a regional parking policy can be helpful in that it can help to maintain the relative positions of existing centres within the region, and also (in theory) help to prevent the development of new, competing centres (but this depends on the planning system at a regional level).

In spite of the significance of the issue of parking and economic development, very few studies have in fact been carried out to better understand the links between parking availability, economic vitality and inward investment. Still and Simmonds (2000) provide a comprehensive review of the work that has been carried out to date. They argue that the lack of empirical evaluation of the effects on economic vitality of parking policy is due to a lack of consistent policy implementation, coupled with the difficulties of disentangling the effects of parking policies from those of other influences – particularly general economic conditions. They also point out that those companies that have been negatively affected by parking policies will not be present in an "after" study, perhaps biasing the results towards those companies that have benefited. Finally, they note that studies of the influences on locational decisions of retail and other firms have tended to assume that parking will be freely available; as maximum parking standards are increasingly adopted across the country, this assumption may be called into question and it may be expected that more studies will consider this issue.

The most comprehensive study of the effect of parking policy on retailing in the UK was carried out by Potter (1996) and Kamali and Potter (1997). They compared various cities according to the level of parking restraint

applied, and their level of economic vitality (in the retail sector, measured by vacancy and rental rates). They concluded (p. 420) that there is "no evidence that a relaxed attitude to parking improves economic performance". A similar type of study, comparing shopping centres in London, concluded that:

"although there is some relationship between indicators of economic prosperity and parking provision, this relationship is extremely weak. Other, much more important variables than parking provision are likely to be responsible for the differences in economic variability between London's centres" (Sanderson, 1997).

Still and Simmonds (op cit) point out that the conclusions of these studies do not mean that there may be no relationship between parking provision and levels of retail vitality. In terms of inward investment by employment uses, there is anecdotal evidence that parking availability has an impact on choice of location, but this has not been backed up by more rigorous empirical studies. Faber Maunsell (2002) note from interviews with the development industry that parking availability is unlikely to play a role in the inward investment process until the decision is at the level of choices between competing locations at the local level; thus it could for example influence a firm's decision as to whether to locate in Vienna or in nearby Wiener Neustadt.

6.2 Parking and land use planning

One area in which it might be imagined that these links might be made more explicit is land-use, and in particular, the amount of parking that is permitted in new developments. However, and once again according to COST 342, although there is guidance in most countries on this issue, its strength/force varies from country to country. In addition, such guidance will only act to restrain car use where it stipulates a *maximum* number of parking spaces that should be permitted in different types of development. There is some move away from minimum standards, towards maxima, but the degree to which this has occurred in different countries is by no means clear – the LEDA project implies that in most EU countries, there is still considerable emphasis on providing a *minimum* number of parking spaces with new development, or not

regulating this issue at all. But, as COST 342 (p. 52) says:

- Parking standards should be set as maximums.
- In more attractive, densely developed areas, parking standards should be lower, in combination with park and ride.
- It is important to allow the combined use of parking spaces, to avoid too much parking being provided.

Some examples of parking standards for new developments in different European countries are shown below (based on Healey and Baker, 1994). The right hand column indicates how many square metres of floor area are required per parking space. For example, in Madrid, a building of 3,000 m² would be permitted (or would be required?) to build 30 car parking spaces. It is not clear whether these are maxima or minima. In certain cases, a range is shown. In Antwerp, more parking is permitted in areas with worse public transport accessibility. This could of course lead to the unintended effect that developers prefer more parking, so try to locate in areas with poor public transport accessibility, thus undermining the intention of the policy, which is to get development located in areas of high public transport accessibility with little parking space so that people travel to it by public transport. The chances of this policy succeeding may be increased by allowing developers to develop at higher densities in the areas of high public transport accessibility.

Table 12: Parking Standards for New Developments

City/town	m² of floorspace per parking space
Paris	250–166
Lyon	100–43
Madrid	100
Barcelona	100
Hamburg	40–65
Frankfurt	30–50
Antwerp (high public transport accessibility)	300–600
Antwerp (low public transport accessibility)	60–120
Brussels	No standard

There is little information about parking standards for new developments in developing country cities. The oft-cited example of Curitiba – well known for its bus rapid transit (BRT) system – actually has generous minimum parking requirements, introduced in 1990 to keep parked cars off the streets around new developments. The problem with these standards is of course that they encourage car travel to the new developments. In Delhi, also, the Delhi Development Authority requires minimum parking standards in new developments. A change to maximums can help to reduce car travel as long as there are effective limits to on-street parking in the vicinity of new buildings.

Box 16: The Dutch ABC parking policy, as applied in The Hague, Netherlands

The Dutch ABC Location Policy is based on two key concepts:

1. *The proximity principle* tries to get the origins and destination of trips together as close as possible.
2. *Accessibility profiles* try to get the right businesses (also new urban developments) in the right places in terms of transport needs. The main objectives of the traffic and transport policies of The Hague are:
    - Minimising the increase of private car use;
    - Improving accessibility to the city centre; and
    - Improving environmental quality of the city.

Although the idea is to limit the need to use the private car, the role of the private car is not denied. Therefore the plan also aims to regulate the scarce space for car parking. The ABC location policy with regard to parking measures has as a general objective to improve city centre access and limit car traffic. A key characteristic of the parking policy is the recognition that parking demand of an office building is related to the number of employees. If demand is unknown, it is estimated that each employee will on average occupy about 25 m². The parking demand for visitors is also related to this. The parking measure is part of the ABC location policy. The key features of the parking policy are:

- The places most accessible by public transport receive the strictest norms for parking spaces. These are the 'A' locations.
- The 'C' locations are far more difficult to reach with public transport and therefore the parking norms are far less stringent.
- The 'B' locations are situated in between and have both public transport and automobile access.

The three 3 parking policy standards are:

A location – Inner city/surroundings of 2 main stations: 1 place/10 employees;

B location – The zone around the inner city: 1 place/5 employees;

C location – Others: 1 place/2 employees.

ABC location parking policy can be introduced in larger towns that have an accessibility problem and have introduced paid parking. The latter is crucial, because the measure implements norms for maximum allowed parking spaces for firms. If parking in the area is free, location policy can be neglected by the firms as parking spaces of the area can be used. As The Hague is a city with a relatively high demand for office space resulted in an increasing zone for paid parking and an accessibility problem. The ABC location policy has been successfully introduced here. The parking norms applied to firms/offices that are related to the PT provision have the advantage that they will receive easier support from firms (because they have the alternative transport means) and they push firms to think about mobility management.

Source: Tom Rye, http://www.eltis.org/studies

7. Conclusions and recommendations

7.1 Recommendations

As car ownership grows, so demand for parking will grow, and most towns and cities will have to deal with many of the issues that have been outlined in this material. It is possible to develop a car parking policy that will manage the negative impacts of urban car use whilst also supporting business and the economy. It is a careful balancing act, which is why it is important to learn from the experience of other places. Based on various studies and practices cited in the earlier chapters, this material draws the following recommendations:

- That the role for parking as a means of restraining car use should be recognised in transport policy documents and actions and needs to be included in a comprehensive manner.
- That there is a need for national maximum parking standards (expressed as guidance) for new development.
- These national guidelines should be translated to regional maximum standards.

- Legislation is needed to set a framework for parking charges and fines, and to put liability for any fine with the owner of the car.
- Legislation should provide local authorities with the powers to enforce parking regulations if they wish, and to keep the revenue so generated, and to follow up those who do not pay fines, and to contract out the parking enforcement operation.
- As demand for parking increases there will be an increasing need to introduce paid parking. Thus, managing demand on a long run.
- Parking tariffs should be higher for on-street than off-street, to encourage people to use the latter.
- Park and ride has a role to play in maintaining the accessibility of central areas of larger towns and cities, but it will work best where there is a shortage of central area parking.
- All changes to parking must be communicated well in advance.
- A positive approach towards working with the public may increase compliance with parking regulations.
- Periodic evaluation of the project is essential, to have an idea for future improvement.

41

Literature and websites

The following literature and websites have been used to set up this written material. Here you can find further information, project results and good practice case studies.

Related Projects

GOAL GOAL – Healthy without car and noise – Final Report http://www.goal-graz.at

ICARO Increase of Car Occupancy through innovative measures and technical instruments – Implementation Guidelines for Increasing Car Occupancy (1999)

COST 342 Parking Policy Measures and their Effects on Mobility and the Economy http://cordis.europa.eu/cost-transport/src/cost-342.htm Final report available at http://www.transportlearning.net/docs/COST%20Action%20342%20final%20report%20veilig.pdf

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Currency abbreviation ISO code

CNY	Chinese yuan
EUR	Euro
IDR	Indonesian rupiah
INR	Indian rupee
UGX	Ugandan shilling
USD	United States dollar