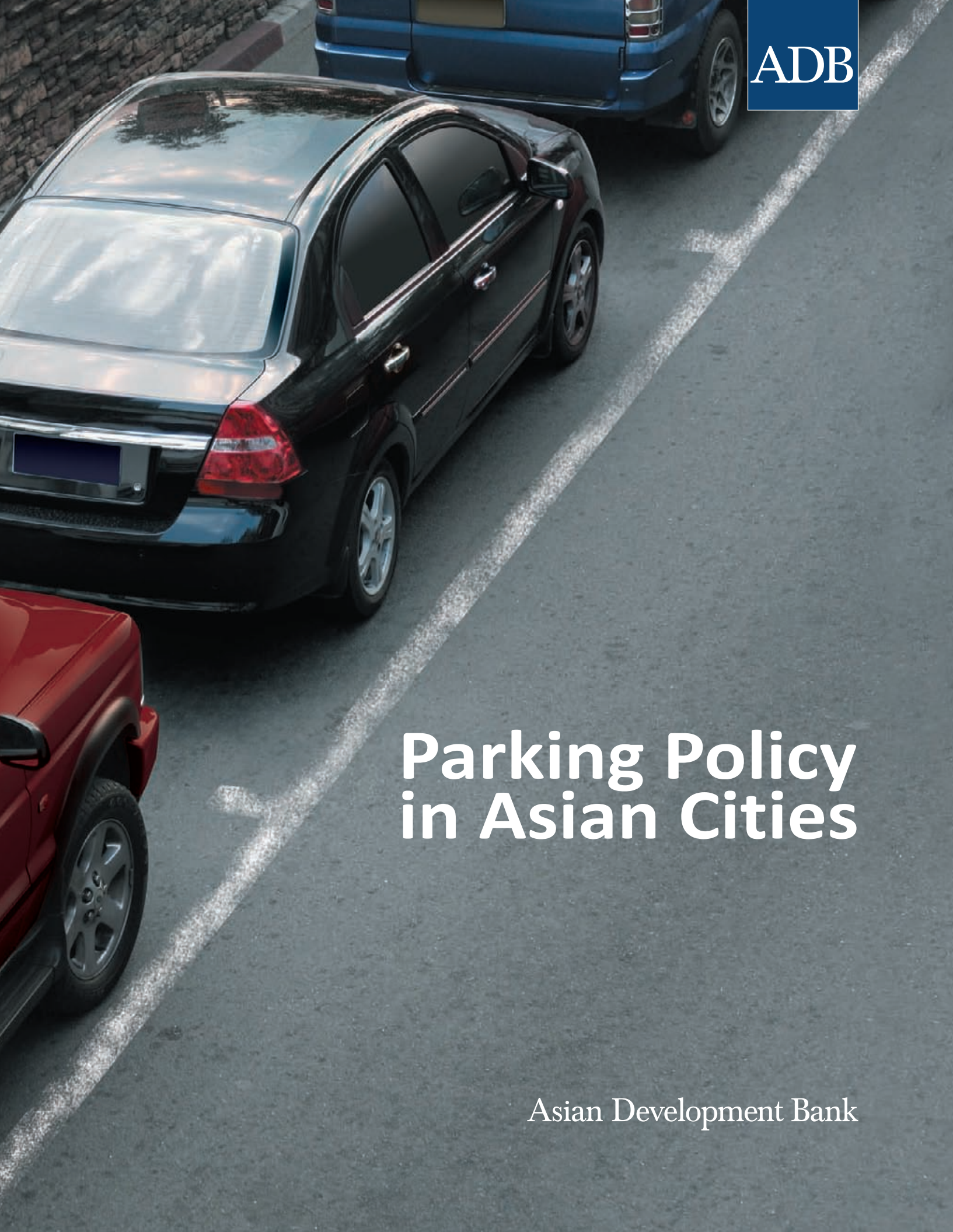

# Parking Policy in Asian Cities

Asian Development Bank

ADB

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In this report, the term "Taipei city" refers to the urban area centered on the City of Taipei of Taipei,China. "Hong Kong" refers to the entire urbanized area within Hong Kong, China.

Note:
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However, the author takes sole responsibility for any errors that may remain in the text.

# Abbreviations

| | | |
|---|---|---|
| ADB | – | Asian Development Bank |
| BMA | – | Bangkok Metropolitan Authority |
| CBD | – | central business district |
| FAR | – | floor area ratio |
| GFA | – | gross floor area |
| HDB | – | Housing and Development Board (Singapore) |
| ITDP | – | Institute for Transportation and Development Policy (United States–based nonprofit organization) |
| LTA | – | Land Transport Authority (Singapore) |
| MAPA | – | Makati Parking Authority (Manila) |
| PPP | – | purchasing power parity |
| PRC | – | People's Republic of China |
| TDM | – | travel demand management |
| URA | – | Urban Redevelopment Authority (Singapore) |

# Executive Summary

Much confusion and uncertainty over parking policy choices face Asian cities. This study addresses a lack of literature on urban car parking policy in Asia. Parking challenges are often acute in this region because of rapid urbanization and motorization and the high density of much of the urban fabric.

Information gathering for this study was done between August 2009 and January 2010. It investigated parking policy across 14 large metropolitan areas in East Asia, Southeast Asia, and South Asia. The data obtained are based on policy documents, previous studies, interviews in each city, observations, and intercept surveys. The cities covered were the following:

- East Asia: Beijing, Guangzhou, and Hong Kong in the People's Republic of China; Seoul in the Republic of Korea; Taipei city of Taipei,China; and Tokyo in Japan.
- South Asia: Ahmedabad in India and Dhaka in Bangladesh.
- Southeast Asia: Bangkok in Thailand, Ha Noi in Viet Nam, Jakarta in Indonesia, Kuala Lumpur in Malaysia, Manila in the Philippines, and Singapore.

This study aimed to provide a clear perspective on the key parking supply policy choices available for Asian cities. It did this by

- providing or highlighting relevant context on international debates on parking policy,
- explaining the contrasting approaches to parking policy that are available,
- providing a comparative perspective on Asian parking policy trajectories by compiling a rich set of information on key aspects of parking supply policy in 14 Asian cities and by presenting results of parking behavior surveys from 12 of them,
- evaluating the relevance for Asian cities of recent international academic and professional debate, and
- considering whether approaches in Asian cities offer lessons for each other and for others.

This report is aimed at a wide variety of actors involved in shaping Asia's cities. Parking policy is important for various urban professions including urban planning, transport planning, traffic engineering, urban design and architecture, as well as parking industry and real estate professionals. Every level of government potentially has some interest and responsibility for parking policy but the local government is a particularly important audience for this report.

For better parking policy, it is vital to gain a clear understanding of the broad choices available. Based on international literature, the main alternatives can be categorized as

(i) "conventional" approaches (with two variations: auto-centric and demand-realistic), which focus on ensuring adequate parking supply by using minimum parking requirements;
(ii) "parking management" approaches (with two variations: multi-objective and constraint-focused) in which complex parking management is seen as a tool for wider policy goals, such as traffic limitation; and
(iii) "market-based" approaches, in which market prices are fostered and allowed to interact with parking supply and demand in the usual ways.

The study also sought insight on the overall parking policy approaches being adopted in these Asian cities. It found distinct parking policy trajectories among the cities studied. Pathways that are the strongest candidates for possible emulation are presented first, followed by trajectories that seem more in need of reform. However, none of them is perfect and all have elements worth studying.

- Tokyo, and Japan more generally, has a unique set of policies that have resulted in a remarkably market-oriented parking system with ubiquitous commercial market-priced parking. This has arisen as a result of three pragmatic policies: minimum parking requirements that are set very low and which exempt small buildings, very limited on-street parking, and a proof-of-parking rule (which requires access to a nighttime parking place to be secured before registering a car).
- Hong Kong, Seoul, and Singapore can be grouped loosely together. It is surprising that these cities use minimum parking requirements despite being known for transport demand management policies. However, they show some signs of shifts away from the conventional approach and away from supply expansion efforts. They have been making their parking requirements more moderate. Each has elements of constraint-focused parking management in transit-rich locations. There are signs of market-oriented parking supply, especially in Hong Kong. Pricing is widespread (although less so in Seoul).
- Beijing, Guangzhou, and Taipei city of Taipei,China seem to be following moderate paths. They have modest parking standards and seem to exempt very small buildings. All have been enthusiastic for government-provided parking but in Taipei city, this has been waning. All are increasingly able and willing to manage on-street parking problems. There are signs of interest in multi-objective parking management policies. Many areas also have a pool of shared, priced parking, raising the potential for market-oriented approaches. However, PRC cities have price controls on private sector parking, which may undermine this potential.
- Ha Noi's car parking policies are not yet strongly developed, since car ownership is very low. It may be heading in a similar direction to the PRC cities. Ha Noi is emphasizing government-supply and off-street parking requirements but neither of these efforts is making much difference so far. Nascent market-based provision is being undermined by price controls.
- Bangkok, Jakarta, Kuala Lumpur, and Manila are "minimum parking requirement enthusiasts" with conventional parking policies that promote car ownership and use. However, relatively high off-street parking standards for buildings have not solved their on-street parking problems. Critiques of Western parking policies that rely on minimum parking requirements (the conventional approach) are relevant to these cities.
- Ahmedabad and Dhaka (and other South Asian cities) face acute on-street parking problems as car ownership accelerates. They are trying to emphasize minimum parking requirements and local government-provided parking. Improving the weak management of on-street parking is crucial but elusive so far. Unrealistic expectations prevail that parking will be cheap for users.

Important policy arguments and lessons in this study include the following:

- International debates and Western experience suggest the conventional approach, which depends on minimum parking requirements, is problematic and is especially poorly suited to dense urban fabric (which accounts for much of urban Asia).
- It was therefore a surprise to find all of the Asian cities in the study applying minimum parking requirements. The Western-focused literature on parking policy led us to expect dense cities with modest car ownership levels to reject the conventional approach and to make much use of variations on the parking management approach.
- It is very important to understand that there are diverse alternatives to the auto-centric version of conventional parking policy. Parking constraint is sometimes seen as the only alternative but it is only one among several options.
- Critiques of the conventional approach are clearly relevant to some Asian cities, especially in Southeast Asia and South Asia. Others, especially in East Asia, are using moderate versions of conventional parking policy so that the problems are less obvious. Nevertheless, they also seem well suited to the alternatives

(parking management and market-oriented parking policy) and should benefit from considering them.

- Whether or not parking space is exempt from counting toward the allowable floor area of building developments is an important but little-discussed aspect of parking policy. It appears to be a strong influence on developer incentives to provide parking and deserves more study. Such floor area exemptions are a parking subsidy (using the currency of planning powers).
- Several cities in the study (and international experience) demonstrate that successful management of on-street parking is possible and is not restricted to high-income locations. This is important, since concern over on-street chaos drives much of parking policy.
- Several cases corroborate international experience that plentiful off-street parking provides no guarantee of orderly on-street parking. Others demonstrate that minimum parking requirements that are set at low levels do not necessarily cause on-street chaos. The key to solving on-street parking problems is effective on-street parking management. Expanding off-street supply is not a replacement for such management.
- Effective enforcement is crucial to on-street parking management. Most of the success stories involve shifting this responsibility from police to local authorities or to contractors.
- The study highlights the high opportunity cost of parking in dense cities. In such cities, there are high-value alternative uses of any space devoted to parking. This implies that, if parking users are to pay their way, relatively high parking prices should be expected in Asian cities.
- Government-subsidized parking is a regressive use of taxpayers' resources in cities with modest car ownership rates and is expensive, in light of the high opportunity cost of built space in dense cities. Unfortunately, it is being expanded in several cities, especially in the PRC and South Asia. Some high-income East Asian cities, such as Hong Kong, Taipei city, and Tokyo have government-owned parking that is priced at close to market prices.
- As expected, pricing of parking is widespread in many Asian cities (although it is uncommon in some). Priced public parking plays a significant role in East Asia especially. Nevertheless, survey results show that a surprising proportion of parking is free-of-charge for motorists, even in dense cities with high property prices (and hence a very high opportunity cost for parking space).
- Few of the successful parking management best practices from inner cities in Europe and North America have been used so far in these Asian cities (Seoul is the main exception). Multi-objective parking management and some of its specific tools probably have much to offer in many Asian urban contexts.
- Very few Asian cities have policies to constrain parking supply, even in city-centers where the alternatives to driving are richest. This is surprising since radial mass transit systems are strong or expanding in many of these cities. Internationally this is often complemented by parking constraint. Seoul is an exception and its experience deserves wider attention.
- Park-and-ride facilities to encourage motorists to access mass transit are found in Bangkok, Beijing, Guangzhou, Hong Kong, the Kuala Lumpur area, Seoul, Singapore, and Taipei city. Unfortunately, many of these are being built within high-density, inner-urban contexts where car-based park-and-ride is unlikely to be a cost-effective use of high-value space near mass transit.
- Minimum parking requirements that are set very low, as in Japan for example, do not mean parking is severely limited by policy. Nor do they imply that most parking must be in streets or in government-subsidized facilities.
- Private sector off-street parking businesses can become significant when on-site parking is not oversupplied (or over-required), if parking prices are not controlled and if government-subsidized supply does not crowd out the private sector. Tokyo, like most Japanese cities, has low minimum requirements but does not have policies to limit parking supply. Parking businesses charging market prices are ubiquitous across Tokyo.
- Japan's proof-of-parking regulation deserves wider understanding and possibly emulation. It was designed to solve parking problems, not to limit car ownership. It succeeds in placing responsibility for nighttime parking onto car owners. A key result of this policy is that many Japanese car owners lease residential parking in their neighborhoods at local market prices.
- Price controls are applied to private sector parking in Beijing, Guangzhou, Ha Noi, and Jakarta. It is difficult to justify regulating

private sector parking prices. Capping prices will suppress supply, inflate demand, and lose the information value of market prices.

- "Park-once neighborhoods" are common across the region. These are places in which most parking is in shared, priced, public parking within dense and walkable mixed-use areas. These offer a promising ideal to foster. Their prominence suggests that a market-oriented approach may have strong potential in Asian conditions.
- Market-based parking systems in many parts of Japanese cities and to some extent in parts of other East Asian cities deserve further investigation for their potential lessons. They may demonstrate the feasibility of a market-oriented approach to parking policy that may be well-suited to dense areas with highly mixed land uses, which are common in Asian cities.

# Introduction

This report provides an international comparative perspective on parking policy in Asian cities, while highlighting the nature of the policy choices available. It addresses the lack of accessible international literature on parking in Asia.

Parking in much of urban Asia is already a source of conflict and inefficiency. It requires urgent action to address its own acute problems. Parking policy choices also have significant wider consequences. There are sharp contrasts among the available approaches and their implications for motorization trends, traffic growth, transport equity, urban development patterns, public space, and emissions of local air pollutants and greenhouse gases. Parking policy may be more pivotal than has usually been recognized. It presents dangers for its potential role in entrenching unsustainable pathways of development. Conversely, wise parking policy might offer tools to address these growing problems.

The study emphasizes that the alternatives in parking policy go deeper than selecting from among a list of best practices. Every city faces choices between fundamentally different approaches to parking policy, each with strongly contrasting assumptions (Chapter 2). The nature of these choices is often misunderstood and many parking policy debates are confounded by hidden assumptions.

This report should help readers to clarify their own understanding of parking and of the relevant policy options. It is important to realize that the alternatives are richer than just the stark choice between a supply-boosting predict-and-provide approach and a supply-constraining approach. Focusing only on these two extremes is to ignore several important approaches.

## Motivations: Parking predicaments

Newly motorizing cities around Asia face alarming predicaments over parking. A common version in South Asia, for example, goes something like this:

> *A commercial street is clogged with motor vehicles. Many are parked at the roadside, across curbs, and on footways and dusty verges. Some cars are double-parked. Attendants can be seen taking small cash payments from motorists, even from vehicles on footways or double-parked. News reports highlight the "shortage" and call for action.*
>
> *Meanwhile, basement parking lots of many buildings along the street are half empty. These lots charge a small fee for parking in an attempt to recoup some of their costs. The fees are slightly higher than is charged in the streets.*
>
> *Municipal regulations require these parking spaces to be provided as a condition for building approval. However, some buildings have shops in their basements instead of parking. With low parking prices, retail offers much higher returns than parking. In some cases, a downward ramp betrays that this was planned to be parking space. Building inspectors were persuaded to ignore these violations. Occasionally, enforcement action is taken and basement shops are demolished.*
>
> *The city government is also trying to build parking structures itself. It has two so far, on city-owned land. The projects were expensive and have low returns. Moreover, they have not prevented on-street parking chaos in their vicinities. There are plans for many more such structures but budget problems have stalled the program. The latest plan involves a developer building 10 stories of office space in return for creating five stories of public parking.*

On-street parking (and double-parking) in the Motijheel office district of Dhaka, with a parking attendant in the foreground

Something like this predicament, similar to that faced by large American cities in the 1920s, has also appeared in various places during the last 50 years. Parking emerged as a serious problem in western Europe from the 1950s, in Japan from the mid-1960s, in Hong Kong and Singapore in the early 1970s, and in the Republic of Korea, Malaysia, and Thailand in the late 1970s and 1980s. How did they respond? Have some done better than others?

With vigorous management and with efforts to avoid underpricing and oversupply, many European cities have now transformed their parking situations (at least in inner cities) from a costly problem that could only be solved at high cost into an economic opportunity and valuable asset for local communities (de Wit 2006, 7). Have any Asian cities achieved the same, and can others follow suit?

## Motivations: Asian urban trends

Three key issues make parking in Asian cities especially important and problematic:

- **Rapid urbanization**. This populous region is undergoing rapid urbanization. Most countries are only part way through an urban transition. Choices now will shape a vast future stock of urban fabric.
- **Rapid motorization**. Rapid motorization is occurring in many countries. This, together with uncertainties about its pace, makes parking policy difficult.
- **Dense cities**. Many of the cities of the region are unusually dense by world standards. This can be an opportunity for achieving rich mode choices. However, high densities make parking dilemmas particularly acute. High density and associated high property prices are impossible to reconcile with the desire among new car owners for parking to be cheap and plentiful.

The Sustainable Transport Initiative (STI) of the Asian Development Bank (ADB) is animated by similar observations. This parking study takes place in the context of wider ADB efforts to align transport sector interventions with the guidelines provided by ADB's Strategy 2020 (ADB 2008). This report is a step in building a knowledge base to inform possible parking policy interventions and to form a component of a holistic approach to sustainable urban transport across the region.

## Study objectives

The motivations above flow into a series of questions and objectives. What approaches to parking policy have emerged in Asian cities? Do they offer any lessons? Do frameworks on parking policy choices developed with reference to Western experience capture the range of Asian approaches? Which approaches seem best suited to various Asian conditions?

With these questions in mind, this study has aimed to

- Place parking policy in Asia into an international comparative perspective by compiling a rich set of information on parking in each city,
- Make a preliminary evaluation of whether recent international academic and professional debate on parking policy is relevant for the cities investigated, and
- Ask if any of the parking approaches of Asian cities offer policy lessons for each other and for other cities.

## Focus

This exploratory study has focused on a group of countries in East Asia, Southeast Asia, and South Asia. Deeper insight was provided through investigating 14 large cities as case studies. It is hoped that these capture much of the diversity of parking policy and outcomes around the region, at least for large cities. The cities covered in detail were the following:

- East Asia: Beijing, Guangzhou and Hong Kong in the People's Republic of China; Seoul in the

Republic of Korea; Taipei city of Taipei,China; and Tokyo in Japan.
- South Asia: Ahmedabad in India and Dhaka in Bangladesh.
- Southeast Asia: Bangkok in Thailand, Ha Noi in Viet Nam, Jakarta in Indonesia, Kuala Lumpur in Malaysia, Manila in the Philippines, and Singapore.

It is important to note that the focus is not just on central business districts (CBDs) but also on parking across whole metropolitan areas. City centers receive more parking policy effort than elsewhere but this study looks well beyond them.

The study also has a wide focus with respect to activities served by parking, as follows:

- Parking at or near **homes**, demand for which is closely linked with vehicle ownership. The spaces are occupied for long periods, especially at night.
- Parking associated with **work and education** trips, which is most closely associated with travel in peak periods most prone to congestion. The spaces are occupied for long periods throughout a working day.
- Parking associated with **shopping, leisure, and entertainment**, which tends to be associated with travel outside peak periods and to be relatively short-term.

The study has emphasized the following issues:

- Forces and policies shaping the supply of parking (including interactions with demand and price).
- The parking of motorized private passenger vehicles (cars and motorcycles), not others, such as goods vehicles or bicycles.
- Much more emphasis on car parking than motorcycle parking. Even in cities with more motorcycles than cars, an overwhelming proportion of policy energy is devoted to car parking. Nevertheless, the chapter on motorcycle parking (p. 67) focuses on motorcycle parking.
- Competition for urban space between parking and other possible uses. In most cases, land or built floor area that is devoted to parking could have been used for other things. The opportunity cost of space devoted to parking is especially important in dense cities and within the most intense activity areas of each city.

It is important to note that the focus is not just on central business districts but also on parking across whole metropolitan areas. City centers receive more parking policy effort than elsewhere but this study looks well beyond them

## What is not covered in this study

The study thus emphasizes the forces shaping passenger car parking supply in competition with other uses of space. There are several important dimensions to parking policy that could not be included in any detail. These include the following:

- Urban design, including both aesthetic and functional design issues around parking;
- Streetscape design issues around parking within the street right-of-way except to highlight in the chapter on parking policy in streets and lanes (p. 30) that several cities could do better on this;
- Enforcement issues except to point toward their importance and to suggest that success is possible (p. 38);
- Bicycle parking, despite its importance in several cities;
- Goods vehicle parking and loading and/or unloading;
- Curbside management to balance the needs of parking, taxi modes, nonmotorized transport, loading and unloading, etc.; and
- Parking information and guidance systems, which are increasingly being deployed.

The study does not aim to be a best practice guide. However, a few especially relevant practices are highlighted. The bibliography points to sources of guidance on policy and best practice specifics, such as Litman (2006) and Hamilton (2006). Other organizations, including Deutsche Gesellschaft für Internationale Zusammenarbeit's (GIZ) Sustainable Urban Transport Program and the Institute for

Transportation and Development Policy (ITDP), are producing parking best practice documents for various regions. Their documents will complement this one.

## Methods

The study was carried out with the help of local field assistants and collaborators in each city (see Acknowledgments).

### Seeking policy documents and previous studies

Local teams were asked to seek relevant documents and highlight relevant contents. The available sources varied from city to city and included documents from a wide range of actors, including parking policy documents; academic studies; legislation; planning regulations, such as building codes; metropolitan transport study and strategy documents; parking industry documents and trade outlets, magazines, events; traffic impact and parking impact studies; local area parking studies; reviews of on-street parking pricing or management; news or media reports on parking, and others.

### Interviews

More than 65 interviews were conducted with relevant stakeholders, both inside and outside government, making interviews one of the principal sources. Most of these involved the principal investigator while on field visits to the cities, but a number were conducted independently by local members of the study team. An overview of the interviews conducted is provided in Appendix 1.

### Observation

This study sought an overview perspective on each metropolitan area. It was not feasible within the budget to use some of the standard methods of local parking studies, such as parking inventories, occupancy surveys, turnover studies, measurement of "cruising for parking," and such like. In any case, these provide highly localized insights. In Tokyo, an online parking information system made it possible to carry out some systematic observations of parking usage levels for three localities.

Walking tours were carried out by the principal investigator, with local team members, in diverse locations across each city, making careful observations of parking phenomena and interviewing locals involved in parking activities. Documentation from teams in the study was supplemented by photos taken during these walks.

### Intercept surveys in most of the cities

Surveys using a set of almost standard questions were carried out in all of the cities, except Guangzhou and Tokyo. The numbers of valid responses from each city were: Ahmedabad = 180, Bangkok = 199, Beijing = 187, Dhaka = 350,


Coin-operated parking in Ueno, central Tokyo (left and right photos)

The samples were not random, but strategies were adopted in each case to yield respondents that were reasonably representative of active motorists with homes and workplaces in a wide range of locations across each metropolitan area

Ha Noi = 198, Hong Kong = 264, Jakarta = 206, Kuala Lumpur = 158, Manila = 183, Seoul = 210, Singapore = 201, and Taipei city = 200.

The sampling strategy aimed to obtain a reasonably representative sample of active motorists. However, compromises on this were necessary in some cities. The samples were not random, but strategies were adopted in each case to yield respondents that were reasonably representative of active motorists with homes and workplaces in a wide range of locations across each metropolitan area. The surveys in most of the cities involved intercepts of motorists in appropriate public places, such as petrol refilling stations. However, in Hong Kong, an online survey approach was adopted. In some cities, intercepts were supplemented to a modest extent with other strategies.

The survey data have some limitations that will require some caution when evaluating the results. These include

- slight differences in some questions due to local circumstances and terminology,
- modest sample sizes mean small differences will not be significant and ambitious cross-tabulations were not possible, and
- these were not random samples so we must be cautious in taking them to be representative of all motorists in each city.

Despite these caveats, the surveys allow comparisons of major patterns in parking behavior among the cities. The discussion on taxing parking perks on page 54 describes the results of the surveys and Appendix 4 provides more detail on the surveys.

Tokyo had a small exploratory survey with a very small sample size and with questions that differed markedly from the others. It provides certain insights but is not compared directly with the rest.

## Distinction between longer-motorizing cities and newly motorizing ones

In discussing the comparisons between the cities in this study, it has been useful to make a distinction between cities that have been grappling with parking issues for decades and those that are only recently facing the need for a robust parking policy.

The criterion chosen is the timing of each city's early surge of car ownership, which is taken to be their passage through about 20 to 60 cars per 1,000 persons and whether this took place more than 15 years ago or was much more recent.

By this criterion, the *longer-motorizing group* is Tokyo, Singapore, and Hong Kong (1960s); together with Taipei city, Kuala Lumpur, and Bangkok (1970s); and Seoul, Jakarta, and Manila (1980s). These cities might be expected to have well-established ways of handling parking.

The second *newly motorizing group* is Beijing and Guangzhou (late 1990s, early 2000s) with Ha Noi, Ahmedabad, and Dhaka (which are only now or very recently reaching this range of car ownership). These have seen accelerating rates of car ownership within the last 10 years, so that it is only within the last few years that they have needed to grapple with parking problems at a scale that demands a significant policy response. Mass car ownership is a recent phenomenon in the People's Republic of China cities, even though they now have car ownership higher than in Hong Kong or Manila.

## Key characteristics of the cities in the study

The cities in this study are diverse. Table 1 provides perspective. Similar data estimates for Sydney in Australia are provided as a comparison.

## Table 1 Key Data (or Estimates) of the Cities in the Study

| | Population (millions) | Urban Density (persons per urbanized ha) | Car Ownership (per 1,000 persons) | Economy GDP/Capita (PPP$ 2008) |
|---|---|---|---|---|
| Singapore | 4.6[b] | 94 (1995); 107[a]; 96[b] | 112 (2008) | 50,456 |
| Hong Kong | 7.1[b] | 320 (1995); 367[a]; 251[b] | 55 (2008) | 43,954 |
| Tokyo | 35.2[b] | 88 (1995); 41[b] | 335 (2008) | 34,173 |
| Taipei city | 6.3[b] | 230 (1995); 101[b] | 253 (2008) | 30,942 |
| Seoul | 19.9[b] | 230 (1995); 282[a]; 101[b] | 227 (2005) | 27,620 |
| Kuala Lumpur | 5.8[b] | 58 (1995); 26[b] | 314 (estimate) | 13,816 |
| Bangkok | 8.3[b] | 139 (1995); 58[a]; 36[b] | 330 (estimate) | 8,216 |
| Beijing | 14.0[b] | 123 (1995); 145[a]; 42[b] | 103 (2008) | 5,958 |
| Guangzhou | 13.2[b] | 119 (1995); 365[a]; 66[b] | 84 (2008) | 5,958 |
| Jakarta | 22.0[b] | 173 (1995); 127[a]; 85[b] | 203 (2006) | 3,975 |
| Manila | 20.8[b] | 206 (1995); 141[b] | 82 (2007) | 3,507 |
| Ahmedabad | 5.4[b] | 134[a]; 184[b] | 55 (2007) | 2,923 |
| Ha Noi | 2.4[b] | 179 (urban core 2001); 82[b] | 18 (2009 estimate) | 2,788 |
| Dhaka | 10.1[b] | 401[b] | 27 (2009) | 1,501 |
| Sydney | 3.7[b] | 19 (1995); 20[b] | 516 (1995) | 36,417 |

GDP = gross domestic product, PPP = purchasing power parity.

Sources and notes: 1995 data are from Kenworthy & Laube (2001). Density figures marked [a] are "built-up area" densities for circa 2000 from Alain Bertaud's database via http://alain-bertaud.com/. Population and density figures marked [b] are from Demographia (2010). Ha Noi's 2001 urban core density is the gross density for the urban districts (1.506 million people in 84.3 $km^2$). Gross domestic product (GDP) per capita figures for the countries and/or territories that contain each city are from the Asian Development Bank (2009). Appendix 3 shows the data sources on car ownership estimates. Seoul population and density data are for Seoul plus its satellite cities, but the car ownership data are for Seoul City alone.


Parking attendant for on-street parking (left) and parking structure attached to an office building (right), both in central Jakarta

# Approaches to Parking Supply Policy

This chapter argues that there are striking contrasts between the available approaches to parking policy around the world. There is a tendency in parking debates for the choice to be portrayed as a dichotomy between pro and anti-car options. However, parking policy choices go well beyond this simple dichotomy even if the literature on parking often fails to make these clear. The framework below summarizes the key alternatives building on a similar framework in Barter (2010) (Table 2).

**Table 2 Contrasting Approaches to Parking Policy**

| Approaches to Parking Policy | | What is parking? And Whose Responsibility? | Central Goals | View of Spillover | View of Supply and Demand |
|---|---|---|---|---|---|
| Conventional | Auto-centric | Infrastructure. Government and property owner responsibility. | Avoid parking scarcity | A free-rider problem. Avoid by ensuring sites handle own parking | Supply planned to meet demand (based on auto-dependent assumptions, including zero price) |
| | Demand-realistic | | Avoid both scarcity and wasteful surplus | To be avoided but small risk of spillover accepted and mitigation planned for | Supply planned to meet demand based on actual context |
| Parking management | Multi-objective | Infrastructure. Government responsibility mainly. | Plan parking to serve wider urban and transport policy goals | A source of conflict, but expected and manageable with active policy efforts | Supply and demand both need to be managed |
| | Constraint-focused | | Key relevant goal is constraint of car travel (to certain locations) | | Constraint of parking supply is a key mobility management and/or TDM tool |
| Market-based | | Real estate–based service. Justified by private actors' willingness to pay. | Ensure demand, supply, and prices are responsive to each other. Avoid market failure. | Defused as a problem and an expected part of parking market workings | Supply and demand to be shaped by market actors' behavior, informed by market prices |

TDM = travel demand management.

Source: Based on discussion in this section and adapted from a similar framework in Barter (2010).

## Conventional parking policy

Much of the world's urban fabric is subject to "conventional" parking policy in which parking is treated as a type of infrastructure and the primary goal of parking policy is to meet demand. Minimum parking standards are the key tool. Every building is required to have enough parking to meet its predicted peak demand. These parking requirements are aimed at eliminating any risk of spillover of parking from the premises. Two streams within this approach can be distinguished by their differing treatments of demand for parking.

### Auto-centric conventional parking policy

The mainstream approach in suburban North America and Australasia is the auto-centric conventional approach. In this stream, parking requirements are estimated based on auto-centric assumptions about parking demand, using data from isolated buildings with no pricing of parking. In other words, the requirements tend to be based on the unconstrained demand at locations with poor alternatives to automobile access (Shoup 1999). As a result, parking standards have a built-in assumption that most travel will be by car. These standards are then applied inflexibly without taking account of context or the specific users of the building. This approach has long come under attack (Buchanan 1964; Shoup 1980; Willson 1995). However, it remains almost universal in its suburban heartlands (Ferguson 2004).

Its long-term result (together with heavy road investment and zoning for low density) is a car-dependent transport system. It shifts parking costs from users to everyone in society (Shoup 2005). However, it has not solved the on-street parking problems in older, dense centers of activity in North America. Inflexible application of parking requirements blocks regeneration of some inner city areas in American cities (Shoup 2005). In inner-city locations, where forcing parking into buildings is difficult, local governments with an auto-centric conventional mindset may also try to build plentiful free parking themselves.

Results of auto-centric conventional parking policy in a suburban subcenter in Auckland, New Zealand

### Demand-realistic conventional parking policy

A refinement of the auto-centric conventional approach is for parking requirements to be based on more realistic assessments of demand for each site in its actual context, taking account of any pricing and of accessibility by alternatives to the car (Forinash et al. 2003; Litman 2006). The overarching goal is still to ensure that parking supply meets demand. However, this demand-realistic approach avoids the simplistic auto-centric assumptions above. This has become common in older parts of American and Australian cities and is widespread in suburban areas of Europe. We will see that it is also common in Asia.

It is sometimes presented as a radical step and can seem risky to proponents of the auto-centric stream. In reality, this is the most moderate of the efforts to reform the auto-centric approach. There may be variations in the ways in which demand is estimated and in the willingness to take the risk of some spillover. To reassure decision makers that the risk of lowering parking standards is not too great, the reform may sometimes be complemented by contingency plans for more active parking management measures (Litman 2006, pp. 22–23). In such cases, this demand-realistic stream may begin to resemble the more active approach—the multi-objective parking management.

## Parking management

A second broad stream in parking policy thinking can be labeled "parking management." This term is defined here as any parking policy regime in which

parking is viewed as a tool for serving wider goals in transport policy and urban planning. Matching supply with demand becomes secondary to other goals of policy, in contrast with the conventional approaches. The use of the term parking management here is inspired by Todd Litman, whose 2006 book highlights the contrast between the auto-centric conventional approach and its main alternatives in the North American context. However, please note that Litman includes in his new parking paradigm some policies that are instead categorized here as part of the demand-realistic variation of the conventional approach (such as context-sensitive parking requirements).

It is useful to distinguish two streams within parking management based on the focus of their objectives.

## Multi-objective parking management

Since transport policy and urban planning involve multiple objectives, parking management, as defined here, also usually has multiple objectives. These may include, for example, efficiency, reducing parking conflict, revenue, urban regeneration, and mobility management[1] (Marsden 2006; McShane and Meyer 1982). Efforts may also involve preventing all-day employee parking from claiming the most convenient spaces, so that these can be managed to favor short-term visitor parking. Favoring residents over visitors is also common. Priority setting in parking management is always contested, with winners and losers, making it inherently controversial.

In principle, a diversity of parking policies could fall under this category but, in practice, most cases follow similar patterns. Despite controversy, this is the mainstream Western approach to parking policy in dense localities with parking problems. It is widely credited with success in meeting its goals and making parking contribute to local economic success, especially in Europe (de Wit 2006).

Parking requirements are not a necessary feature of parking management but, if present, tend to resemble demand-realistic conventional ones. Increasingly they are being replaced by parking maximums. Excessive parking supply is as likely as shortage to be seen as a problem. Multi-objective parking management often involves accepting some risk of parking spillover while making use of a toolbox of policies to minimize it, to manage its impacts, and to deal with any conflict (Litman 2006). This includes active management of on-street parking as well as non-parking efforts, such as mobility management.

Such policies have long been widely applied in the older, less car-oriented parts of Western cities but are rarely applied to car-oriented suburban areas. Despite the apparent relevance of this stream of parking policy for dense Asian cities, it remains relatively undeveloped in most parts of the region at this stage.

An important substream of parking management arises when traffic demand management becomes the central objective

## Constraint-focused parking management

An important substream of parking management arises when traffic demand management becomes the central objective. In such constraint-focused parking management, parking supply is seen as a policy lever and is actively constrained for the sake of wider transport objectives (and used in conjunction with other mobility management policies) (Hamilton 2006). Parking levies may also be applied to discourage supply and to raise prices. This approach also usually requires vigorous application of the parking management policy toolbox to avoid parking-related conflict.

Since the 1960s, constraint-focused parking management has been applied in many city centers in the West, especially in strong central business districts (CBDs) that are rich in alternatives to car use. Prominent examples include Amsterdam, Copenhagen, London, San Francisco, Sydney, and Zurich. Such policies often produce high market prices for parking. Constraint-focused parking management has so far rarely been applied beyond CBDs. It has proved difficult to contemplate politically unless alternative transport options are strong. A surprising finding of this study is that constraint-focused parking policy is uncommon in Asia.

[1] Mobility management and travel demand management (TDM) are used here as synonyms.

## Market-oriented parking policy

This is the least familiar of the three major approaches. Market-oriented parking ideas have a long history (for example, Roth 1965) but have only recently received attention through the work of Donald Shoup (2005). Shoup suggests an integrated package of reforms for American cities: (i) charge demand-responsive market-clearing prices for on-street parking, (ii) make this politically attractive by devoting the revenue to local civic improvements via parking benefit districts, and (iii) abolish planning requirements for off-street parking.

The on-street parking reforms proposed by Shoup are often taken merely as new elements in the parking management toolbox (for example, Litman 2006, p. 243). However, Shoup's whole package of reforms is actually strongly distinct from the parking management approach here (Barter 2010). It does not require parking policy to serve multiple urban objectives but seeks to "let prices do the planning." It calls for conditions in which local actors on parking supply and demand respond to market-based parking prices, and in which these prices are responsive to supply and demand conditions. In short, it is market-oriented.

Spillover is not seen as negative in this perspective, but as a healthy part of the workings of local parking markets (Barter 2010). This approach tends to see parking demand as a vicinity-by-vicinity phenomenon in park-once localities, not as something associated with specific buildings. Spillover is defused as a problem via pricing (both on-street and off-street) that can adjust easily in the face of demand changes. Parking supply is expected to respond to these price signals (for example, with high prices prompting some private parking to be opened to the public or, over longer time scales, with investments in capacity).


Competing commercial parking operators in Auckland's central business district

A market-based parking situation already exists in some city centers where most parking is provided by competing parking businesses (both inside buildings and in stand-alone parking facilities). However, this is generally not the result of an explicitly market-oriented policy. We will see in this study that Japanese parking policies have also inadvertently resulted in rather market-based outcomes.

## Hidden assumptions muddle parking policy debates

Each broad approach to parking has its own hidden assumptions. This causes confusion in parking policy debates. Participants working under one set of assumptions will often be baffled by arguments based on another approach. This section discusses questions whose answers depend on the approach to parking policy that is adopted.

### Whose responsibility is parking supply?

It has usually been taken as reasonable that the local government be held responsible for parking outcomes. Local government responsibility for parking is often understood narrowly as the responsibility to ensure adequate parking. Most local governments take action on this by passing on the onus for parking supply to developers, through requiring parking in real estate developments. This is now so common that it may seem natural and normal.

Japan's proof-of-parking regulation (see p. 49) involves an alternative placement of responsibility. It places the onus for home-based parking not on real estate developers, nor on local governments, but on car owners themselves, requiring them to secure access to an overnight off-street parking space. This has helped create local markets in residential parking. This example highlights that we have choices over where to place responsibility for parking.

### What kind of economic good is parking?

Parking policy debate often proceeds with confused assumptions about the kind of economic good we are dealing with. For example, on-street parking is sometimes assumed to be a public good. This claim can easily be rejected since parking is obviously excludable and there is rivalry in the use of parking spaces (Button 2006).

In many situations, we have a choice on how to treat parking as an economic good. These choices have important consequences. Consider, for example, ways in which parking within multi-family housing can be treated:

- Some treat parking as part of the collectively paid common facilities and find it difficult to justify rationing access among residents. Such parking is bundled but collective. This results in it being an unmanaged common property resource.
- Other complexes also treat parking as part of the common facilities but do ration access through pricing, so that only those who use the resource pay for it. Here we see access rights to a common property resource being allocated via pricing, but without turning the spaces into private property. Parking is unbundled but remains collectively managed.
- Another possibility sees parking spaces treated as private property but still indivisibly linked (or bundled) with each residence, so that unit owners are not allowed to sell or lease their parking space. Such parking may be private property but is also seen as required infrastructure. This precludes flexible forms of rationing, except surreptitiously.
- Finally, some residential complexes view parking as completely unbundled, individually owned property that can be traded or leased out independently of the housing units. It may even be possible for nonresidents to buy or lease a parking space within the complex. This frames the parking inside the complex, not as infrastructure, but as akin to any other form of real estate (or a real estate-based service).

## Is parking "infrastructure"?

Although the term infrastructure is not precisely defined, it seems natural to treat parking as a kind of infrastructure. Unfortunately, this can prompt misleading analogies.

For example, much of the mainstream parking policy discussion in the conventional approach frames parking as an essential ancillary service for buildings. This tends to place it in the same mental category as fire escapes or toilets required with each building. In this view, developers will tend to provide less parking than optimal, so space for parking must be reserved and protected from competition from commercial uses of the space.

The framing of parking as infrastructure is rarely questioned but parking could easily be reframed as leasable floor space rather than as an ancillary service for buildings. This dramatically shifts assumptions about how supply and pricing decisions should be made.

## What is the right price?

There is no single, clear-cut answer to the question of the proper price for parking, but some answers are much more problematic than others. Hidden assumptions about parking often influence people's thinking about parking prices.

When parking is seen as a government responsibility and as a type of infrastructure, the possibility of a market price may be ignored. Erroneous public good arguments may prompt calls for parking to be free to users. The effort to ensure adequate parking supply under the conventional approach often ignores prices altogether, implicitly assuming free parking (or a status quo price). In fact, people's view of the "right price" often seems to be whatever motorists are accustomed to.

For on-street parking, Vickrey (1954), Roth (1965), and Shoup (2005) have argued that the right price at any particular time and place is that which ensures enough vacancies for zero parking search, thus minimizing external impacts on traffic. This would help in a market-based approach by providing a responsive price signal for actors in the local parking system.

The pricing principle when parking is a stand-alone business is generally "what the market will bear." However, most parking is not run as a stand-alone business but in association with other activities, whose managers manage parking as a complement to their main business. For many, pricing is merely a tool to deter free riding. Customers may be offered free parking via grace periods and parking validation systems.

Although the term infrastructure is not precisely defined, it seems natural to treat parking as a kind of infrastructure

Cost recovery is often invoked as a pricing principle. This can also bring in the question of land and property prices. For example, India's National Urban Transport Policy (Government of India 2006) reflects such thinking in its advice to set parking prices to reflect the value of land (although it does not make clear how this goal is to be realized).

Only in the CBDs of cities that constrain parking do we find market prices high enough for investments in parking space to be competitive with other uses of space (see p. 62).

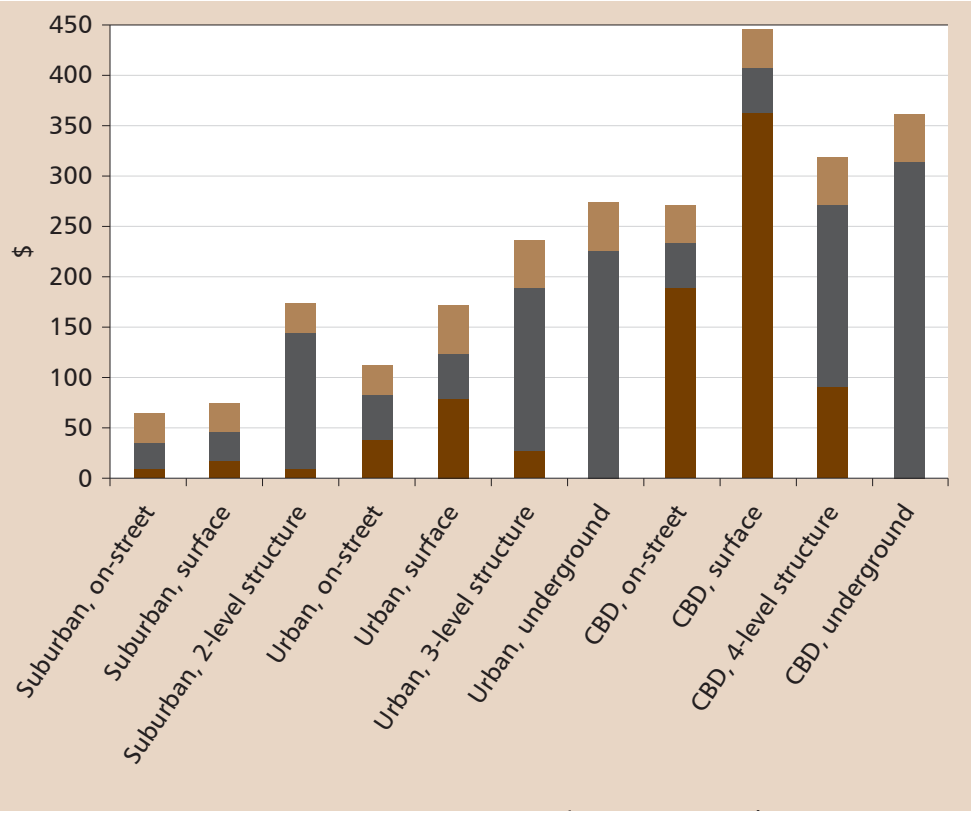
Figure 1 shows typical costs of providing parking for American conditions (Litman 2009). They were calculated as annualized costs but are shown here on a per month basis for ease of comparison with monthly parking costs in Asian cities cited later in this report.

These figures provide a sense of parking costs and the ways in which they vary with circumstances. Land costs are a large component for surface parking wherever land prices are high. Accounting for land costs reveals open-lot parking to be the most expensive kind of parking for dense cities. In Asia, high densities, expensive real estate, and scarce public space mean the opportunity cost of parking space can be very high. It is important to note that even on-street parking has a significant land opportunity cost.

## Is spillover parking really a problem?

Much mainstream parking policy is motivated by the assumption that having parking "spill over" from any particular building into its vicinity is inevitably a "bad thing" because it would result in conflict over parking in that vicinity, especially if that area has saturated on-street parking and especially if it is mainly a

**Figure 1 Typical Parking Costs in the United States**
(Annualized and expressed on a monthly basis, 2007 $ per space)




CBD = central business district, O&M = operations and maintenance.

Source: Adapted from data in Litman (2009).

To avoid confusion in parking policy debates, it is important to be clear about the different assumptions that are made by each approach

residential area with residents who believe that the on-street parking is theirs.

Those using a parking management approach also tend to see spillover as a problem but do not see it as necessarily the primary problem or the worst thing that could happen regarding parking supply and demand. Managing parking conflict is just one of various policy priorities to be balanced.

However, in a market-oriented approach, spillover is not framed as a problem at all. In practice, city centers often manage parking supply and demand as vicinity-wide phenomena rather than building by building. Such areas are park-once neighborhoods, in which people arriving by private motor vehicle expect to park in shared priced parking that is not necessarily within their destination. Every parking facility serves the neighborhood rather than any specific building. In such park-once vicinities, there is no such thing as parking spillover.

## Summary: Parking policy choices and assumptions

This chapter has highlighted the key choices at the heart of parking supply policy. It argued that there are three fundamentally different approaches.

Based on the explanations of the key approaches, the contexts in which they are most used, where they have been successful or problematic, together with our knowledge of Asian cities we can form an expectation on which approaches are likely to be best suited to the urban conditions that are common in Asia, such as high urban densities, relatively low car ownership, and relatively well-used public transport. This would lead us to expect the conventional approach to be poorly suited to most Asian conditions and to expect that the alternatives of parking management or market-oriented parking policy should work better in this region.

To avoid confusion in parking policy debates, it is important to be clear about the different assumptions that are made by each approach. Practitioners working within one specific approach will often make implicit assumptions about parking and assume that other people share these assumptions. This section highlighted some of these hidden assumptions. It would be useful for such assumptions to be made explicit in discussions of parking policy.

# Minimum Parking Requirements and Parking Built with Buildings

This chapter examines the car parking supply standards that are applied to real estate developments in Asian cities. Parking requirements are a key force shaping the supply of parking. These regulations also offer a useful indicator of each city's philosophy toward parking.

While reading this chapter please keep in mind that advocates of both the parking management and market-oriented approaches to parking policy question the need to impose minimum parking requirements at all. Recall also that their critiques are especially forceful when applied to localities with high urban densities, low car ownership, and strong alternatives to cars. Surprisingly, all of the Asian cities studied do have minimum parking requirements, in which many or all buildings are required to provide parking.

We will see that the Asian regulations vary widely in their style and their levels. Examples of successful cities with low parking requirements should reassure other cities that it may be possible to relax theirs.

## Parking requirements quantified

This section compares the levels of minimum parking requirements found in each city. To keep the task manageable, the comparisons in this study have focused on a small set of hypothetical standard buildings (office, retail, and residential).

### Commercial uses, office buildings, and retail

Table 3 reveals wide variations in parking space required for commercial buildings.

Among the longer-motorizing cases, it is striking that the richer cities (Hong Kong, Seoul, Singapore, Taipei city, and Tokyo) all have lower parking requirements than the middle-income cities (Bangkok, Jakarta, Kuala Lumpur, and Manila). The Kuala Lumpur metropolitan area and Bangkok stand out from the others with especially high requirements, averaging above 2 spaces per 100 square meter ($m^2$) of floor space for the building types examined. However, even these are well below the extreme parking requirements in suburban areas of the United States (US) or Australia, which range between 3.0 and 4.3 spaces per 100 $m^2$ (Shoup 2005, p. 81; Victoria Department of Planning and Community Development 2008; Planning SA 2001).

Only Seoul has a much lower city-center office parking requirements than in its outer areas. This is also a feature of Hong Kong, Kuala Lumpur, and Singapore to some extent. Low or zero parking requirements are increasingly common for central business districts (CBDs) in the West, as in Sydney, for example.

**Table 3 Car Parking Required in Office and Retail Buildings**
(Per 100 $m^2$ of gross floor space)

| | CBD Office Building | Non-Central Office Building | Shopping Center (Non-Central) | Commercial Requirements Average |
|---|---|---|---|---|
| Beijing | 0.5 | 0.5 | 0.3 | 0.35 |
| Tokyo | 0.3 | 0.3 | 0.4 | 0.36 |
| Singapore | 0.2 | 0.5 | 0.5 | 0.42 |
| Hong Kong | 0.4 | 0.6 | 0.4 | 0.46 |
| Dhaka | 0.5 | 0.5 | 0.5 | 0.50 |
| Guangzhou | 0.6 | 0.6 | 0.6 | 0.60 |
| Ahmedabad | 0.7 | 0.7 | 0.7 | 0.65 |
| Taipei city | 0.7 | 0.7 | 0.7 | 0.67 |
| Seoul | 0.1 | 1.0 | 1.0 | 0.78 |
| Ha Noi | 1.0 | 1.0 | 1.0 | 1.00 |
| Manila | 1.3 | 1.4 | 1.0 | 1.19 |
| Jakarta | 1.0 | 1.0 | 1.7 | 1.33 |
| Bangkok | 1.7 | 1.7 | 2.6 | 2.15 |
| Kuala Lumpur | 1.5 | 2.6 | 2.7 | 2.40 |
| Sydney | 0.0 | 3.3 | 4.0 | 2.83 |

CBD = central business district, $m^2$ = square meter.

Notes:
1. The "standard buildings" used for the comparisons here were: a CBD office building of 25,000 $m^2$ gross floor space; a "non-central" office building of 25,000 $m^2$ gross floor space; and a medium-sized, non-central shopping center with 25,000 $m^2$ gross floor space.
2. The "average" column is the average of the shopping center figure and the average of the two office figures.

Source: Appendix 3.

Another important perspective on these findings on commercial parking requirements is provided by comparing them with car ownership estimates (Figure 2). To get an idea of where Sydney would appear on this graph, note that its 1995 car ownership per 1,000 persons was 516 (Kenworthy and Laube 2001).

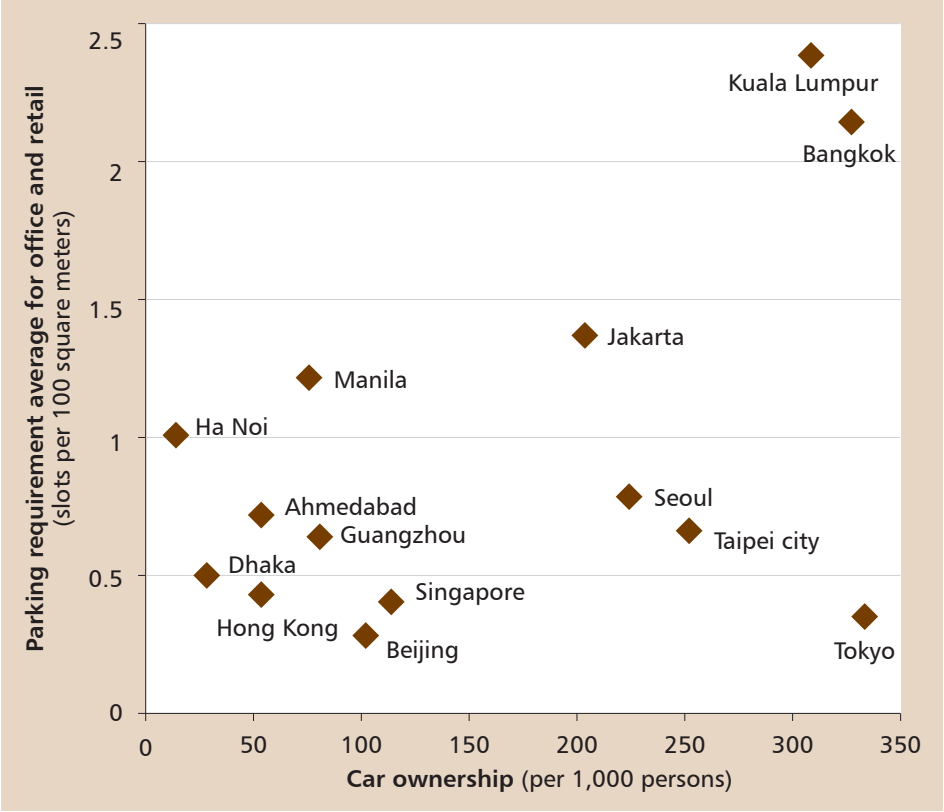
With this perspective, Seoul, Taipei city, and Tokyo and have minimum parking requirements for commercial buildings that are low relative to their levels of motorization. Note that although Tokyo's requirements are for the core area of Tokyo Prefecture and the car ownership data are for the whole metropolitan region, parking requirements seem to have only slight variations across Japan and across this metropolitan region.

Conversely, Singapore's relatively low parking requirements merely go with its modest car ownership. Note that Singapore's parking requirements were lowered significantly in 2003 after an assessment that the previous requirements were excessive. The requirements for Hong Kong may appear a little high compared with its car ownership despite being slightly eased in the early 2000s after mid-1990s standards were found to be excessive.

The newly motorizing cities, except those of the PRC, have parking requirements that appear to be running ahead of motorization. This may reflect a desire to make up for existing stocks of buildings with low supply of car parking. They may also reflect

Another important perspective on these findings on commercial parking requirements is provided by comparing them with car ownership estimates

**Figure 2 Parking Requirements at Commercial Buildings (on average) versus Approximate Car Ownership**




Sources: See Appendix 2 for parking standards and Appendix 3 for car ownership estimates.

expectations of higher car ownership in the future. Delhi (not included in this study) may be an extreme case of this, according to information in CSE India (2009). Its car ownership rate per 1,000 persons is about twice that of Ahmedabad, but its parking requirements seem to be much more than double.

## Residential buildings (multi-family)

This section compares the parking standards that apply to apartment buildings. This reveals, for some cities, rather different approaches to parking requirements for homes than for commercial destinations. This may reflect that home-based parking is linked closely with car ownership rather than car use. Note that in most of these Asian cities, apartment buildings are relatively common and are by no means restricted to transit-oriented locations.

Before presenting the table, we need to note the different ways in which residential parking requirements are expressed.

- Most jurisdictions specify residential parking requirements per dwelling and this is the case in Bangkok, Beijing, Dhaka, Guangzhou, Ha Noi, Hong Kong, Kuala Lumpur, Manila, and Singapore, among our study cities.
- However, Ahmedabad specifies residential parking as a percentage of the allowed built floor area.
- In Taipei city and Tokyo, residential parking requirements are based on slots per unit of floor space. This avoids accidentally imposing high requirements per square meter on small units (as it happens in Singapore and Kuala Lumpur, for example).

The three rightmost columns in Table 4 are expressed as parking slots per 100 $m^2$ to allow comparison across cities and with the commercial requirements. However, for the small apartments, there is a column on the left expressing the requirements per housing unit. To estimate this for the medium flats, note that the requirement per 100 $m^2$

**Table 4 Parking Required in Apartment Buildings**

| Urban Area | Small Flats (slots per unit) | Small Flats (slots per 100 $m^2$) | Medium Flats (slots per 100 $m^2$) | Average of Small and Medium (slots per 100 $m^2$) |
|---|---|---|---|---|
| Jakarta | 0.1 | 0.2 | … | … |
| Hong Kong | 0.03, 0.1 | 0.05, 0.2 | 0.03, 0.6 | 0.24 |
| Ahmedabad | 0.1 | 0.2 | 0.3 | 0.24 |
| Ha Noi | 0.2 | 0.3 | 0.2 | 0.25 |
| Tokyo | 0.2 | 0.3 | 0.2 | 0.28 |
| Dhaka | 0.1 | 0.2 | 0.5 | 0.33 |
| Beijing | 0.4 | 0.7 | 0.4 | 0.52 |
| Bangkok | 0.2 | 0.3 | 0.9 | 0.62 |
| Taipei city | 0.4 | 0.7 | 0.7 | 0.67 |
| Manila | 0.3 | 0.4 | 0.9 | 0.67 |
| Guangzhou | 0.5 | 0.8 | 0.6 | 0.74 |
| Singapore | 1.0 | 1.7 | 0.9 | 1.30 |
| Kuala Lumpur | 1.0 | 1.7 | 1.0 | 1.35 |
| Seoul | 0.8 | 1.3 | 1.5 | 1.44 |
| Sydney | 0.9 | 1.6 | 1.2 | 1.36 |

… = data not available, $m^2$ = square meter.

Notes:
1. The specific hypothetical buildings used to derive these requirements were: small flats (middle-suburb, slots for a 100 unit block of flats each of 59 $m^2$) and medium flats (middle-suburb, slots for a 100 unit block each of 110 $m^2$).
2. The Singapore figures are the regulations that apply to private sector housing, a small segment of the market serving mainly high-income residents.
3. For Hong Kong, two figures are given in each column, the left ones are for subsidized housing and the right figures are for private housing. The average is a weighted one, assuming subsidized housing accounts for about 48% of the population.

Source: Appendix 2.

is actually just slightly lower than the requirement on a per unit basis (since the calculations were based on a building consisting of 110 $m^2$ apartments).

Kuala Lumpur again stands out with relative high requirements. However, this time it is exceeded by Seoul. For larger apartments, Manila and Bangkok also require almost as much parking as Kuala Lumpur but they have lower standards for very small flats. Singapore also has high residential parking standards, although these may be a little misleading because they apply to expensive private sector housing, which is mostly elite housing in the city state. Residential parking requirements in these three Asian cities are comparable with Sydney's despite much lower car ownership levels. Sydney's residential parking requirement figures in the table reflect the average of a central municipality, an inner one and a middle suburban area (Sydney, Leichardt, and Ryde).

Excessive residential parking requirements, especially for small units, have the potential to harm housing affordability, which is an important issue in most cities. This needs more study in Asian contexts. High home-based parking requirements tend to lead to the bundling of residential parking costs with the cost of housing itself. In that case, households cannot reduce their housing-related costs by owning fewer or no cars. When parking is bundled, car-free households cross-subsidize the parking of their neighbors.

Excessive residential parking requirements, especially for small units, have the potential to harm housing affordability, which is an important issue in most cities

Parking floors in a residential condominium in Subang Jaya in Kuala Lumpur

In a number of the middle-income and low-income cities in the study, a significant proportion of low-income housing is outside the formal planning system. Many factors contribute to this situation. Is it possible that rigid parking requirements may be one of the factors preventing affordable self-help housing from being legalized and preventing legal housing from being affordable?

One might expect smaller flats to have lower (or no) requirements imposed on them, both in the interests of affordability and because smaller apartments are likely to accommodate lower-income people or small households. Indeed, several cities do impose lower requirements on small apartments. In some, such as Taipei city, this is achieved by specifying a fixed requirement per unit of floor area. In others, there are different requirements per unit for different-sized apartments, as for example in Dhaka. In Hong Kong, there are detailed demand adjustment ratios that vary depending on the size of the units and very much lower requirements for subsidized housing. In Bangkok, apartments below 60 $m^2$ per unit are exempt from the mainstream standard and have their own much lower one.

Comparing the residential requirements with car ownership is again revealing (Figure 3). Tokyo stands out with very low requirements relative to car ownership. Conversely, this time Seoul stands out with very high apartment parking requirements relative to car ownership. This may reflect an overcompensation for shortages in the past. Since the early 1990s, Seoul has faced serious parking conflicts in its traditional, low-rise residential areas and in older high-rise areas (Seoul Metropolitan Government, Department of Parking Planning 2009). Kuala Lumpur and Bangkok have high residential parking standards that might be considered in line with its motorization perhaps. Manila has surprisingly high parking requirements for apartments considering its modest level of car ownership. This may reflect a presumption in Manila that modern, high-rise apartments are for high-income people.

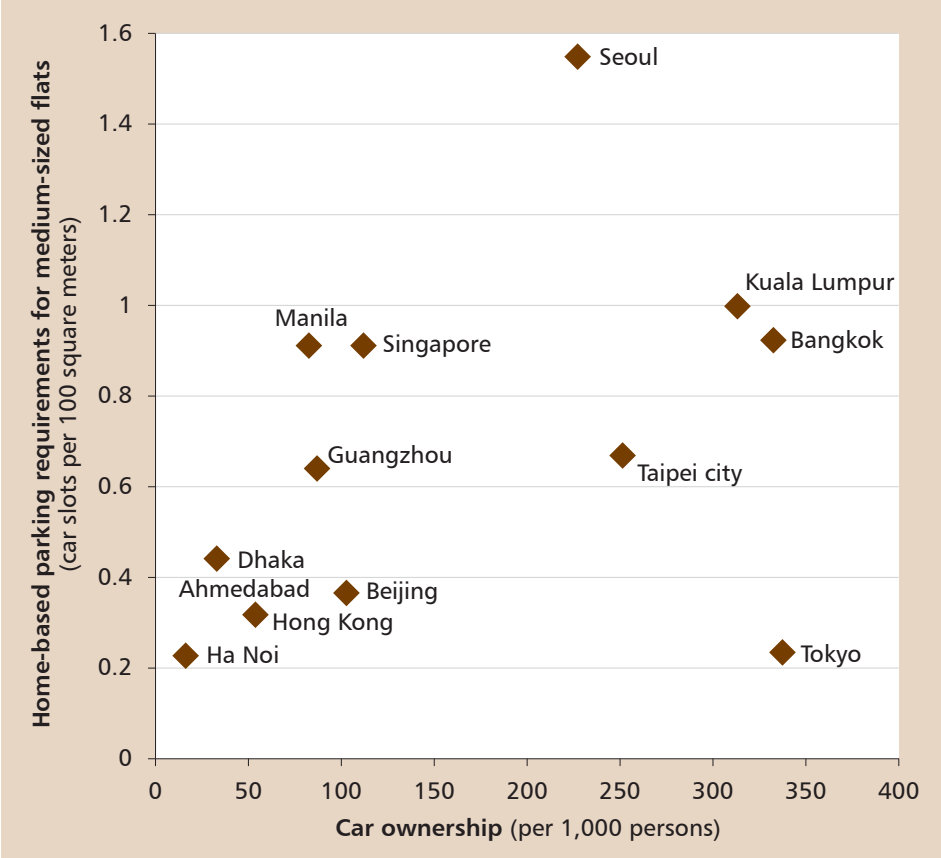
As mentioned earlier, Singapore's relatively high parking standards are for private sector housing. This is a small segment of the market that serves mainly high-income residents. Around 80% of the citizen and permanent resident population live in public housing provided by the Housing and Development Board (HDB). The HDB does not publish its parking supply guidelines, but in 2009, the overall ratio of parking spaces to residential HDB units was 0.63. This is also surprisingly high considering that only 30.4% of households living in HDB housing own a car (Housing and Development Board 2009, Singapore Statistics 2009). However, it also includes some parking that serve businesses located in HDB estates.

## Exempting small buildings

A noteworthy feature of parking standards in some of the Asian cities is a threshold for the floor area below which a building is not required to have parking. Therefore, small buildings in some Asian cities do not have parking requirements imposed on them.

A noteworthy feature of parking standards in some of the Asian cities is a threshold for the floor area below which a building is not required to have parking

## Figure 3 Home Parking Requirements (average of example buildings) versus Approximate Car Ownership




Sources: Appendix 3 for car ownership estimates and Appendix 2 for parking standards.

## Table 5 Floor Area Thresholds in the Application of Parking Requirements in the Asian Cities Studied

| | Floor Area Threshold Below which There are No Parking Requirements |
|---|---|
| Tokyo | Yes (1,500 $m^2$ or 2,000 $m^2$). Above the threshold, parking requirements phase in gradually according to a formula so that they are at full force only from 6,000 $m^2$ floor area and above. |
| Guangzhou | Yes (500 $m^2$) |
| Taipei city | Yes (300 $m^2$ or 500 $m^2$) |
| Bangkok | Yes (commercial, office, shopping malls: 300 $m^2$; condominiums: 60 $m^2$ per unit; hotels: 30 rooms; restaurants: 300 $m^2$; entertainment buildings: 500 seats) |
| Hong Kong | Small, street-side retail serving local residents is generally exempt |
| Ahmedabad | Yes (60 $m^2$) |
| Ha Noi | Low-rise residential buildings are exempt |
| Beijing | Yes? |
| Seoul | No? |
| Jakarta | No? |
| Singapore | No |
| Kuala Lumpur | No |
| Manila | No |
| Dhaka | No |

$m^2$ = square meter.

Source: Appendix 2.

Japan's approach is especially striking, since the thresholds are set quite high, usually at 1,500 $m^2$ or 2,000 $m^2$ of floor space. Furthermore, above the threshold, parking requirements only phase in gradually to avoid creating perverse incentives for buildings with floor areas just below the threshold. Full requirements apply only to buildings between 6,000 $m^2$ and 10,000 $m^2$ in floor area. Buildings larger than 10,000 $m^2$ are assigned parking requirements slightly lower than the full rates, and very large buildings slightly lower again.

Ahmedabad, Bangkok, Guangzhou, Taipei city, and (apparently) Beijing also have thresholds, but a smaller proportion of buildings are exempt. Ha Noi is pragmatic in apparently having no parking requirements for low-rise residences, only high-rise ones.

The Japanese approach to parking requirements is unique in exempting a very large number of buildings. Surprisingly, Japanese parking literature seems not to highlight this prominently. Furthermore, the levels of the parking requirements themselves, even when applied in full, are rather low, as we have seen. This is true throughout Japan, not just in Tokyo. Nevertheless, car parking supply is now generally not seen as a problem. In fact, interviewees were more concerned about an oversupply in the centers of small Japanese cities. The explanation lies in public parking that is not linked with any specific building.

## Local tailoring of parking standards

Parking requirements being fine-tuned for local circumstances can be a sign of a demand-realistic conventional approach or of one of the streams in parking management. For example, parking standards in inner urban municipalities of the Sydney metropolitan area are considerably lower than those in the outer suburbs (Barter 2009). Cities in the Netherlands have parking standards (both minimums and maximums) that vary based on the accessibility of each location (Hamilton 2006).

Asian parking standards vary in terms of details tailored to local conditions. Table 6 provides examples in the Asian cities arranged according to the extent of such tailoring. The variations are most significant for Hong Kong, Seoul, and Singapore.

**Table 6 Variations in the Application of Parking Requirements within the Asian Cities Studied**

| | Variations Depending on Location? |
|---|---|
| Seoul | Significant. Strong maximums apply in CBDs since 1997 (and expanded to new areas recently). Lower requirements for studio apartments and certain kinds of housing near rail stations. |
| Singapore | Significant. Lower requirements for nonresidential buildings in central and transit-oriented locations. Conserved heritage buildings (or part of buildings) in gazetted conservation areas are exempt in most cases. |
| Hong Kong | Significant. Some differences according to zone. CBD office buildings have the possibility of zero parking. Residential parking requirements vary with an "accessibility adjustment" and include an element of discretion for district engineers to assess parking on a case-by-case basis. |
| Kuala Lumpur | Small reductions in requirements permitted in the most central, transit-rich locations. |
| Guangzhou | Some requirements are lower in core areas. |
| Beijing | Some requirements are lower in core areas. |
| Ahmedabad | Old Walled City is a special case, where many buildings are exempt. |
| Manila | Limited, in the sense that the Makati and Ortigas CBDs have their own regulations. |
| Tokyo | Some perverse variations, with slightly higher requirements in central areas. Ginza policy exempts tall buildings with a small footprint (they must contribute toward parking nearby). |
| Bangkok | Little variation. But perversely, some requirements are higher in central areas. |
| Jakarta | Not found. |
| Taipei city | Not found. |
| Dhaka | Not found. |
| Ha Noi | Not found. |

CBD = central business district.

Source: Appendix 2.

Another common way for parking requirements to be made less rigid and onerous is to waive them in certain circumstances with a payment made to the local government in lieu of parking

## Flexibility and in-lieu payments

Another common way for parking requirements to be made less rigid and onerous is to waive them in certain circumstances with a payment made to the local government in lieu of parking (Shoup 2005). This is very common in the older, dense parts of Western cities where the conventional auto-centric approach is ill-suited to the pre-automobile urban fabric. This might suggest that flexibility will also be common in Asia but we find surprisingly few examples of flexibility.

Asian cities in the study with a provision for such a "deficiency charge" included Ahmedabad, Hong Kong, Kuala Lumpur, and Singapore, but most allow this only in limited circumstances.

In Dhaka, it is proposed in the 2009 parking policy to impose a deficiency payment even on older buildings lacking parking up to newly increased standards. However, this is not really a sign of flexibility (Dhaka Transport Coordination Board 2009). In this city with only 30 cars per 1,000 persons, every residential building is expected to have some car parking space.

Finally, while most parking standards require parking to be provided on-site, certain cities allow required parking to be built nearby but off-site in some circumstances. The examples noted in this study were Tokyo and Ha Noi.

## Level of detail in parking standard regulations

American-style parking regulations have been criticized by Shoup (2005) and others for specifying parking requirements for a ridiculous number of building types. He views such detail as "precision without accuracy," especially since they ignore the context of each building, which surely has as much influence on parking demand as small differences in floor space uses.

Table 7 lists the Asian cities in this study the different kinds of land use for which specific parking requirement standards are defined. We see that some have something like an American level of detail, while others are remarkably simple.

**Table 7 Number of Distinct Land Uses That Have Their Own Parking Requirements in Each City**

| | Land Uses or Building Types with Specific Parking Requirements |
|---|---|
| Singapore | About 50 types: residential; offices; shops and department store (retail use); restaurants, nightclub, coffeehouse, bar, cafeteria, eating house and canteen; hotels and residential clubs; cinema, theater and concert hall; warehouse/godown; factory (i) flatted type; factory (ii) terrace type; factory (iii) detached type; crèche, nursery school/kindergarten; primary schools; secondary schools; junior colleges; vocational institutions; polytechnics and universities; library; community centers; welfare houses; churches, mosques and temples; columbarium; funeral parlor and crematorium; sports complex (a) administrative and related uses; sports complex (b) snack/coffee bar, restaurant; sports complex (c) multi-purpose hall with gymnasium, indoor courts, etc.; sports complex (d) indoor game rooms, clubrooms, health clubs, and related uses; sports complex (e) spectators' gallery; tennis, squash/ badminton courts, *sepak takraw*; soccer/basket ball; bowling alley; swimming pool; ice/roller skating rink; golf range; clinic/ dispensary; nursing homes; hospitals; retirement housing; eating house within industrial estate; marina/ boat sheds; electrical substation and related use; fire station; convention/exhibition; public park; nursery; foreign workers' dormitories; tourist attraction developments (coach parking); off-course betting center; petroleum, petrochemical, chemical, and related industries on Jurong Island; "white sites" (nonresidential use); boarding houses and hostels; and showflat. |

*continued on next page*

Table 7 *continued*

| | Land Uses or Building Types with Specific Parking Requirements |
|---|---|
| Manila | About 29 types: residential in residential subdivisions/developments; townhouses; indigenous houses; multi-family residential in condominiums; hotels; residential hotels/apartels; motels; pension boarding houses; bowling alleys; churches and similar types; public schools; private schools; public colleges and universities; private colleges and universities; mental hospitals; public hospitals; private hospitals; nursing homes; transport terminals/intermodals/multimodals/depots; neighborhood shopping centers; public markets; restaurants, etc.; nightclubs, etc.; office, commercial, and mixed use condominium buildings; columbarium; aircraft hangar/open parking carports and garages; industrial (2 types). |
| Kuala Lumpur (Petaling Jaya) | About 24 types: residential other than apartments; low-cost apartments; medium-cost apartments; other apartments; commercial and offices; auditoriums, convention halls, and seminar rooms; cinemas; restaurants, nightclubs, cafeterias, pubs; supermarkets, markets; show halls; shophouses; hotels; serviced apartments; industrial uses; kindergarten; schools; higher education institutions; places of worship; stadium; recreational parks; swimming pools; theme parks; bowling alleys; squash, badminton, and tennis courts. |
| Dhaka | About 18 types: bungalow/semi-detached/rowhouse; multi-family residential; hotel (star class); hotel (other class); educational; institutional; health service; medical research institute; other medical; conference hall; theater, auditorium; community center; religious institutions; commercial; restaurant; office; other commercial; industry; storage building. |
| Beijing | About 16 types |
| Jakarta | 11 types: office; commercial and retail; cinema; hotel; restaurant, entertainment club; market; meeting/convention center; sports venue; hospital; higher education; school. |
| Seoul | 9 types: (i) entertainment facilities; (ii) cultural and gathering facilities (except concert halls), religious facilities, commercial facilities, transport facilities, medical facilities (except mental institutions and special medical facilities alike), sports facilities (except golf courses, golf practice facilities, and outdoor pools), office facilities (except foreign public offices and office-residence complex apartments), broadcasting stations; (iii) "category 1" neighborhood facilities, "category 2" neighborhood facilities and lodging facilities; (iv) non-apartment complex independent houses; (v) apartment complex, shared living facilities (except foreign officials' residential areas and dormitories) and office-residence complex apartments; (vi) golf courses, golf practice facilities, outdoor pools, and concert halls; (vii) outdoor schools, factories, and development facilities; (viii) storage facilities; and (ix) other facilities. |
| Ahmedabad | 9 types: (i) residential (flats/apartments); (ii) cinema theater, public assembly, stadium, hall etc.; (iii) industrial; (iv) commercial and business establishments; (v) community and religious buildings; (vi) primary schools; (vii) secondary and higher secondary schools; (viii) colleges and coaching classes; and (ix) special buildings: stock exchange and wholesale trade markets. |
| Hong Kong | 7 types: subsidized housing, private housing, village housing, office, retail markets, hotels, and commercial entertainment facilities. |
| Bangkok | 6 types: (i) entertainment buildings, (ii) hotels, (iii) residential, (iv) restaurants, (v) shopping malls, and (vi) office buildings. |
| Ha Noi | 5 main types: (i) includes three-star hotels and upper class hotels; (ii) includes high-class office buildings, foreign affairs head-office buildings; (iii) includes supermarkets, big shopping centers, conference centers, exhibition centers, showroom buildings; (iv) includes high-class (class 1) apartment buildings; and (v) others: including hotels under 3-star classes, lower class or conventional/ independent offices, public service buildings (bank, guesthouse building, public service center) |
| Taipei city | 5 types: (i) includes theaters, international hotels, clubs, offices, markets, shopping malls, restaurants, shops; (ii) residential buildings; (iii) includes hotels, museums, libraries, hospitals, funeral parlors, religious facilities; (iv) includes warehouses, schools, factories, and slaughterhouses; and (v) others. |
| Tokyo | 2 categories: (i) specific uses (theater, cinema, music hall, viewing field, broadcast studio hall, assembly hall, exhibition, wedding hall, funeral hall, inn, hotel, restaurant, restaurants, cabarets, cafes, nightclubs, bars, dance hall, playground, bowling alley, gymnasium, other department stores, offices, hospitals, wholesale markets, warehouses or factories, or places with two or more of the above functions); and (ii) non-specific uses (others). |

Source: Appendix 2.

## Does parking space count in allowable floor space?

Jurisdictions vary in the extent to which parking space is counted in the built space allowed in buildings by the planning system.[2] This is an under-researched issue, little discussed in the parking literature. It may have a strong impact on the incentives for developers to construct parking space.

If parking is included in allowable floor space, every extra car slot reduces the allowed leasable space by about 15 $m^2$ to 25 $m^2$. Conversely, where parking is excluded from being counted in the allowable floor area, the opportunity cost of parking is lower, although physical limits of each site and other planning controls may still limit the amount of parking that can be fitted into the design.

Table 8 shows the cities where reliable information could be obtained on this question. Most exclude parking that is required by the parking standards from being counted in the allowable floor area. However, some cities, such as Manila and Jakarta, also exclude some extra parking over and above required parking. This presumably gives developers a considerable incentive to provide extra parking.

Such exemptions and their implications require more investigation and debate. In Hong Kong, an environmental group has alleged that developers of residential complexes are encouraged by the exemption of private parking from allowed floor area (which also exempts parking from land premium fees) to build excessive parking. It is also seen as unfair to give this exemption to parking floor space, which in Hong Kong is often unbundled and sold or rented like other real estate (Ng 2009).

Jurisdictions vary in the extent to which parking space is counted in the built space allowed in buildings by the planning system

## Do parking requirements make much difference?

Do parking requirements result in more parking than would be provided otherwise? It seems clear that in many situations they do. However, the story is complicated by various factors.

In certain cities, illegal conversions of parking suggest that many developers and building owners would prefer less parking than they are required to have. Such conversions are the focus of much concern, as described in the parking predicament highlighted

**Table 8 Extent to Which Parking is Excluded from Allowable Built Space**

| City | Parking Exempt from Floor Area Allowance in Planning Rules |
|---|---|
| Bangkok | Parking apparently not exempt. |
| Hong Kong | Building authority has discretion, but private parking (for use of occupants) is generally exempt; public parking generally not exempt. |
| Singapore | Only required parking is exempt, but for residential buildings all parking is exempt. |
| Taipei city | Required parking (and parking encouraged with a floor area bonus) is exempt up to a cap. |
| Kuala Lumpur (Petaling Jaya) | Exempt if outside or basement; if in-building, above-ground only is parking exempt. |
| Jakarta | Exempt so long as parking is not more than 50% of maximum allowed floor area. |
| Manila | Exempt from GFA, but covered parking included in the allowable maximum total GFA. |

GFA = gross floor area.

Source: Appendix 2.

[2] The development controls of most urban planning systems place limits on the floor area of buildings as a central element of their building controls, together with height limits, among others. The allowable gross floor area (GFA) is usually determined using the floor area ratio (FAR), which is the ratio of the allowable gross floor area to the area of the land plot in which the building is to stand.

**Table 9 How Common is Required Parking Space Diverted to Other Uses?**

| City | Diversion of Required Parking Reported? | Enforcement Action Reported? |
|---|---|---|
| Ahmedabad | Many shopping centers (2009 reports), and in most other Indian cities. | Demolitions of basement shops in 2009 along important streets |
| Dhaka | Some basement parking diverted to retail (2009 reports). | Basement shop demolitions in 2009 |
| Bangkok | Various shopping centers (2006 reports). Car wash businesses and others appear in shopping center parking lots. | Police were to act. |
| Beijing | Reports suggest some buildings failed to open required parking. | None reported. |
| Kuala Lumpur | Shophouse areas, during evenings, for open-air eating. Often illegally and controversially, but sometimes with local government permission (and fees paid). | Crackdowns. Legalization and fee collection in some cases. |
| Seoul | Hints found in policy documents, suggesting it sometimes happen, but no specific reports. | Not reported. |
| Singapore | Yes, but done legally and with permission, after requirements were reduced in 2003, by shopping centers that found themselves with extra parking within their GFA allowance. | None. |
| Ha Noi | Hinted at by some interviewees but not confirmed. | None reported. |

GFA = gross floor area.

Sources: Interviews, observations, documents studied, and news items.

at the beginning of this report (Table 9). According to media reports, many cities in South Asia face difficulties enforcing their parking requirements, with developers and building managers often finding it tempting to divert planned parking space to other uses. In the South Asian cities in this study, Ahmedabad and Dhaka, this has led recently to dramatic enforcement action involving demolitions of basement shops. It is also allegedly a source of corruption of local government officials (Md. Mahmud 2007).

Defiance of parking standards is striking since ease of enforcement is usually seen as part of the appeal of the parking requirement approach. The incentives to evade these rules must be significant, such as a large difference in financial returns. However, Table 9 suggests that such enforcement problems are probably not widespread outside South Asia.

In Singapore, the parking standards have a clear effect in combination with the policy of not exempting extra parking from allowable floor space. Reportedly, Singapore developers treat the parking requirements as effectively maximums, and not just as minimums as they are on paper. Developers are unwilling to sacrifice leasable space for extra parking, which at current prices offers markedly lower returns than commercial space (*Business Times* 2008). In 2003, Singapore's requirements were lowered and most developer provision of parking has since then conformed closely to the new standards. In fact, several retail developments subsequently were allowed to convert some basement parking into retail space.

Conversely, in some circumstances, developers seem to provide plentiful parking, over and above the regulations. It is likely that this happens mainly in cities where parking above the requirements remains exempt from being counted in the allowable gross floor area (GFA). In Manila, it is common for retail and/or commercial developments aiming at high-end customers to provide much more parking than


Basement in a commercial street in Dhaka signposted as "car parking" (but there are stairs, not a ramp, and this space had been used for shops before being demolished, presumably during an enforcement action)

required while developments aimed at lower-income market segments are said to provide only as much parking as required.

## Parking supply outcomes for real buildings

As mentioned earlier, today's parking requirements do not necessarily completely determine the actual provision of parking in new buildings. Parking minimums do not prevent extra parking if the developer finds it strategic. This seems to happen mainly in cities where such parking is not included in the allowable built space. The exercise of flexibility by planners may also cause deviations from published requirements and many existing buildings may have been built under earlier, different requirements.

A small exercise was attempted to gather information on real buildings around the region and their parking relative to their gross floor area. Table 10 below presents a summary and more detail is presented in Appendix 5. This is obviously a small and unrepresentative sample of buildings. Nevertheless, it provides some corroboration for the parking requirement discussions in the earlier sections.

A comparison was made between these results and the parking requirements according to the official sources (where possible). These results do not include all of the buildings in Table 10.

- Provision of parking in excess of requirements seems to be common in Guangzhou, Jakarta, Kuala Lumpur, and Manila. In Jakarta, this was so for all five buildings observed. In Kuala Lumpur, four of five office buildings examined had more parking than required. In Metro Manila, a retail building example provided more than the guidelines call for.
- However, three of four Manila office buildings and one office and/or retail mixed building had a little less parking than the national guidelines ask for.
- Guangzhou was a mixed story. Two of five mixed developments had parking close to the required level but three had more. Nine of 13 residential buildings had parking close to either the older, lower standard or the existing standard but four had considerably more parking than required. One Guangzhou office building had less than the existing requirement and one had much more.
- Tokyo and Taipei city also showed variation around the required levels. Data on office buildings in Tokyo showed five of nine buildings having approximately the required

**Table 10 Parking Spaces per 100 m² of Floor Space in Small Samples of Buildings in Various Cities**

| | Number of Buildings Found with Parking Spaces per 100 m² in These Ranges | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–0.49 | 0.5–0.99 | 1.0–1.49 | 1.5–1.99 | 2.0–2.49 | 2.5–2.99 | 3.0–3.49 | 3.5–3.99 | 4.0–4.49 |
| Hong Kong | 3 | | | | | | | | |
| Singapore | 1 | 3 | | | | | | | |
| Tokyo | 7 | 1 | 1 | | | | | | |
| Fukuoka | 2 | 2 | 2 | | | | | | |
| Shanghai | 5 | 4 | | | | | | | |
| Beijing, Nanjing, Shenzhen | 2 | 1 | | | | | | | |
| Guangzhou | 7 | 6 | 4 | 1 | | | | 1 | |
| Taipei city | | 3 | | | | | | | |
| Seoul | | 2 | | | | | | | |
| Metro Manila | | 1 | 4 | | | | | | |
| Bangkok | 1 | 1 | 1 | | | 1 | | | |
| Jakarta | | 2 | 2 | 1 | 1 | | | | 1 |
| Kuala Lumpur | | | | 2 | | 1 | | 2 | |
| Melbourne and Sydney | 2 | 1 | 1 | | 1 | | 1 | | |

Source: Appendix 5.

parking, two with more than required, and two with less than the requirements. Similarly, of three office buildings examined for Taipei city, one had exactly the parking required, one had less, and one had more.

- Of three central Hong Kong office buildings examined, one had about the level of parking indicated in the standards, while two had much less.
- One Singapore retail building and two office buildings were found to exceed current standards but matched an earlier higher requirement. One new office building matches the new, low city-center standard.
- Data on a single Beijing office building showed it matching the requirement.
- Data on three modern Bangkok retail centers showed that two had substantially less than the required parking, while one had precisely the requirement.

These results are based on a very small convenience sample and therefore cannot be used to make sweeping conclusions. But even this anecdotal information makes clear that parking standards do not determine the supply in a simple way. This exercise reminds us that actual parking outcomes may depend on a complex mix of parking standards, business considerations by developers, incentives such as floor area exemptions, flexibility in the application of standards, and the effectiveness of enforcement.

## Stated aims and approaches to setting parking requirements

We have seen that all of the Asian cities in the study have minimum parking requirements. Knowing how each place sets its parking standards should provide important insights. Most of the explicitly stated rationales for these described them as being intended to fulfill each building's own parking demand. This suggests widespread adherence to a conventional approach to parking policy. The related idea of seeking to reduce on-street parking was also often mentioned in standards documents and was universal among relevant interviewees.

These results are based on a very small convenience sample and therefore cannot be used to make sweeping conclusions

Rationales for residential parking requirements sometimes make an explicit link with existing and expected levels of vehicle ownership (especially cars). For example, the standards for residential buildings in Hong Kong aim to "match existing and forecast car ownership of residents" and its general standards aim to meet "the operational requirements and such visitor parking as deemed reasonable and thereby avoiding the necessity for on-street parking and loading/unloading" (Planning Department, Government of the Hong Kong Special Administrative Region of the People's Republic of China 2009, 42).

In order to be systematic in making an assessment of the parking policy approach that best matches each city's parking requirement setting, we draw on insights from a framework based on United Kingdom's (UK) practice and experience (KonSULT 2006). Drawing on work by H.S. Potter, the KonSULT project suggests the following taxonomy of approaches:

i. *The Demand Standards Approach*: Parking standards set to meet all demand.
ii. *The Two-Part and Operational Standards Approach*: Parking within the premises is set to meet only operational (minimal) levels of demand, which can be taken as the private parking needs of the occupants. Other parking is catered through public sector off-site parking, often with the help of payments levied on the developer.
iii. *The Capacity Rationing Approach*: Standards for a whole area or corridor are set (as maximums) in light of the road capacity available for newly generated traffic.
iv. *The Area Needs Approach*: This approach explicitly seeks to weigh up multiple policy priorities for an area in setting the standards, including traffic demand, management of public spaces and urban design, economic development priorities, environmental considerations, site constraints and design considerations, modal balance, and others.
v. *The Modal Split Target Approach*: This uses parking supply as a tool to modify travel behavior in favor of non-car options by making parking more difficult or expensive.
vi. *The Public Transport Accessibility Level Approach*: This aims to set lower standards at destinations for which a high proportion of trips can easily be by public transport, while

setting higher standards for destinations less accessible by public transport.

How can we interpret these in terms of the typology of policy approaches in Chapter 2?

- Type i corresponds to the conventional approach. In fact, it would be the auto-centric stream if all demand is taken to mean unconstrained demand.
- Type vi is a demand-realistic conventional approach. It does not necessarily constrain parking supply relative to an unconstrained but realistic demand level for each locality.
- Type iv corresponds with multi-objective parking management.
- Types iii and v correspond with a parking constraint approach, representing slightly different rationales for containing traffic demand.
- Type ii encourages shared public parking for demand beyond minimal operational needs. It is potentially compatible with market-oriented approaches or with parking management.

We can now use these types to review clues on the approaches to parking supply policy that each Asian city works under (Table 11). Both rhetoric and practice are taken into account.

Even with this qualitative review, it is clear that conventional parking policy dominates generally among this set of Asian cities. A number of cities are surprisingly auto-centric but the demand-realistic stream within the conventional approach is also strongly represented.

Tokyo, and perhaps Hong Kong and Taipei city too, appear to have an interesting variation that may contribute to the rather market-based parking arrangements in these cities (as we will see in later chapters). Japanese parking standards appear to

**Table 11 Types of Parking Requirements in Asian Cities**

| | Dominant Types of Parking Requirements | Approach to Parking Policy Implied by Parking Requirement Types |
|---|---|---|
| Bangkok | Type i (and rather auto-centric) | Conventional (increasingly auto-centric) |
| Jakarta | Type i (and somewhat auto-centric) | Conventional (increasingly auto-centric) |
| Manila | Type i (and somewhat auto-centric) | Conventional (increasingly auto-centric) |
| Kuala Lumpur | Type i (rather auto-centric) in practice, but with talk of type vi and type iii | Conventional (increasingly auto-centric with talk of demand-realistic conventional) |
| Dhaka | Type i (auto-centric in catch-up effort) | Conventional (not yet auto-centric but trying) |
| Ahmedabad | Type i (auto-centric in catch-up effort) | Conventional (not yet auto-centric but trying) |
| Ha Noi | Type i (auto-centric in catch-up effort but exempts small buildings) | Conventional (not yet auto-centric but trying) |
| Guangzhou | Type i (auto-centric in catch-up), signs of type vi | Conventional (demand-realistic) hints of parking management |
| Beijing | Type i (not very auto-centric), signs of type vi | Conventional (demand-realistic) hints of parking management |
| Taipei city | Type i (not auto-centric, pragmatic exemptions), possible hint of type ii | Conventional (modest, maybe demand-realistic). Hints of market orientation. |
| Seoul | Type vi (not auto-centric except in catch-up effort for residential). Type iii in commercial centers | Conventional (demand-realistic) but constraint-focused parking management in centers |
| Singapore | Type vi (and not auto-centric even away from rail), possibly almost type iii in city center and near rail | Conventional (demand-realistic) with some parking management |
| Hong Kong | Type vi hybrid with type ii (and not auto-centric even away from rail). Some type iii, potentially | Conventional (demand-realistic). Some parking management. Hints of market orientation. |
| Tokyo | Type ii (standards aim at minimal needs). Shared, priced parking serves most other demand. | Conventional on paper but compatible with market-oriented parking |

Note: The judgments here on the approaches to parking policy that best match each city are based on the parking requirements issue.

Source: Appendix 2 and interpretations by the author.

cater to a restricted conception of demand so that parking beyond minimal operational needs will take place in public parking outside the premises. This is reminiscent of type ii in the framework above. The parking requirements in Japanese cities also vary little from place to place within the city, which does not fit with type vi. The use of the word "operational" in the Hong Kong policy statements mentioned above may also be a clue. In Taipei city, interviews suggested type i but relatively low parking requirements may also indicate type ii thinking. All three cities also have relatively simple building categories, suggesting they do not feel the need to be precise in avoiding spillover. There are early signs that PRC cities may also have a similar approach. Type ii approaches obviously lead to low minimum parking requirements and seem to go with a strong role for commercial-priced parking (or public sector parking).

## Views on parking supply as a problem

This section briefly summarizes local perspectives on parking supply and analyses whether it is a problem. This is relevant to various sections of the report. However, it is placed here to allow a comparison between the approaches to parking requirements discovered earlier and whether parking shortage is seen as a problem. Table 12 represents the author's summary of clues gleaned from interviews, documents, and media monitoring. More weight has been placed on policy makers' perceptions and experts' views rather than broader public perspectives.

Concern over shortage is most common in the newly motorizing cities in the study. Among the longer-motorizing cities, there appears to be some correlation between perceptions of shortage and enthusiasm for auto-centric parking requirements. Are parking requirements failing to deliver peace of mind on parking supply or is enthusiasm for high parking requirements a result of fear of parking shortage?

A likely explanation is that concern over parking shortage and enthusiasm for high parking standards are both driven by worries over the on-street consequences, as has been argued by Shoup (2005) with respect to American cities. This mechanism would suggest that cities that handle on-street parking effectively will tend to have less concern about shortages and be less drawn to high parking requirements. This brings us to the next chapter, which focuses on parking in the streets.

**Table 12 Views on Parking Supply as a Problem**

| | Main Perspectives Encountered in this Study on Parking Supply as a Problem |
|---|---|
| Dhaka | Concern over shortage. Commercial areas with chaotic on-street parking—to extreme extent in some areas. Buildings illegally diverting parking space to other uses. Architecture profession pushing for higher parking requirements. Frustration at slow progress of local government efforts to build off-street parking facilities. |
| Ahmedabad | Concern over shortage. Commercial areas with chaotic on-street parking. Parking across footway areas at shop frontages. Buildings illegally diverting parking space to other uses is viewed as major problem. Controversy over beginnings of unbundling in housing complexes. Frustration at slow progress on local government off-street parking facilities. |
| Ha Noi | Shortage seen as critical and widespread problem, especially in the 10 inner-city wards, prompting city government efforts to find land for parking. High prices for off-street parking seen as problem (despite price control regulations). Motorcycle parking supply seen as OK but two-wheeler parking on pavements is a problem. Frustration at slow progress of government efforts to expand its off-street parking. |
| Beijing | Shortage seen as widespread problem both day and night. Frustration at slow progress of expanding off-street parking facilities (both by government and private sector). |
| Guangzhou | Shortage seen as widespread problem, day and night, especially in older parts of the city, prompting raised parking standards and efforts at government-built parking. On-street parking seen as under adequate control. Parking industry unhappy with price controls. |
| Manila | Civil engineering profession is pushing for higher parking requirements. Populist political campaigns against parking pricing, even private pricing of parking in malls. Parking across footways at frontages of businesses is seen as problematic. |

*continued on next page*

Table 12 *continued*

| | Main Perspectives Encountered in this Study on Parking Supply as a Problem |
|---|---|
| Bangkok | Shortage seen as problem in certain old areas, such as Chinatown. Public perception of shortage in mall parking lots (institutionalized double-parking). |
| Kuala Lumpur | Low-cost housing and shophouse areas seen as having shortage. Conflict in terrace house streets, especially near shophouse areas. Illegal street parking widely seen as a problem, especially in shophouse areas. Popular backlashes against pricing. But many see an oversupply in CBD. |
| Seoul | Ongoing shortage in older residential and/or mixed-use areas. Chaotic parking in alleys seen as problem both day and night. But supply in centers of activity seen as causing congestion. |
| Taipei city | City government thinking has shifted from calling for more supply, toward considering limiting supply in centers. Illegal parking is a problem, but is gradually being tackled. |
| Jakarta | Supply issues relatively low on list of parking worries except in some locations. Motorcyclists complain that parking planning ignores two-wheelers. |
| Tokyo | Gradual shift in official view from focus on shortages in 1950s to 1980s toward current main view that supply is generally adequate. In fact, oversupply in small and suburban town centers seen as problem, although parking construction lobby still claims shortage. View that lack of provision for motorcycles and for goods loading and/or unloading remain problems. |
| Hong Kong | Perception of shortages 15 years ago, but second parking demand study in early 2000s found generally adequate supply both day and night. Goods vehicle night parking and deliveries remain as issues. Critics now suggest some residential oversupply. |
| Singapore | Broad satisfaction. However, CBD supply seen as excessive and incompatible with mobility management/TDM policy, but being addressed via lowered requirements (since 2003). Localized shortages perceived in older shophouse areas. Illegal on-street parking problems in the same areas. |

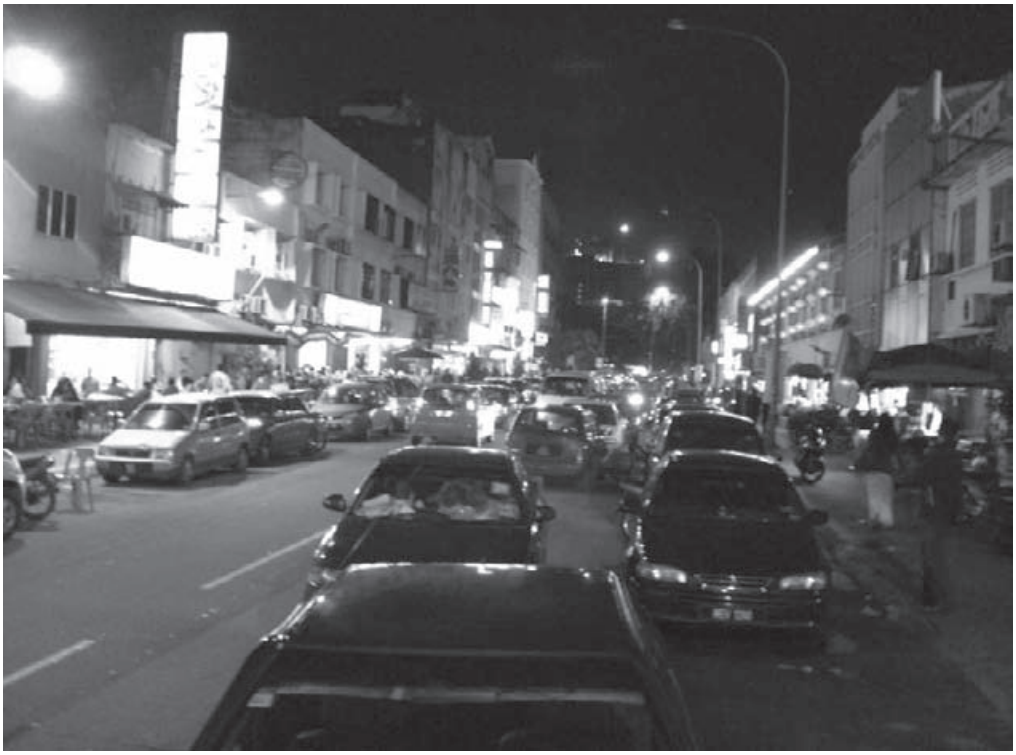
CBD = central business district, TDM = travel demand management.

Sources: Interviews, news and web monitoring, and local documents consulted for this study.

# Parking Policy in Streets and Lanes

Concern over on-street parking drives much of parking policy. On the one hand, fear of chaotic on-street parking is a key motivation for requiring parking in real estate developments. This is based on the assumption that such on-street parking is the result of inadequate spaces off-street. On the other hand, it is clear that plentiful off-street parking provides no guarantee of orderly on-street parking or of less on-street parking.

Despite the fact that parking in streets is rarely a large proportion of parking in Asian cities, improved management of this segment of the parking scene may well be an indispensible key to parking policy overall. International experience and successes in some Asian cities demonstrate that it is possible to manage their on-street parking effectively.



Saturated on-street parking in Kuala Lumpur

## Is there a problem?

Table 13 summarizes views in the Asian cities regarding on-street parking as a problem. We see that on-street parking is seen as a problem of crisis proportions in some cities in the study. However, the survey data to be presented in "Taxing parking perks" (p. 54) show on-street parking to be a modest part of overall parking behavior in most of the cities.

These observations are not necessarily in conflict. A small number of vehicles parking in the streets can take most of the space and cause a great deal of disruption if: (i) they do so on streets with heavy traffic, (ii) they park in ways that are especially disruptive, and (iii) if they park for a long period, such as the whole working day. Furthermore, street parking crises are often localized in high-profile commercial areas or streets. The fact that on-street parking problems are not necessarily a result of large numbers of parking events is another reason that they cannot necessarily be solved by providing abundant off-street parking.

Note that a distinction is made in the table between the phenomenon of saturated on-street parking in one column, and chaotic, obstructive, or illegal on-street parking in the other. These are often conflated. However, it is possible to have saturated on-street parking even if enforcement adequately deters illegal obstructive parking.

While parking itself is widely seen in these cities as hindering traffic flow, there was surprisingly little concern about the impact on congestion of motorists searching for parking (the parking search externality). Of course, a lack of awareness of the parking search externality does not prove that it is not important. Nevertheless, there are hints that this may not be as significant as in the United States, since most cities in the region do not allow much parking on many main arteries. It is impossible to be sure without more detailed investigations.

**Table 13 Perspectives on On-Street Parking as a Source of Problems**

| | Chaotic and/or Disruptive On-Street Parking | Saturation of On-Street Parking |
|---|---|---|
| Kuala Lumpur | Illegal parking rampant in many commercial areas, especially in shophouse commercial areas | Conflict in many streets with terrace houses. Saturation in shophouse commercial areas. |
| Dhaka | Chaotic on-street parking, including double and even triple-parking by chauffeurs, in key commercial areas | Super saturation in key commercial areas for long periods. |
| Ahmedabad | Chaotic on-street parking by both cars and motorcycles a problem in commercial areas | Saturated by motorcycles in the Walled City, by cars on certain streets at certain times |
| Beijing | Widespread illegal parking outside designated on-street spaces (both daytime and nighttime) | Saturation in older-style commercial areas and in older residential areas. |
| Jakarta | Not a major issue generally but problematic in certain places (e.g., near major markets) | Saturation in some middle-class, low-rise residential areas and street-oriented commercial areas |
| Manila | Widespread illegal parking but enforcement generally effective on main roads | Saturation in certain commercial areas. |
| Taipei city | Controlled effectively on main roads but can be problematic in smaller streets and alleys | Conflict in residential alleys and streets. Saturation in busy commercial streets. |
| Ha Noi | There are some reports but apparently not a major issue | Car space saturation widespread in the 10 inner city districts. |
| Bangkok | Enforcement adequate on major streets. Localized problems. | Saturation in old Chinatown area. |
| Singapore | Under good but not perfect control. Illegal on-street parking in hot spots (e.g., restaurant districts) | Saturation in older commercial areas. Conflict in some low-rise residential streets. |
| Hong Kong | Reasonably good but not perfect control | Saturation at various times, especially in older commercial and/or mixed areas. |
| Seoul | Controlled or banned on most main roads but problematic in smaller streets and alleys | Saturation in many commercial streets, including some important ones |
| Guangzhou | Generally considered under adequate control | Saturation in older commercial areas and in older residential areas |
| Tokyo | Greatly improved since 2006 reforms of enforcement, so not seen as a major problem | Legitimate on-street parking, allegedly not saturated or only rarely. |

Sources: Interviews, documents, observations, and surveys for this study.

## Disruption of pedestrian environment

The preceding section focused on parking at the curb. However, parking in streets often intrudes between curb lines and buildings, onto pedestrian walkways, straddling curbs, or in spaces with ambiguous status at building frontages (Table 14).

Some of these problems are enforcement problems. Experience in the People's Republic of China suggests that pavement parking can be greatly reduced with relatively simple enforcement and design efforts (Institute for Transportation and Development Policy and Nelson\Nygaard Consulting Associates 2009).

However, in several cases, these intrusions are institutionalized or embedded in urban design and building codes. Parking on building frontages is an example. It is important to reduce the harm caused by such parking, but to do so will often require revised building codes. This touches on a wider debate over the practice of requiring buildings to have spacious setbacks from streets. This seems especially entrenched in Ahmedabad, Jakarta, and Manila.

In many cases, such as in India and the Philippines, the boundary between public space and private property is unclear and the parking in front of buildings often straddles the invisible boundary. This causes acute conflict with the pedestrian environment. The Metro Manila Development Authority (MMDA) made an effort to tackle this recently with its "pink line" program, which aimed at a compromise to reduce conflict but without eliminating such parking. However, observations suggest limited success (see photographs on p. 33).

## Informal or criminal parking fee collection

Informal or criminal parking fee collection is an important issue in some cities. If parking in a vicinity is not managed efficiently by governments, informal fee collectors may step in, as seen in Bangkok, Jakarta, Kuala Lumpur, Manila, and some Indian cities. In Bangkok, Kuala Lumpur, and Manila such activities occur whenever and wherever the official fee collection system is absent but where demand remains high.

**Table 14 Parking Impacts on the Pedestrian Environment**

| | Disruption of Pedestrian Environment |
|---|---|
| Dhaka | Severe: Widespread parking across and on pavements, which are often ill-defined. |
| Ahmedabad | Severe: Widespread parking across ill-defined pedestrian spaces. Motorcycles on footways. |
| Manila | Severe: Widespread parking on and across ill-defined footways in front of businesses. The "pink line" project to establish clearer walking space seems to be failing. |
| Jakarta | Serious: Parking across ill-defined pedestrian ways in small-scale commercial areas. Disruption from alleyway and residential street parking. Motorcycles are on footways in many areas. |
| Seoul | Serious: Parking on building frontages in commercial and residential areas is institutionalized. Alleyway parking often in conflict with pedestrians. |
| Ha Noi | Serious: Motorcycles are on footways and sometimes, even cars (some illegal but often institutionalized). |
| Kuala Lumpur | Motorcycles are on footways. Illegal car parking at corners (and such like) endangers pedestrians. |
| Beijing | Impact from parking on frontage spaces, often institutionalized. |
| Guangzhou | Widespread impact from parking on building frontage space, often institutionalized. Strong enforcement action has reportedly drastically reduced pavement parking in recent years. |
| Bangkok | Motorcycles are on footways in some places; frontage parking found across ill-defined footways in outer areas. |
| Taipei city | Motorcycles on pavements are generally orderly but still often a barrier for pedestrians. |
| Singapore | Some parking across walkways but only in low-rise residential areas. |
| Hong Kong | Little pavement parking, but access points for off-street parking disrupt many pedestrian ways. |
| Tokyo | Motorcycles on footways were a problem until 2006. Many access points for off-street parking. |

Sources: Interviews, observations, documents studied, and surveys for this study.

Parking straddling building frontage and pedestrian space in Metro Manila (a "pink line," which runs under the front doors of these vehicles, is intended to demarcate pedestrian space)

Residential parking in curb cuts, blocking the pedestrian way on Boundary Road, Singapore (these houses have parking space inside their compounds)

## Table 15 Prevalence of Informal Parking Fee Collection

| | Illegal Fee Collection and/or Leakage from Formal Fee Collection |
|---|---|
| Kuala Lumpur | Touts collect illegal parking fees at night in certain areas with high demand |
| Jakarta | Gangster involvement in on-street fee collection. City parking agency in deficit |
| Manila | Fees collected by "watch-your-car" people (informal attendants) in many places |
| Bangkok | Gangsters collect fees at night in certain areas with high demand |
| Singapore | Reported but only several decades ago |
| Ahmedabad | Concern in India over parking fee contracts (how it was awarded and the contractor's behavior) Reports from Kolkata of gangsters collecting fees at night |
| Dhaka | Parking contractors collect fees even from double-parked cars |
| Beijing | Not reported |
| Guangzhou | Not reported |
| Ha Noi | Not reported |
| Hong Kong | Not reported |
| Seoul | Not reported |
| Taipei city | Not reported |
| Tokyo | Not reported |

Sources: Interviews, observations, documents studied, and surveys for this study.

The Jakarta case is more complex. As in the other cities, local thugs take control of collections at night. More surprisingly, Jakarta and other Indonesian cities have "gangsters" that allegedly control parking even in streets that are officially managed by city employees. Loopholes in the management systems for on-street parking pricing and management in Jakarta reportedly create openings for such activity (Tigor Nainggolan, Chrysna, and Karbiyanto 2006).

## Hostility to on-street parking in general

In many of the cities studied for this report, on-street parking is widely regarded by decision-makers as undesirable in general. Parking is increasingly banned from all arterial roads. However, there are variations in how explicit and how profound the hostility is (Table 16).

## Rationing demand: Pricing and/or time limits

A central issue of interest for this study was how on-street parking is rationed. All cities in the study had some priced on-street parking. Shoup (2005) argues that the efficient approach to on-street parking pricing is to make price levels demand-responsive to prevent saturation, with regular adjustments and different prices at various times of the day. San Francisco is currently doing the largest trial so far of this "performance pricing" approach to on-street parking (see www.sfpark.org).

A central issue of interest for this study was how on-street parking is rationed

None of the cities studied go quite this far. Table 17 provides insights on the extent to which pricing varies from place to place, as an indicator that prices are to some extent a demand rationing tool. Table 17 also summarizes qualitative findings on the role of prices and time limits in such rationing, as well as an indication of how extensive pricing was.

Observed on-street parking prices were very low in Ahmedabad, Bangkok, Dhaka, Jakarta, and Kuala Lumpur. Conversely, Taipei city and Seoul stood out with relatively high on-street parking prices and with prices that vary from place to place. Hong Kong, Singapore, and Tokyo have surprisingly moderate on-street parking prices. However, Tokyo and Hong Kong complement their on-street pricing with time limits. In April 2010, Beijing announced price rises for city-center on-street parking, which have made its rates comparable with these three rich cities.

The policy of the city government of Taipei city on the pricing of its parking (both on-street and off-street) is intriguing for its kinship with Shoup's (2005) demand-responsive ideal. Saturation is a key criteria for pricing reviews, which take place every

**Table 16 Hostility to the Existence of On-Street Parking**

| | Degree of (or signs of) Hostility to Existence of On-Street Parking |
|---|---|
| Ahmedabad | Strong rhetorical hostility not matched by policy action in the streets but used in justifying policies aimed at creating off-street parking. |
| Delhi (not in main study) | According to CSE India (2009), Delhi High Court ordered in August 2007 that on-street parking be banned from all main roads. Unclear if action has been taken. |
| Singapore | Parking absent from most arterials and from most streets in Housing and Development Board estates. Regulated on-street parking accepted on minor roads in older areas. |
| Seoul | Official policy states that on-street parking should eventually disappear when there is enough off-street supply. In practice, parking mostly absent from main arterials but regulated on-street parking is accepted on minor roads and unregulated parking is the norm in the city's ubiquitous minor alleys. |
| Tokyo | Official policy since the 1960s states that on-street parking is generally not allowed. However, in practice there are important long-running exceptions, providing for some legal on-street spaces, including metered spaces. Some academics are calling for a more pragmatic and accommodating attitude to on-street parking (Tanaka and Kuwahara 2006). |

Sources: Interviews, observations, documents studied, and surveys for this study.

## Table 17 Use of Prices and Time Limits for On-Street Parking

| | How Extensive is Pricing of On-Street Parking? | Differences in Prices: from Place to Place or Time to Time? | Highest Price Found (PPP$/hour) | Time Limits Used? |
|---|---|---|---|---|
| Dhaka | Limited to the busiest commercial streets | Higher price in Motijheel CBD than elsewhere | 0.78 per day (Tk20) | No |
| Ahmedabad | Very limited | Single price. Few locations priced. | 0.16 (Rs2.5) per hour | No |
| Jakarta | Extensive in commercial streets | Two zones | 0.37 (Rp2,000) | No |
| Kuala Lumpur | Extensive in commercial streets | Uniform price within each municipality | 0.41 (RM0.80) | Yes (3 hours) |
| Bangkok | Limited to a set of older commercial streets | Uniform price, where priced | 0.60 (B10) | No |
| Ha Noi | Extensive | Two zones | 0.81 (D5000) | No |
| Guangzhou | Extensive | Zones with different prices | 1.05 (CNY4) | No |
| Beijing | Extensive | Three zones with different prices | 1.32 (CNY5) | No |
| Hong Kong | Many streets, throughout | Uniform legislated price | 1.46 (HK$8) | Yes (2 hours if demand is high) |
| Manila | Extensive within Makati and in few other commercial areas of Metro Manila | Different prices around Metro Manila under various cities | 1.71 (P40 last hour, P35 first 2 hours) | Yes (3 hours) |
| Singapore | Extensive in older commercial streets | S$1/half hour in central area, elsewhere, S$0.50/half hour | 1.90 (S$2) | No |
| Tokyo | Scattered in many locations but not extensive | Uniform legislated price | 2.58 (¥300) | Yes (usually 60 min) |
| Taipei city | Extensive | Prices higher in high-demand locations. Occupancy influences price revisions | 3.45 (NT$60 > 6th hour) | No (price per hour escalates) |
| Seoul | Extensive in commercial streets | Five zones (Area 1 has parking constraints) | 7.86 (Area 1 W1,000/10 min) | No |

CBD = central business district, min = minutes, PPP = purchasing power parity.

Note: In April 2010, Beijing announced a doubling (to CNY10) of central-area on-street parking prices (Guest 2010).

Sources: Interviews, documents studied, observations, and surveys for this study.

6 months. Occupancy of 80% triggers an upward revision, while occupancy below 50% triggers a downward revision. However, in practice, this is subject to local political processes which often stall such price adjustments. The prices do not vary from hour to hour, however, as Shoup would urge. Hong Kong also uses occupancy of 85% or higher (on average between 10 a.m. and 5:30 p.m.) as the trigger for commencing pricing but only has a single price.

Time limits are widely used in Australia and North America as a complement or replacement for pricing. There is debate over which is optimal, time limits, or pricing, or both. Shoup (2005) argues that efficient pricing renders time limits unnecessary. In this study, time limits were found only in Hong Kong, Japan, Makati central business district (CBD) in Manila, and Malaysia.

The Makati CBD is also interesting for its strong on-street parking management under a hybrid public–private institution, the Makati Parking Authority (see photo next page). Its on-street parking prices are higher than elsewhere in Manila.

Beijing, Guangzhou, and Seoul have concentric zones with different on-street parking prices. Similarly, several cities such as Ha Noi, Jakarta, and Singapore, had coarse variations with just two prices, a central one and another everywhere else.

[3] Note that these schemes are not residential permits but are for all on-street parking, day or night.

The Makati Parking Authority decides on-street parking pricing in the Makati central business district in Manila

In Ahmedabad and Dhaka, low prices and continued saturation suggests that their pricing policies have not yet embraced pricing as a way to ration demand. However, Dhaka's newly adopted parking policy calls for higher parking prices in the busiest areas, where a "restrictive" parking policy is urged (Dhaka Transport Coordination Board 2009).

Similarly, pricing levels and practices in Bangkok, Jakarta, and Kuala Lumpur suggest that demand rationing is not the main objective. In most of the municipalities of the Kuala Lumpur metropolitan area, monthly payment is an option.[3] The Jakarta government has recently announced plans for annual subscription payment for on-street parking within the whole municipality. One of the parking authorities in Delhi has reportedly proposed annual payment for unlimited parking in its on-street and off-street spaces (CSE India 2009, p. 33). These approaches reduce the marginal cost of on-street parking to zero within these large areas. They suggest that these authorities see pricing simply in terms of revenue.

Several cities face barriers to changing on-street parking prices in response to demand or saturation. Japan's parking meter price is fixed by legislation, as is Hong Kong's. Some pricing mechanisms (discussed below) make price adjustments difficult. For example, Tokyo's parking meters accept only 100-yen coins. In Singapore, it is thought that more complex variations in prices might be too confusing under its coupon system.

## On-street pricing mechanisms

Pricing mechanisms can have important implications for efficiency and for policy options such as price setting. Improvements in pricing technology such as pay-and-display parking meters are expanding the options (Litman 2006). In this region, we find a surprisingly wide range of distinctive pricing mechanisms for on-street parking pricing.

## Reservation of on-street parking

The parking literature generally assumes that on-street parking will be part of the pool of shared parking, open to the general public, which is more efficient than having reserved spaces. However, parking in streets is sometimes reserved for and by specific users or user groups (such as customers of specific buildings).

The informal reservation of curbside space is quite widespread wherever demand is high enough for conflict to emerge over parking space but where formal municipal regulation has not been imposed. In certain cities, such as Ahmedabad and Ha Noi, such practices involve a large proportion of on-street parking. In Ahmedabad and Manila, such parking often straddles private and public space.

Formal local government management of curbsides usually shifts parking back to shared,

## Table 18 On-Street Parking Pricing Mechanisms

| | On-Street Pricing Mechanisms Deployed |
|---|---|
| Jakarta | Attendants (are supposed to) issue paper tickets and receive cash payment. The decision to have annual permits for on-street parking anywhere in Jakarta was made in late 2009. |
| Bangkok | Attendants issue paper tickets and receive cash payment. |
| Singapore | Paper coupons must be purchased in advance and are designed to be torn to indicate time and date and then displayed on dashboard. |
| Ahmedabad | Attendants who issue paper tickets also receive cash payment. |
| Dhaka | Attendants who issue paper tickets also receive cash payment. |
| Ha Noi | Attendants who issue paper tickets also receive cash payment. |
| Manila | In Makati CBD, attendants use digital handheld devices to issue tickets and receive cash payments. Elsewhere, attendants issue paper tickets and receive cash. |
| Seoul | On-street pricing via attendants with personal digital assistant (PDA) sets gradually expanding. |
| Taipei city | Attendants with digital handheld devices issue tickets and attach them to vehicles at regular intervals. Motorists pay later at various places, including convenience stores. Parking meters also exist and accept contactless payment cards. |
| Guangzhou | Parking meters use contactless payment cards. Attendants who issue tickets and take cash work in some areas. Sometimes both attendant and meters are present in the same location. |
| Beijing | As in Hong Kong, parking meters using contactless payment cards serve adjacent spaces, both left and right sides. Attendants who issue tickets remain in many areas. |
| Tokyo | Coin-operated meters accept only 100-yen coins, serve one space each, with infrared detection of vehicles. A blinking red light indicates nonpayment or overstaying. |
| Kuala Lumpur | "Pay and display" parking meters serve many spaces. Some municipalities allow season parking permits, allowing parking anywhere within municipal boundaries. |
| Hong Kong | Parking meters that use only Octopus contactless cards are used. These meters are placed between two spaces and serve both sides. |

CBD = central business district.

Sources: Interviews, documents studied, and observations for this study.

## Table 19 On-Street Parking Space Reservation Practices in Asian Cities

| | On-Street Parking Reservation Practices and Their Extent |
|---|---|
| Ahmedabad | Space in front of street-front shops is usually controlled by building managers and/or owners via attendants, so that only customers or clients may park there. The parking is often partially or fully within the public right-of-way (often overlapping where the footway should be). This affects a large proportion of all on-street parking in the city. |
| Bangkok | Semi-private streets in commercial developments tend to have curbside space reserved for the frontage business. Residents of single-family housing often informally reserve space in front of homes. |
| Ha Noi | Motorcycle parking on footways or roadways in front of shop fronts is informally controlled by the shop owners and/or managers, so that only customers or clients may park there. Presumably this also extends to car spaces on-street, at least in some cases. |
| Kuala Lumpur | In shophouse areas, most parking is shared, but businesses can legally reserve a small number of specific spaces for a premium monthly fee to the municipality. These lots will be indicated with red lines and labeled as reserved for that business. Residents of low-rise housing often informally reserve space in front of homes. |
| Manila | Space in front of street-front shops is usually controlled by building managers and/or owners, so that only customers may park there. The parking often straddles the footway. Residents of single-family housing often informally reserve space in front of homes. Makati central business district allows reserved spaces by businesses for a premium monthly fee. |

*continued on next page*

Table 19 *continued*

| | On-Street Parking Reservation Practices and Their Extent |
|---|---|
| Seoul | Ward-level governments administer a system of residential permits for on-street parking. In most cases these provide for shared parking in any one of a set of spaces on a stretch of street, but in some cases there are individually reserved spaces. |
| Singapore | On-street loading zones are not provided. Businesses sometimes resort to temporarily reserving spaces when expecting a delivery. They can legally reserve a spot for such purposes, for a fee. Residents in low-rise housing estates often informally reserve curb space in front of their homes. |

Sources: Interviews, documents, and observations for this study.

public status. However, there are exceptions. In Kuala Lumpur and in Makati CBD in Manila, businesses can reserve on-street parking for a premium fee.

Another variation of on-street parking reservation is Seoul's residential permit scheme. This was the only on-street residential permit scheme found in this Asian study. This is surprising in light of the increasing importance of residential permit systems in Western city cores.

## Delegation to private contractors

Private sector involvement in on-street parking is common in the region, without any clear-cut correlation between such delegation and successful on-street parking management. Activities that can potentially be delegated separately to the private sector include on-street parking pricing itself, enforcement against illegal or disruptive parking, and enforcement against pricing-related violations.

Many of the cities have some delegation of on-street pricing to private contractors. Attendant-based parking pricing uses private contractors in Ahmedabad, Dhaka, and Ha Noi (under its socialization policy). In Guangzhou, the Kuala Lumpur area, and Hong Kong, parking contracting includes installation of parking meters. In Singapore, the Urban Redevelopment Authority (URA) has outsourced enforcement against pricing violations of its coupon-based system.

We will see below that Japan and Singapore have been delegating at least part of their enforcement against disruptive illegal parking. Both of these reforms are viewed locally as successful. Many cities delegate only the towing part of such enforcement.

## Enforcement

Enforcement of on-street parking rules and of on-street pricing are complex issues that this study was not able to evaluate in detail. It was obvious during fieldwork that no city has perfect enforcement of on-street parking rules. Nevertheless, a number of cities have had success recently. Table 20 provides enforcement insights from cities in the study.

Private sector involvement in on-street parking is common in the region, without any clear-cut correlation between such delegation and successful on-street parking management

Again, off-street parking supply appears irrelevant. Tokyo's success, despite low parking requirements, contrasts with Kuala Lumpur's difficulties despite high parking standards.

Inability or unwillingness to carry out adequate enforcement is a key problem in many cities and arguably the central reason for chaotic, obstructive parking behavior. Interviewees in South Asia were pessimistic about making progress, since most streets lack the basics of clear parking rules and signage. These are hindered by a multiplicity of agencies with authority over street space.

Further barriers to effective enforcement include unreliable vehicle registries; low social status of enforcers relative to motorists; professional drivers who remain with the vehicle when it is parked; and enforcement by police forces, for whom parking is a low priority or an opportunity for rent seeking. A priority for such cities must be to identify appropriate and feasible precedents to emulate.

Experience in Europe and elsewhere in recent decades has revealed a number of institutional and legal foundations for effective on-street enforcement

## Table 20 On-Street Parking Enforcement Initiatives

| | Notable Enforcement-Related Initiatives and Approaches |
|---|---|
| Ahmedabad | Police responsible for enforcement. Towing ("cranes") by private contractors is also deployed but only used against motorcycles, since the equipment to tow cars without damaging them has not been purchased (although some other Indian cities do tow cars). Low fines (Rs200 = less than $4) are a weak deterrent to car owners. Parking signage is unclear and rules are ambiguous, confounding enforcement. |
| Dhaka | Enforcement against illegal on-street parking appears to be negligible. The 2009 parking policy laments ambiguity in parking signs and rules. Private on-street parking fee contractors collect fees even from double-parked vehicles. |
| Kuala Lumpur | Vehicle owner liability for parking offenses. Police-issued fines have high payment rate, otherwise road tax cannot be renewed. Local government-issued fines have extremely low payment rates, since they lack effective powers to act against nonpayers. One municipality, Subang Jaya, has a trial of tagging repeat offending vehicles with difficult-to-remove yellow plastic tags. |
| Seoul | Vehicle owner liability for parking offenses. Gradually escalating battle against illegal parking wherever especially disruptive. Tactics include closed-circuit television (CCTV) monitoring. Steady improvement noted, with much remaining to be done. |
| Ha Noi | A number of streets in city core declared no-parking streets, meaning no parking of motorcycles or cars on footways or curbside (seems to be enforced effectively). Police use towing as a routine enforcement tool. One punishment is impoundment for 15 or 30 days (but this is burdening parking facilities of the Hanoi Parking Company). |
| Singapore | Vehicle owner liability for parking offenses. Designated on-street parking spaces run by the Urban Redevelopment Authority, which delegates enforcement to private contractors. Dangerous and obstructive parking enforced by the traffic police and also delegated to private traffic wardens at 105 locations under the traffic warden scheme. |
| Guangzhou | Recent years have reportedly seen enforcement stepped up to the point that illegal on-street parking is said to be under effective control. |
| Manila | Parking control rests with the local government, often at the very lowest level, the *barangay*. Makati central business district parking under the Makati Parking Authority is said to have efficient and effective enforcement of both the pricing arrangements and against chaotic or disruptive parking. |
| Tokyo | The shift in 2006 allowed vehicle owners, not just drivers, to be held responsible for parking violations, greatly improving the ability to enforce against illegal parking. In the same set of reforms, enforcement was shifted from police to private enforcement companies. The reforms have been assessed to be a success. |

Sources: Interviews, documents studied, and observations for this study.

(for example, see de Wit 2006, pp.12–13). These include:

- *Placing legal responsibility for parking offenses with the registered owner of the vehicle if the driver cannot be identified*. This appears to be the case in most countries. It was a barrier to enforcement in Japan, until liability was shifted in 2006 (Morikawa et al. 2010).
- *Enforcement power delegated to local government together with the revenue.*
- *Parking violations decriminalized or treated as an administrative offense.* In Europe, this is seen as an element in the relative success in the Netherlands, Spain, and the United Kingdom. This seems to be the case in Malaysia, the Philippines, and Singapore and possibly others in this study.
- *Ability for parking enforcement to be contracted out to private actors*. This has been successful in Japan and Singapore. Such delegation often includes the use of towing of vehicles parked obstructively, which is feasible even where vehicle registration systems are unreliable.

# Government Resources Devoted to Off-Street Parking Supply

Local governments in almost all of the cities in this study direct some public sector resources to boost parking supply. This usually takes the form of direct investments in parking structures or open-lot parking on public sector–owned land. Most such efforts seek to offer alternatives to on-street parking.

These efforts are usually focused in older parts of the built environment that have many buildings with little or no parking and where parking standards have little effect until there is redevelopment.

Unfortunately, government-subsidized parking is a regressive use of taxpayers' resources, especially in cities with modest car ownership rates. It is also expensive due to high property prices in the areas with the clearest parking problems. Furthermore, such government efforts crowd out private sector investments.

This section will present comparisons of the approaches taken in each city, their relative objectives, and whether this remains an important expanding program or not.

Poorly utilized public sector-built public parking structure in central Dhaka

## The importance of looking at government-provided off-street parking

Strong efforts by governments to provide parking provide an indicator of their attitude to parking. It suggests that most see parking as a kind of infrastructure and as a government responsibility, worthy of taxpayers' money despite poor returns on the investment. These government efforts also imply that parking is often perceived to be in short supply and that there is an unwillingness to allow parking prices to rise as a market response to shortage.

Few appear to question if parking supply is a good use of precious government resources. In cities with low levels of car ownership, such spending is highly regressive, since it serves mainly households with above-average incomes.

On the other hand, government-provided parking (both on-street and off-street) is generally open to the public and shared, and can foster park-once neighborhoods, which is a positive feature. Shared parking is more efficient than private destination-specific parking. However, the failure of most to adjust prices in response to changing demand reduces their ability to cushion spillover problems.

Large government investments in parking supply risk crowding out private parking investments, especially if priced below market rates and combined with a failure to control on-street parking efficiently. Interviewees in Taipei city reported that the industry of private for-profit parking structures had been undermined by local government investments in parking supply.

Strong efforts by governments to provide parking provide an indicator of their attitude to parking. It suggests that most see parking as a kind of infrastructure and as a government responsibility, worthy of taxpayers' money despite poor returns on the investment

## Government investment in parking

Most local governments in this study have tried to directly supply off-street parking but few have been able to create much. Table 21 presents a qualitative assessment of these efforts. In high-density, high-priced property urban cores, the resources needed to provide additional off-street parking can be very large (see Figure 1).

Most cities use land that they already own. However, such decisions should not ignore the opportunity cost of such land. Some have resorted to building parking underneath parks or public plazas.

**Table 21 Importance of Government Provision of Off-Street Parking and Approaches to It**

| | Size and Trend | Nature of Government Role in Investment in Off-Street Public Parking |
|---|---|---|
| Beijing | Significant and expanding | Local government runs many parking facilities. Seeking to build many more. Some under flyovers. Underground parking in key activity centers. Program of 26 parking structures at subway stations announced in 2006. |
| Guangzhou | Small but significant and expanding | City government runs some multi-storey facilities, is building more and has plans for more. Progress is said to be slower than expected. Some are intended to be park-and-ride at metro stations. |
| Ahmedabad | Small but significant. Seeking to expand. | One municipal multi-storey facility in the Walled City. Parking on small parcels of municipality land in various places, some free, some priced, and usually managed by contractors. Municipal government seeking private participation to build more facilities but finding it difficult. |

*continued on next page*

Table 21 *continued*

| | Size and Trend | Nature of Government Role in Investment in Off-Street Public Parking |
|---|---|---|
| Ha Noi | Small but significant. Seeking to expand. | A city-government company (Hanoi Parking Company) runs 4 major open-lot or covered ground-level parking lots. In the 10 inner-city districts, there are 338 tiny government-owned parking points for cars (but most are sections of street or pavement). Studies are underway to identify additional sites but high prices for land use rights make this difficult. Private participation on build–transfer (BT) or build–operate–transfer (BOT) basis is proposed for new lots. |
| Taipei city | Small but significant. Not expanding. | City government built and runs various underground or multi-storey facilities, often under parks. Its target was to have public off-street parking (whether private or government-owned) at 15%–20% of car numbers in each area. |
| Dhaka | Very small but wants to expand | One government-owned multi-storey public parking facility has been built in the Motijheel office district (see photo on p. 40). It remains partially empty, despite continued super-saturation of the much cheaper on-street parking nearby. Office space is being added above to help make it viable. Local governments are seeking private participation for more multi-storey facilities. |
| Tokyo | Small and not expanding | Tokyo and ward governments built and still run underground or multi-storey facilities in various districts. These are a relatively minor but not a tiny proportion of parking stock in each area. |
| Seoul | Small, relative to all parking | Government builds parking under parks and schools and some open-lot facilities in various districts. Expanding only in certain residential areas. Some park-and-ride parking construction in outer areas. |
| Singapore | Important, but only if public housing parking is counted | Government-built parking is mostly associated with public housing estates. It is open to the public to some extent and serves some centers of activity. The planning agency, the Urban Redevelopment Authority, runs a modest and diminishing number of open-lot parking areas aimed at handling spillover. |
| Hong Kong | Significant if public housing included. Vacant government lots. | The Public Housing Authority owns a significant amount of parking but has divested a large proportion of its former stock. A small number of other government-built multi-storey parking facilities exists. Vacant lot parking ("short-term tenancy" sites) on government land leased to private operators. |
| Bangkok | Small and little expansion except for more possible park-and-ride | The Bangkok Metropolitan Administration runs at least one multi-storey parking facility (in the old city area) and a small number of other off-street parking lots. Other (transport-related) agencies run two park-and-ride parking facilities. Government-organized off-street parking is a small part of the parking supply. |
| Kuala Lumpur | Small and not expanding | Some local governments, primarily Kuala Lumpur and Petaling Jaya, run a small number of facilities. |
| Manila | Small and little interest or effort | Some local governments run one or more parking facilities. Some open municipally owned lots. |
| Jakarta | Tiny and little interest or effort | City government runs a very few parking facilities. A tiny part of Jakarta parking. |

Sources: Interviews, observations, documents consulted, and the surveys for this study.

This is prominent in Seoul, Taipei city, and Tokyo especially, as well as several others.

Today, it is the newly motorizing cities that are keenest on government-built parking. Beijing and Guangzhou are unusual in their capacity to mobilize state resources for parking space but even there the pace of supply expansion has been lower than planned. Park-and-ride facilities are a prominent part of these cities' plans (p. 53).

Ahmedabad, Dhaka, and Ha Noi have had greater difficulties and are considering or trying private participation. However, at prevailing parking prices, any such approach will still require significant government resources. One option is to use government land and to invite private construction under a concession contract (such as a build–operate–transfer approach). A variation being tried in Dhaka and considered in Ahmedabad is

to add commercial space to cross-subsidize the parking.

## Incentives for private sector involvement

Some city governments offer incentives for the private sector to build more parking (over and above requirements) and to open this extra parking to the public. Japan has had a long system of subsidies for parking provision in areas deemed to have shortages. Despite today's consensus that Japanese cities generally no longer have parking shortages, the policy remains, although the subsidies seem too small to make much difference.

Taipei city has, for many years, used a planning bonus approach to encouraging developers to build extra parking in return for up to 20% extra floor space. This policy comes with the condition that the extra parking must be made open to the public. However, interviewees indicated that this policy was under review in light of changed priorities and the prospect of a shift to constraining rather than promoting parking supply in the urban core.

We should note that development bonuses are not free of cost. Just like land itself, such bonuses can be considered a public sector resource with an opportunity cost. A bonus to incentivize parking cannot be used to promote something else, such as low-cost housing or public space.

## Pricing for government-owned off-street parking

City parking agencies face dilemmas over how to price their off-street parking. It is expensive to provide, so the agency is usually under pressure to recover some of the cost. However, as long as on-street parking remains underpriced or poorly managed, anything but a low price for the city parking facility leads to underutilization.

Sometimes calls are heard for the government off-street parking prices to be reduced (sometimes to zero) to make them attractive relative to the street. Ha Noi's and Singapore's public sector parking have identical pricing for their on-street and off-street parking. Many cities end up pricing their off-street parking at only a slight premium over their on-street parking. However, Beijing's city-owned off-street parking is priced lower than on-street parking to encourage their use relative to on-street spaces.

Some city governments offer incentives for the private sector to build more parking (over and above requirements) and to open this extra parking to the public

This may be considered a good parking management practice, but it worsens the cost recovery problem.

By contrast, Tokyo and Hong Kong have market pricing for their city-owned parking, meaning prices are roughly in line with those of private operators in the vicinity. Parking facilities of the city government of Taipei city have adopted demand-responsive pricing (although moderated by political negotiations). Price reviews are triggered by occupancy straying outside a range of between 50% and 80%.

Although Singapore's public sector parking prices are not market-based, high occupancy can influence certain simple pricing choices. Broadly, the Housing and Development Board, which controls parking in public housing estates, aims to meet home-based demand by planning for supply that will not be saturated at existing prices. It uses only a limited range of pricing responses. For example, it can extend daytime prices further into evenings and can price parking on Sundays and public holidays if it needs to. It can also apply the higher of its two price schemes to additional locations.

Public housing parking in Hong Kong is also interesting for its pricing arrangements. Most such parking was divested in 2006 to a privatized company, The Link Real Estate Investment Trust (The Link REIT), which has the freedom to pursue commercial objectives. As a result, parking prices are beginning to vary from estate to estate in Hong Kong's public housing. However, this may not be a thoroughly market situation in that The Link REIT seems to face limited competition in some estates. The Link REIT and any later buyers are also not allowed to change existing parking spaces to uses other than parking.

## Cost recovery in government-owned off-street parking

Given that governments provide parking because private investors do not find it attractive to do so, it

seems almost certain that most government-provided parking is subsidized, explicitly or implicitly.

This is corroborated by the difficulties faced in Ahmedabad, Dhaka, and Ha Noi in persuading private investors to join with the cities to build more parking. The extent to which these deals need to be "sweetened" with commercial floors, government land, and such like, is an indicator that the cost recovery gap is large.

Pricing of parking in Singapore's public housing aims for cost recovery (or close to it), but specific data on this are no longer made public.

Market pricing should greatly assist but still does not guarantee cost recovery since prices can be depressed by various factors, such as parking requirements, underpriced on-street parking, and being too liberal in allowing vacant lot parking.

Market pricing should greatly assist but still does not guarantee cost recovery since prices can be depressed by various factors, such as parking requirements, underpriced on-street parking, and being too liberal in allowing vacant lot parking

# Policy toward Public Parking as a Business

Most of the policies reviewed up to this point have involved seeing parking as a kind of infrastructure, for which government is responsible and with a presumption that private initiative will not provide enough of it. But what if it is public policy that prevents business from rising to the occasion? If it seems obvious that private investors will not provide parking at the low prices that motorists are used to, maybe we should question the low prices rather than assume that parking as a business is impossible.

This chapter focuses on privately owned parking offered to the public by businesses charging fees. This mode of parking provision involves seeing parking as a real estate-based commercial service. Many of the Asian cities in this study have a significant role in parking businesses. Some of these provide useful insights for policy makers to consider as we think about the potential for more market-based approaches to parking policy. Private sector parking businesses may have more potential to be part of successful urban parking systems than most governments recognize.

## The importance of parking as a business

Parking offered as a business is usually open to the public and shared. So despite private ownership, this priced off-street parking is part of the pool of public parking. It thrives best in park-once neighborhoods with mixed land uses. Market prices also enhance flexibility in coping with spillover, providing signals and incentives for all of the actors in the system. However, several of the cities in the study impose price controls on their private sector public parking, thus undermining this feature.

Although these characteristics can be seen as positive, especially from a market-oriented parking policy perspective, some of the parking management literature is wary of private sector commercial parking, since its management practices and pricing arrangements are usually outside the direct control of parking policy makers (de Wit 2006; Marsden 2006).

Most of the Asian cities in the study have a significant amount of privately owned public parking. Our survey data show it to be most significant in PRC cities, including Hong Kong, as well as in Ha Noi (p. 65). Other sources of evidence suggest its importance also in Tokyo. This category of parking can potentially allow cities to worry less about parking spillover than do places that lack this responsive pool of parking. Some city governments do see the benefits of such parking and explicitly encourage it.

Commercial streets in Ahmedabad, Dhaka, Jakarta, and Manila seem relatively lacking in privately owned public parking because most frontage parking and much parking within developments tends to be private and reserved for occupants and customers only. However, even these cities do have priced private sector public parking in larger developments and in their busiest commercial and retail districts.


Priced public parking in a private building in Taipei city

## Private versus public parking in private buildings

Parking inside the premises of buildings can be either private (restricted to tenants or their customers and clients) or public and open to all comers. In the latter case it is usually priced, at least in dense cities with mixed land uses. It may be managed in-house or by a professional parking management firm. Making parking in buildings public is usually a matter of choice rather than an intrinsic design feature.

The insights in Table 22 are based on observations in each city, interviews, and on the survey results presented on p. 54. As mentioned above, some cities encourage owners of private parking to open it to the public. The development bonus incentive for parking in Taipei city carries a condition that the extra parking must be open to the public. Pusan in the Republic of Korea encourages city center buildings to open private parking to the public (World Bank 2003). In Seoul, there are incentives for companies to open their workplace parking to residents at night (Seoul Metropolitan Government, Department of Parking Planning 2009). PRC cities are also trying to encourage this.

Parking standards in Hong Kong make a distinction between private parking and public parking. Private parking "services the particular requirements of the development in which it is located and is restricted to owners and authorized users." Public parking "is available to the general public and services the area around which the car park is located" (Planning Department, Government of the Hong Kong Special Administrative Region of the People's Republic of China 2009, p. 42). Developers are sometimes required to provide additional parking as public parking. The distinction is made more important by the practice of exempting private parking but not public parking from being included in floor space allowance for each development. Under this rule, private parking is thus treated as infrastructure and public parking as a real estate–based business. Unfortunately, this probably creates an obstacle to converting private parking into public parking.

Making parking in buildings public is usually a matter of choice rather than an intrinsic design feature

## Permanent private stand-alone parking

Privately owned parking structures that stand alone, apart from other buildings, are a common feature of city centers outside this region. However, they are relatively rare in the Asian cities studied.

Only in Seoul and Tokyo were more than a few observed. In Taipei city, these began to emerge in the 1990s, but industry insiders say they were undermined by local government parking investments. The Makati central business district (CBD) in Metro Manila has several such structures, but, being owned by the Ayala Corporation, which developed most of the properties in the vicinity, they may not be run as independent profit-maximizing businesses.

## Temporary vacant lot parking dilemmas

More common than permanent stand-alone private sector facilities in this region are parking businesses running from vacant lots. Vacant lot parking has some positive features but is problematic in important ways. Some of the cities need to treat it with more caution. Property tax regimes can have a large (and often inadvertent) impact on the attractiveness of running parking businesses in vacant lots.

Vacant lot parking is very common in Japan, in Kuala Lumpur's central area, and in Hong Kong. It is a source of concern in all three cities over its role in causing localized oversupply of parking. Kuala Lumpur's vacant lot parking is prominent in and

## Table 22 Prevalence of Parking in Private Buildings That Is Open to the Public

| | Public Priced Parking in Private Buildings Obvious in Centers of Activity? | Explicit Policy Encouraging Public Parking in Developments? |
|---|---|---|
| Ahmedabad | Some | None found |
| Dhaka | Some | None found |
| Manila | Common, but also much private, customer-only parking | None found |
| Jakarta | Common but also much private, customer-only parking | None found |
| Bangkok | Common | None found |
| Kuala Lumpur | Common | None found |
| Singapore | Common | None found |
| Tokyo | Common | None found |
| Ha Noi | Some, especially for nighttime | None found |
| Beijing | Common | Policy encourages nonresidential buildings to make parking open to nearby residents at night. |
| Guangzhou | Common | Policy encourages nonresidential buildings to make parking open to nearby residents at night (but little impact). |
| Taipei city | Very common | Further encouraged as part of policy of giving floor area bonuses for extra parking. |
| Hong Kong | Very common | In certain cases of assessed need, developers can be required to provide additional parking as public parking. |
| Seoul | Very common | Schools and government offices encouraged to make their parking public, at least at night. Not clear if private sector is also incentivized to do so (as in Pusan). |

Sources: Interviews, documents studied, and observations for this study.

## Table 23 Privately Owned Stand-Alone Parking Structures

| | Stand-Alone Privately Owned Public Parking Structures Common? |
|---|---|
| Jakarta | None found |
| Bangkok | None found |
| Kuala Lumpur | None found |
| Ahmedabad | None found |
| Dhaka | None found |
| Ha Noi | None found |
| Hong Kong | Almost none. Discouraged by policy |
| Singapore | One or two in CBD but now discouraged by policy |
| Manila | Almost none, except a number in Makati under the Ayala umbrella |
| Guangzhou | A few (including a small number of automated facilities) |
| Taipei city | Very few |
| Seoul | Some, including some automated parking towers, concentrated in CBDs |
| Tokyo | Numerous small facilities, often in the form of automated parking towers |

Sources: Interviews, documents studied, and observations for this study.

**Table 24 Prevalence of Temporary Private Vacant-Lot Parking Facilities**

| | Private Vacant Lot Parking Common? |
|---|---|
| Dhaka | None or very few |
| Ha Noi | Very few (however, Ho Chi Minh City is said to have more) |
| Bangkok | Very few |
| Singapore | None (but vacant state land used for parking where deemed necessary) |
| Guangzhou | A few |
| Jakarta | Some. Mostly illegal, without license. |
| Ahmedabad | Some, but most seem to be on vacant municipal land, not private |
| Manila | Some and especially numerous in the Ortigas CBD area |
| Taipei city | Some, mostly with attendants but a few coin-operated |
| Seoul | Some, mostly with attendants but some coin-operated |
| Hong Kong | Quite a few (short-term tenancy parking lots) but on government land |
| Kuala Lumpur | Very common, especially in and around CBD and centers of activity |
| Tokyo | Many. Coin-operated or monthly parking on small lots throughout the urban fabric. |

CBD = central business district.

Sources: Interviews, observations, and documents consulted for this study.

around its city center, where it offers cheap all-day parking and adds to that city's CBD parking oversupply.

The case of Hong Kong is perhaps better seen as government parking, delegated to the private sector, since these sites are under government ownership. The Hong Kong Lands Department has been criticized by industry participants for undermining nearby parking businesses by too readily leasing land for such temporary parking lots. Singapore's Urban Redevelopment Authority also creates parking on state land (of which Singapore has a large amount). This is done in locations that are deemed to have a spillover problem or on-street parking problems.

Tokyo's case is striking for the phenomenon of coin-operated parking lots on small vacant lots throughout the urban fabric. Most localities also have vacant lots offering monthly parking. Both types appear to be a result of a combination of factors, including: ease of obtaining permission for such facilities, tax and tenancy regulations that inadvertently encourage plots to be held without buildings (Kanemoto 1997), and the existence of demand for paid parking both day and night in most neighborhoods. The nighttime part of this is associated with Japan's proof-of-parking regulation (p. 49).

Vacant lot parking provides for potential rapid deployment of a pool of public parking with prices that are responsive to demand. However, they are a cause for concern for their impact on the long-run viability of existing parking businesses with higher fixed costs and sunk investments. Being too liberal in allowing vacant lot parking means encouraging hit-and-run competition for such incumbents. This risks undermining the industry, triggering disinvestment, and actually reducing the ability of the local parking system to adapt to local change. It risks creating an oversupply of parking, especially during real estate downturns.

A tiny coin-operated parking lot in central Tokyo

## Markets in unbundled home-based parking

Even home-based parking can be offered in a parking-as-a-business model. This takes things a step further than simple unbundling. Recall that home parking

in many contexts is often bundled with housing, so that residents with a vehicle do not pay anything extra that would not be paid by a resident without a car. Bundling of parking in multi-family housing has been criticized for inflexibility and inequity, since it involves a cross-subsidy from households without vehicles to vehicle-owning households. Unbundling separates housing and parking transactions but does not necessarily involve parking provided by a business.

However, in some of the cities in this study, it is common for home-based parking to be obtained from parking businesses. For example, residents might lease home-based parking in vacant lot parking businesses, in priced parking in commercial buildings, and others. This is common in Ha Noi, Tokyo, and to some extent in Taipei city. Sometimes, parking within residential complexes forms a part of the local parking market by allowing nonresidents to rent or buy parking rights or spaces.

## Proof of parking policy creates local markets for leased home-based parking

A key component of Japan's approach to residential parking is its long-standing proof-of-parking (*Shako Shomei*) law. In this policy, administered by local police, registration of a car is conditional upon demonstrating access to a parking space within or near the residence. When imposed in the 1950s, it was aimed at eliminating haphazard nighttime parking in streets and alleys. It has served this purpose and had some other important effects.

Perhaps most importantly, the policy created a demand for leased parking near homes, which the market has generally managed to meet, at a market price. The proof-of-parking regulation eliminated the need to adopt American-style parking requirements for residential buildings in which every building would be required to have parking. It made it easier to adopt a pragmatic approach, in which small buildings are exempted. The regulation removes residential parking from streets, which also removes the need to have residential parking permits. It has also probably had the indirect effect of avoiding the pressure to increase street width standards for residential areas to accommodate parking.

The policy likely slowed the growth of car ownership in Japan's cities. This impact must obviously be greatest in places with high property prices, where leased parking prices are also high. This deters car ownership in precisely the highly accessible, densely developed, transit-rich contexts where car ownership is least necessary.

However, in some of the cities in this study, it is common for home-based parking to be obtained from parking businesses

A number of places in this study have considered emulating Japan's proof-of-parking policy. Ha Noi actually enacted a similar policy. However, interviewees explained that this has lapsed due to the difficulty of enforcing it. Seoul, Taipei city, and the city of Mandaluyong in Manila have debated the possibility. A trial is now taking place in Cheju Island, Republic of Korea.

## Market prices

"Market prices" for parking do not necessarily reflect the full opportunity cost of the space used. In some contexts they are simply a form of gatekeeping, to ensure outsiders do not free load on parking intended for customers or tenants.

A price for parking can also emerge within multi-family housing compounds as an allocation mechanism. Again, this is not a case of people paying for the real estate taken up by parking. If there is free (or very cheap) on-street parking as the main alternative, then these prices, at least initially, will be relatively low compared to the price per square meter of housing space. They reflect the value of the security and convenience of parking within the compound relative to the on-street option outside. However, wider scarcity may gradually push prices in buildings upward.

It is noteworthy that parking pricing has emerged to some extent in even the lowest motorized cities in this study. This means that priced parking tends to be taken for granted in many of these cities. Widespread pricing for parking also means that prices are taken for granted in assessments of demand for the setting of parking requirements for buildings. This contrasts with a tendency to presume free parking in the setting of American suburban parking requirements (Shoup 2005).

## Controversy over pricing of parking in private buildings

Most cities in this study, in common with the international norm, have no legal or ethical problem with having market prices for public parking in private buildings.

However, such pricing is a controversial issue in certain cities, especially in South Asia. Some voices suggest that the status of parking as a common facility implies that it should remain bundled. They claim that, since such parking is required by law and because it is not included in the floor area allowance, it does not attract the taxes that must be paid on such space, and hence developers should not be allowed to get rent or profit from it.

Such notions are the basis for a ban in Hyderabad, India, on shopping malls charging for parking (although they are reported to do so anyway) and calls for such a ban in some other Indian cities (Kumar 2009). Similar arguments were heard in Ahmedabad to object to residential societies charging their residents for parking. The same argument justifies price controls in Jakarta (see below). In Metro Manila, a court challenge recently failed to prevent shopping malls charging for parking (Araneta 2009). These examples highlight that alternative conceptions of parking as an economic good and resulting legal niceties in the status and treatment of parking can potentially have important consequences.

## Price controls on private sector parking

In line with the international norm of deregulated private sector parking pricing, the prices of parking run as a business are not regulated in most cities in the study. Yet Beijing, Guangzhou, Ha Noi, and Jakarta do control parking prices. Parking price control is likely to be common throughout the People's Republic of China, Indonesia, and Viet Nam.

In line with the international norm of deregulated private sector parking pricing, the prices of parking run as a business are not regulated in most cities in the study

Such a policy seems unwise, since it brings the always difficult politics of public sector price setting into prices, which need not be politicized. Moreover, controlling the price of a private good is problematic and should not be done lightly. It inevitably suppresses supply, inflates demand, and throws away the information value of market prices.

There are hints in Ha Noi that the official prices are much too low, at least in the urban core. Complaints of saturation are one sign. In another area, some compounds in buildings and residential condominiums are said to charge much more than the official rates.

Until recently, price controls in Beijing left room for market pricing in certain key segments of parking. However, price controls were expanded in April 2010 to include more previously market-priced facilities. In 2008, Guangzhou's price controls had reportedly also become somewhat more restrictive than before, provoking complaints from the private parking industry that it was stifling private investment in parking. Many prices observed in Guangzhou during field visits were at the city-decreed price level, but some prices were below the maximum, which may suggest that these maximums are not yet too divergent from market prices.

In Jakarta, no prices lower than the controlled maximum were observed at any priced parking facility during the study. Some parking facilities were charging higher rates. This prompted enforcement action in February 2010 (Setiawati 2010). The survey for this study revealed almost universal pricing of parking for work trips and shopping and/or leisure trips. These points suggest that deregulated parking prices would generally be higher in Jakarta.

Market-based pricing can also be influenced indirectly by government participation in parking supply. For example, the Housing and Development Board's public housing parking in Singapore is apparently the price leader in most localities outside the core of the city so that private sector parking there tends to deviate little from the board's prices.

Price regulation undermines useful market mechanisms. Rising parking prices are a sign of scarcity within a locality, which provides useful information to all actors there, including private ones who can respond by investing in parking, by making private parking open to the public, or by improving the alternatives (including taxi, valet, or shuttle services).

Interviewees in each city justified these controls on the basis of social stability. This seems odd when it is noted that car owners in these cities tend to

be high-income earners. Controlling parking prices forces everyone in society to subsidize car owners.

In Beijing's recent extension of price controls, one aim appears to be ensuring that off-street parking is cheaper than on-street. It would probably be wiser to achieve this by setting a market-clearing on-street price rather than forcing down the off-street prices.

Another rationale was based on seeing parking as ancillary infrastructure. This kind of argument has been seen recently in Jakarta, Manila, and in some Indian cities where it has been argued that parking in commercial buildings should not be priced or should not cover investment costs, because parking is required by the standards and is part of the building infrastructure paid for by occupants, especially if this means that parking is exempted from property taxes paid on leasable floor space. This is logical but serves to highlight that it can be problematic to treat parking as ancillary infrastructure rather than as any other kind of real estate-based service.

In Beijing's recent extension of price controls, one aim appears to be ensuring that off-street parking is cheaper than on-street

# Parking as a Mobility Management Tool

Parking management approaches to parking supply policy often include the use of mobility management strategies to influence parking demand. Furthermore, the constraint-focused stream within parking management emerges when traffic reduction is the key objective and constraint of parking the key tool. This is the stream in parking policy that is most closely associated with efforts at a mode shift and sustainable transport agendas. Both of the streams of parking management include the use of parking policy as a policy lever for wider mobility management objectives.

We will see that few of the Asian cities use parking as a mobility management tool. Most could consider doing so more, especially in city centers and other localities with high accessibility by public transport.

## Constraining parking supply in congested and/or transit-rich locations

Western cities' parking constraint usually involves capping the parking in a locality. Copenhagen, for example, has for decades reduced the number of parking spaces in its central business district (CBD) by roughly 3% per year. The Swiss cities of Bern and Zurich tightly constrain parking in their city centers, especially all-day parking (Hamilton 2006). Even some American CBDs limit parking, including New York City, Portland (Oregon), San Francisco, and Seattle (Kaehny 2008). In Sydney, the New South Wales government imposes parking restraint not only in the CBD but also in the major subcenters (SGS Economics and Planning 2007).

The clearest constraint-focused parking policy found in the Asian cities in this study is in Seoul where parking maximums apply to buildings in its core centers of activity. This policy began in 1997 and was expanded in March 2009. In the areas covered, parking minimums are set at about 10% of the usual level, and building and parking maximums are set at about 50% of the usual minimums (Seoul Metropolitan Government, Department of Parking Planning 2009). Note that these parking limitation areas do not have an overall parking cap. Rather, it is the parking linked with each building that is constrained. Spillover prompts some local parking businesses to emerge in these areas, whereas, according to our survey results, there is relatively little priced parking elsewhere in Seoul (p. 59).

A constraint element can also be seen in Singapore's city center parking policies since 2003, when it drastically lowered the parking requirements for buildings in the central area. Office buildings in that zone now require only one parking space per 450 square meters ($m^2$) of floor space. In addition, Singapore's parking requirements now allow flexibility for a further 20% reduction. When this is taken into account, Singapore's CBD office building parking requirements are around double those in Seoul's central areas. The constraint aspect arises because this rate is seen by developers as a maximum as well as a minimum (since parking beyond the requirement is not exempt from inclusion in the allowable building floor area).

Parking requirements in Hong Kong, which are relatively low and provide for lower levels in highly transit-rich locations, might sometimes also have an active constraint element. This is because of the proviso that actual parking required and/or allowed will be "subject to road capacity considerations" (Planning Department, Government of the

Hong Kong Special Administrative Region of the People's Republic of China 2009, 42). Most parking policy documentation in of Hong Kong appears to take a demand-realistic conventional approach. However, efforts to estimate parking demand take place in a context of already high parking prices. These make it hard to ignore the potential for parking constraint in this approach even if it is not an explicitly stated aim.

Surprisingly, Taipei city and Tokyo do not have explicit parking constraint policies. In both, there are signs of official interest, but nothing concrete has been implemented yet. Whether Japan's proof-of-parking regulation should be considered as an example of a parking constraint policy is discussed on p. 55.

For the newly motorizing cities and the developing Southeast Asian cities, where the problem is widely felt to be a parking shortage, rather than excess, there is so far little enthusiasm for constraining parking. For example, over the last 2 decades, politicians and planners in Kuala Lumpur have often mentioned the possibility of parking constraint but there has been little action on this except for central parking requirements that are slightly lower than elsewhere. In fact, the city center in Kuala Lumpur has a large oversupply of parking (City Hall, Kuala Lumpur 2003).

Despite serious traffic congestion problems in most Asian cities, interviewees in the public sector generally saw parking constraint as something for the future. Much more energy generally goes into parking expansion than restriction. In most of these cities, disappointment with existing public transport was also raised as a reason that such parking constraint would be politically impossible for now.

## Public sector pricing as mobility management

Parking operated by the public sector can be priced to achieve mobility management goals. This approach is also limited so far in Asia. Table 17 highlighted Seoul's use of parking pricing zones, with expensive on-street parking in its parking limitation areas. A shift to market pricing for public sector parking in Hong Kong, Taipei city, and Tokyo can also be seen perhaps as having a travel demand management (TDM) element.

Newly motorizing cities have begun to consider this policy. Dhaka's 2009 parking policy document calls for a distinction between areas with non-restrictive and restrictive parking policies, with the latter proposed to have deterrent prices. India's national government guidance urges parking prices to reflect land prices of each vicinity and this is linked with a TDM rationale

Despite serious traffic congestion problems in most Asian cities, interviewees in the public sector generally saw parking constraint as something for the future

(Government of India 2006). The adoption of higher on-street parking prices in central areas of PRC cities is also a sign of TDM thinking, although it must be set against efforts to boost public sector parking supply.

## Parking levies and taxes

Parking taxes or levies are sometimes used as a parking constraint mechanism, such as in Sydney and in some United Kingdom cities. Singapore tried such a levy for city-center parking in the 1970s and 1980s. However, this was incompatible with also having parking minimum requirements. The levy was subsequently dropped, not the requirements. Jakarta has a special tax on priced off-street parking but there is no suggestion that this has anything to do with parking constraint. It is more a revenue-raising licensing fee.

## Park-and-ride: Parking as a pull for public transport

One use of parking policy to reduce traffic in city centers does get widespread support in Asia. This is the creation of park-and-ride facilities. Many of the cities in the study have park-and-ride at mass transit stations and several have plans for more. The rationale is to entice motorists onto public transport who might otherwise drive into the congested city core.

Such efforts are common on the outskirts of European, North American, and Australasian cities, where they are widely viewed as working (de Wit 2006). Despite their popularity, there are concerns that they may increase total traffic more than they decrease city center traffic (Parkhurst 1995; Parkhurst 2000). Although the park-and-ride facilities are in the periphery, this policy can be considered as a part of city center-focused parking management efforts. It is most used in cities that have a transit-oriented core surrounded by auto-centric suburban areas. The

Bangkok MRT park-and-ride structure at Lad Prao (left) and its dense urban context (right)

suburban contexts for most Western park-and-ride facilities have low densities and very high car ownership, with little hope of efficient feeder bus service.

Park-and-ride policies are found in Bangkok, Beijing, Guangzhou, Hong Kong, the Kuala Lumpur area, Seoul, Singapore, and Taipei city. However, only the Beijing and Guangzhou cases seem to be on a large scale. No public sector–sponsored park-and-ride program for cars was found in Tokyo, although there are private parking lots that are used in this way (without public subsidies) in the outer reaches of the metropolitan area. Park-and-ride facilities have been debated in Ahmedabad and Jakarta in association with bus rapid transit (BRT) systems. Research in Hong Kong and in the Kuala Lumpur region has given positive evaluations of the local park-and-ride schemes (Hamid 2009; Lam, Holyoak, and Lo 200). However, an unfortunate feature of Asian park-and-ride programs is the location of some facilities within dense urban areas rather than in low-density peripheral areas. Only in Kuala Lumpur and Hong Kong are most of them in low-density, far-flung localities. There must be serious doubts about the cost effectiveness of park-and-ride in dense urban locations where the opportunity cost of space near mass transit stations is high. In such places, parking can deliver fewer passengers to the mass transit system than most other possible uses of floor space. In dense urban contexts, complementary bus service and/or bicycle and motorcycle-based park-and-ride are likely to be much more cost-effective than car-based park-and-ride. Until there is clear evidence for higher benefits than costs, park-and-ride within the dense parts of cities should be viewed with skepticism.

The one exception perhaps to this cautious view of park-and-ride is station vicinities that are primarily residential (even if high-density). Park-and-ride can then potentially share spaces with residential parking in such locations. This opportunity arises from the complementary timing of peak demand for home-based and for park-and-ride parking. This can sometimes allow cost-effective daytime use of residential parking that would otherwise have low occupancy and would not require expensive purpose-specific facilities. Singapore's park-and-ride program seems to exploit such opportunities in its Housing and Development Board's public housing estates.

## Taxing parking perks

Providing discounted parking for employees can be considered a fringe benefit and, if untaxed, would amount to avoiding income tax. There is a case on taxation policy grounds, to tax the value of parking benefits. If this prompts employers to refrain from offering such perks, the tax could be considered a mobility management measure. An increasing number of countries tax employee parking benefits to some extent. Australia, for instance, taxes free employee parking if commercial-priced parking exists nearby, providing a benchmark for the value of the parking perk.

In Singapore, free parking for an employee is considered a benefit-in-kind and taxed as income in the same way that other such benefits, such as employee housing, are taxed. However, Malaysia appears to exempt employee parking from taxation as a benefit-in-kind. It is unclear which of the other Asian countries in the study tax employee parking benefits.

## Workplace mobility management and parking

In North America and in Europe, workplace-based mobility plans (or green transport plans) or

## In North America and in Europe, workplace-based mobility plans (or green transport plans) or workplace TDM programs are increasingly common

workplace TDM programs are increasingly common (Litman 2002). These frequently include a parking element, such as efforts to contain parking demand. Conversely, mobility management can help enterprises avoid investments in expanded parking or provide opportunities for reducing parking (in negotiation with local government). In California, parking cash out programs provide an example of parking-based TDM, in which free employee parking is converted to paid parking, but employees then receive a cash transport allowance instead of the free parking (Shoup 1995).

In the Asian cities studied, there was little evidence of this kind of active role for parking in mobility management. A prominent exception is again Seoul, which has explicit workplace mobility management efforts involving parking. Eliminating free parking for employees is the most widely adopted element of the Seoul Metropolitan Government's workplace TDM program, taken up by around 1,200 workplaces as of 2008 (Ko 2009).

Workplace-based mobility management efforts of any kind are rare so far in most of Asia. However, it should be noted that simply introducing pricing for employee parking is often considered a mobility management initiative in auto-centric contexts. So the fact that priced workplace parking is ubiquitous (although not universal) in the Asian cities in this study (p. 59) might be taken by some as a sign of a mobility management role for parking.

## Is the proof-of-parking policy a mobility management policy?

Debates over proof-of-parking policies in the Republic of Korea, the Philippines, and Viet Nam have apparently taken for granted that it is a demand management-oriented policy aimed at reducing car ownership. Both proponents and opponents have framed it this way.

However, it is important to note that in Japan, the proof-of-parking policy has generally not been framed as mobility management. Seeing it as such may miss the original point of it in Japan, which was to ensure that motorists would have no excuse to park illegally overnight in the streets. Proof-of-parking is neither restrictive nor promoting of supply. It simply shifts responsibility for supply. This creates a situation in which much residential parking is unbundled and must pay its way. It has led to local markets in overnight parking.

Despite this policy, car ownership in Japan rose steeply from extremely low levels in the 1960s to western European levels today. Nevertheless, the proof-of-parking regulation must have helped foster low car ownership in the urban cores of Japan's large cities, where high real estate prices translate into expensive overnight parking. For example, leased residential parking prices of more than $300 per month were seen advertised in inner-city Tokyo during late 2009 fieldwork for this study. Almost $4,000 per year is clearly a substantial and tangible additional cost of car ownership. Appropriately, such effects are automatically focused precisely in locations where alternatives to cars are richest, and where living car-free is easiest, in the transit-rich urban core localities.

The policy has been widely cited but with little detail. It may have much to offer in other countries. Unfortunately, we were unable to locate systematic studies of its details and of lessons learned over time, or of whether it has potential elsewhere. International parking policy discussions could benefit greatly from a stronger effort to translate Japanese knowledge on this policy and to investigate its suitability to other contexts.

Leased parking lot in a residential neighborhood near Ueno in central Tokyo

# Car Parking Outcomes in Asian Cities

This chapter presents key results of the surveys of motorists that were conducted in most of the cities in this study (except Guangzhou and Tokyo). Except for "Central business district parking prices relative to office rents" (p. 62), all graphs in this chapter are based on data from these surveys. The aim was to obtain comparable data on the main features of parking activity by motorists across each city, such as typical parking locations for the main parking purposes, payments for home and work parking, and others.

The survey respondents were asked about the car that they drive most (in case they had more than one) and asked about their home-based and other parking for that particular vehicle. Vehicles not used mainly for personal travel were excluded. Care was taken to ensure that the survey could handle either motorists driving their own car or professional drivers (chauffeurs) as respondents. The work parking questions were screened to include only those who usually use their car to get to work and asked about the most recent trip. Shopping and entertainment parking questions asked about the most recent such trip but screened so that answers were for a trip within the 2 weeks before the interview.

## Where do motorists park?

A set of questions asked where parking took place, in terms of whether inside or outside the destination premises, and the kind of parking space.

### Home-based parking

Figure 4 shows the results for home-based parking among the survey respondents. They are arranged with longer-motorizing cities at the top and newly motorizing cities below, then within these groups in order of decreasing proportions of parking inside the home compound or home estate (for multi-family housing).

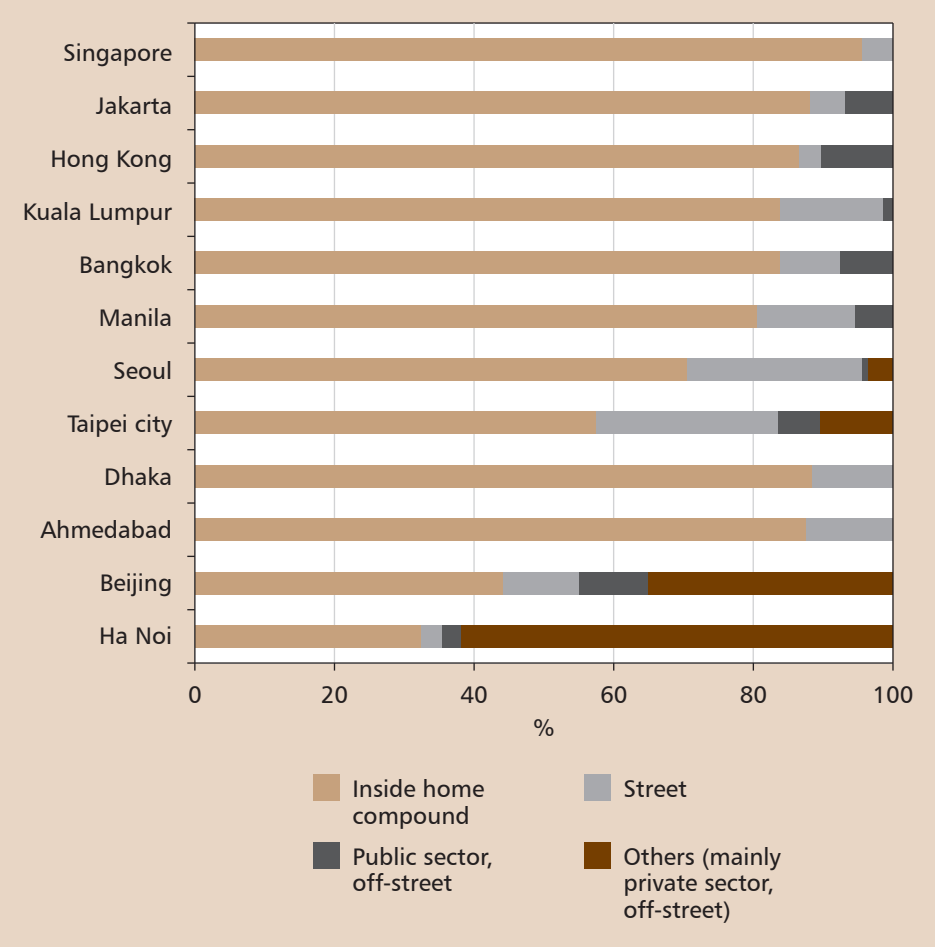
Home parking within the home compound dominated among respondents in Bangkok, Dhaka, Hong Kong, Jakarta, Kuala Lumpur, Manila, and Singapore.

Conversely, Beijing, Ha Noi, Taipei city, and to a lesser extent Seoul, stand out with large percentages of respondents with home-based parking outside of their home compounds. In Seoul and Taipei city, most of this outside parking was on-street. However, in Beijing and Ha Noi, it was mostly in private-leased parking places (although some of Ha Noi's parking in this category is in parking points or privately run parking operations, some of which make use of street or pavement under contract).

Tokyo was not covered by the same kind of survey. However, a very small exploratory survey with 18 valid home parking results showed 22% of respondents parking outside their own housing compound, all of them in leased off-street neighborhood parking. This corroborates field observations and can be seen as an outcome of the proof-of-parking rule.

Only for Beijing, Ha Noi, and Taipei city were there more than very small numbers of respondents using public sector off-street parking and even in these cities this was the smallest category.

**Figure 4 Locations of Home Parking Among Survey Respondents**




Source: Surveys carried out for this study.

## Work parking

Work trips and workplace parking receive a great deal of attention for their association with peak hour congestion, considered in many cities to be a central urban transport problem.

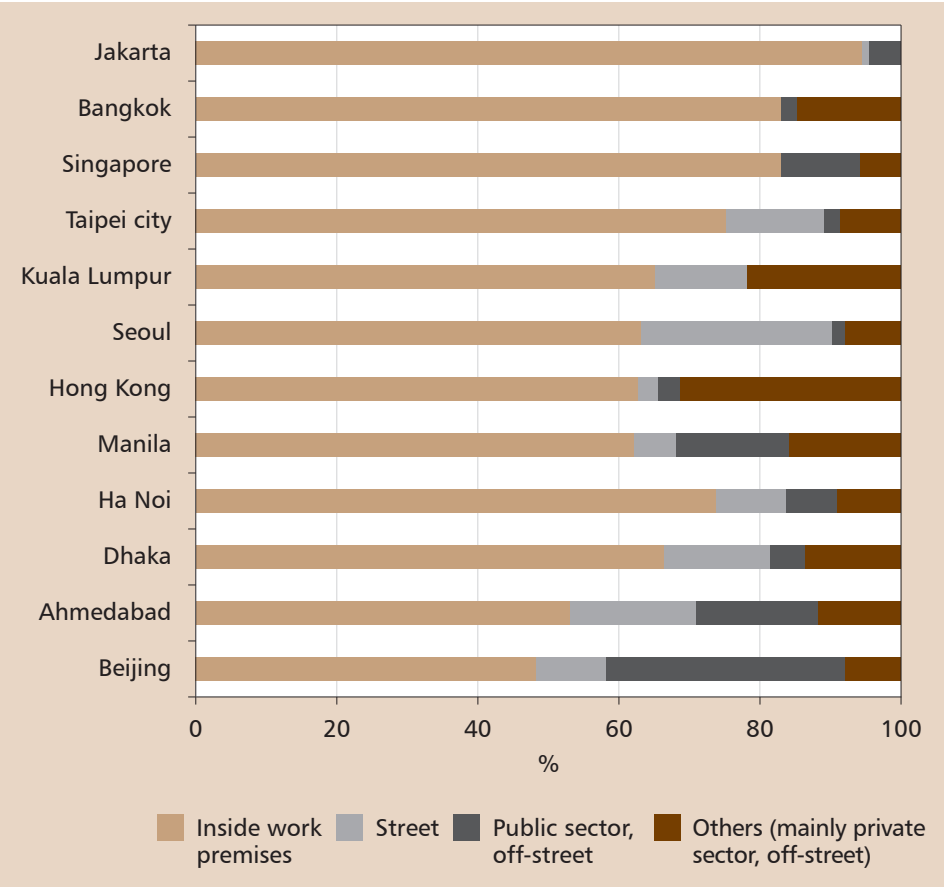
Except for Bangkok, Jakarta, and Singapore, all of the cities had well over 20% of work parking by respondents being outside the workplace premises.

On-street work-based parking is usually regarded as problematic because of the long duration of such parking, often taking convenient spaces in commercial districts. Several cities show up with significant amounts of on-street work parking (Ahmedabad, Dhaka, Kuala Lumpur, Seoul and Taipei city). In those cities (or parts of cities) with weak on-street parking management, such parking is indeed likely to be disruptive. The on-street parking in Dhaka's Motijheel district is an example. Seoul's results are striking with 27% of respondents who park at work parking in streets or in alleys.

However, on-street parking was unimportant for work parking among survey respondents in Bangkok, Hong Kong, Jakarta, Manila, and Singapore. This is interesting in the cases of Manila and Hong Kong since they show that relatively high proportions of work parking outside the workplace premises do not necessarily end up in the streets. Similarly, only a modest fraction of Beijing respondents' spillover beyond work premises appears as street parking.

Only Ahmedabad, Beijing, Manila, and Singapore reveal significant roles for government-provided parking, mostly in priced government-provided parking either in structures or at-grade (although the Manila case involved 16 cases of parking on state-owned open lots without payment).

**Figure 5 Locations of Work-Based Parking Among Survey Respondents**




Source: Surveys carried out for this study.

Private sector off-street public parking outside workplace premises shows up strongly in Bangkok, Hong Kong, Kuala Lumpur, and Manila, and is noticeable in all of the cities.

## Parking at shopping and entertainment destinations

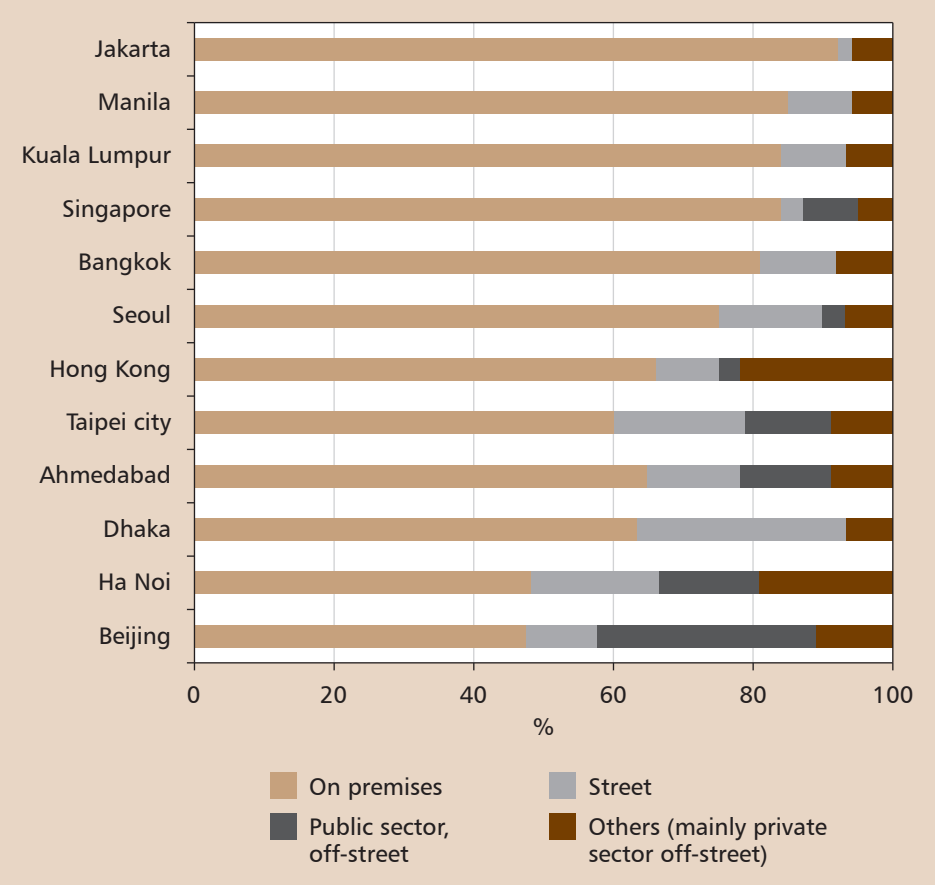
The results in Figure 6 refer to parking by respondents for their most recent car trip to shopping, eating out, and/or entertainment. Such parking is usually short-term.

This category of parking is often a focus of concern for retail-intensive centers of activity, including many commercial streets. It is often associated with conflict over chaotic or saturated on-street parking and with complaints from motorists of having nowhere to park.

High rates of parking within the destination premises in Bangkok, Jakarta, Kuala Lumpur, Manila, and Singapore, might perhaps be seen as a triumph for an emphasis on parking requirements in parking policy (p. 14). However, Ahmedabad, Beijing, Ha Noi, Hong Kong, and Taipei city demonstrate that off-site parking need not necessarily end up mainly as on-street parking. Each has substantial proportions in the public sector or private sector off-street categories, most of which are priced and shared, and therefore potentially a relatively responsive and efficiently utilized stock of parking (provided that prices can respond to demand changes).

Parking at shopping destinations is often associated with conflict over chaotic or saturated on-street parking and with complaints from motorists of having nowhere to park

**Figure 6 Locations of Shopping and/or Entertainment Parking Among Survey Respondents**




Source: Surveys carried out for this study.

## What proportion of motorists pay for parking?

Free parking (including having someone pay for you) is surprisingly common for respondents in the cities studied (Figure 7). Priced parking is certainly widespread but is far from universal. For example, only in Beijing, Jakarta, and Singapore did more than 40% of workplace parking respondents pay anything for their parking.

In the longer-motorized cities, shopping and entertainment parking is more often priced than work or home-based parking. However, in the newly motorizing cities, home-based parking is as likely or nearly as likely to be priced as the others. Perhaps this reflects the rapidly rising car ownership, causing a current mismatch between the housing stock and its parking.

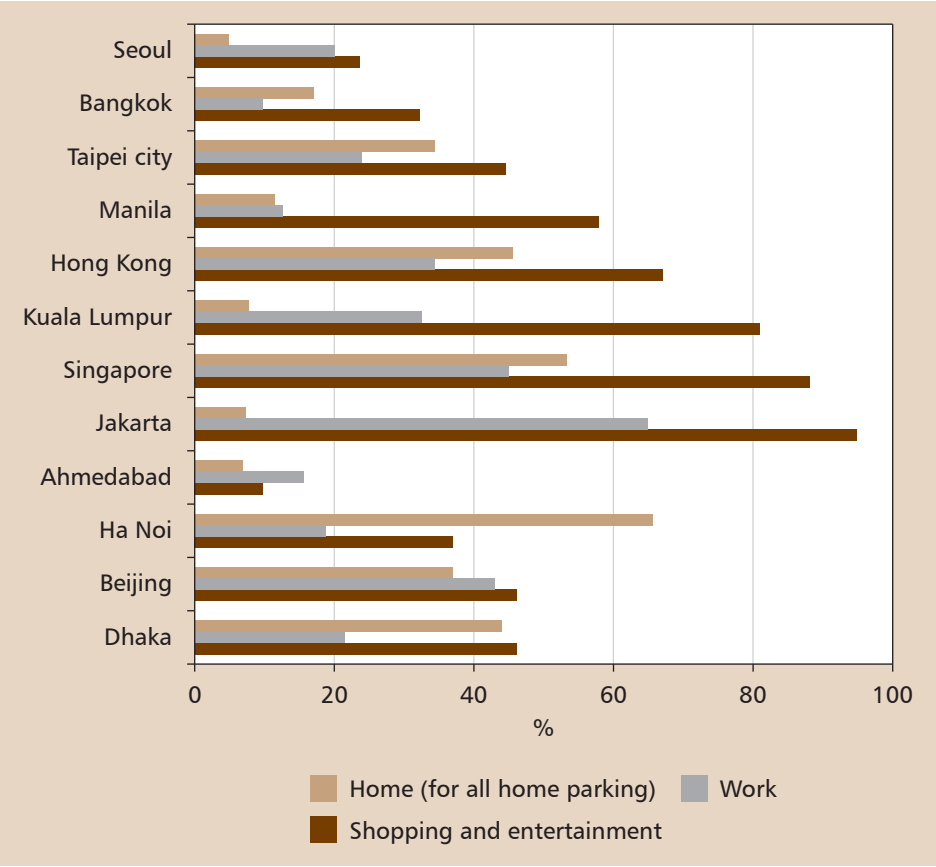
The results for Seoul are striking with low proportions of parking being priced. This came as a surprise in light of Seoul's very high urban densities and high-profile constraint-focused parking policies for its business districts. Low home-based pricing is surprising in light of the concern there over residential parking shortages. Or could an apparent reluctance to price parking be part of the explanation for some of Seoul's parking difficulties?

Jakarta and Kuala Lumpur have surprisingly high proportions of paid work and shopping and/or entertainment parking despite their relatively auto-centric approaches to parking requirements. However, we will see later in "How much do they pay?" (p. 60) that the prices paid are low.

## Bundled versus unbundled home parking

Priced home-based parking can be either inside the home compound, in streets, or in other

**Figure 7 Proportion of Respondents Paying for Parking by Purpose**
(as % of survey respondents parking for each purpose)




Note: The Seoul work parking figure will be a slight overestimate, since respondents there were not asked if their employer pays for their work-based parking.

Source: Surveys carried out for this study.

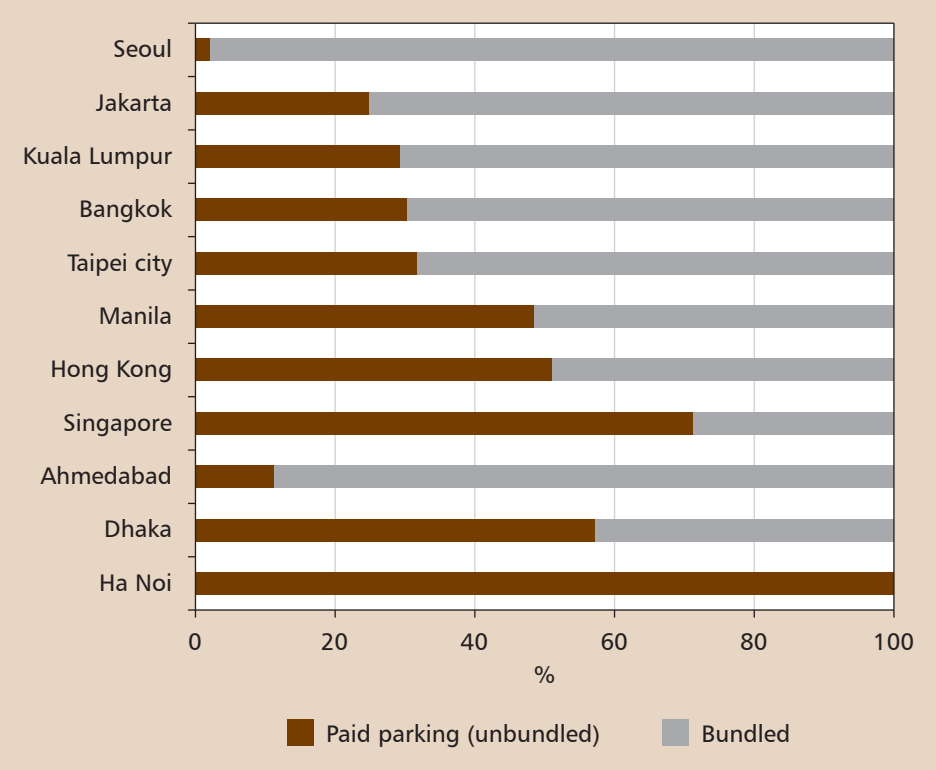
parking facilities. When parking within the home compound is priced separately from the housing, this is known as unbundling. Figure 8 shows the proportions of bundled versus unbundled parking among respondents reporting that they park inside their own multi-family housing complexes. Unbundling is common in all cities except in Seoul and Ahmedabad. It is universal among apartment-dwelling respondents in Ha Noi. In Singapore, almost all of the cases of unbundled parking were in public housing estates, while almost all of those in private condominiums reported bundled parking. It may come as a surprise that unbundling is far from universal among respondents in Hong Kong. Dhaka is interesting in having common unbundling, especially when compared with the mostly bundled parking in the other South Asian city in the study, Ahmedabad.

## How much do they pay?

Figures 9 and 10 provide comparisons of the parking prices reported in the surveys for home-based parking and for work-based parking. Each figure shows two averages for each city. The first is the overall average, counting non-paid parking as a zero price. The second is the average price only among those who reported paying more than zero. Presenting these two averages side by side provides an indication both of prevailing prices (among those who pay) and the prevalence of pricing (which is low when the average on the left is much lower than the one on the right).

In both home-based and work-based parking, prices in Hong Kong stand out from the others. Some readers might take this as an oddity and as suggesting

**Figure 8 Proportion of Unbundled Parking Payments for Respondents Parking Inside Multi-Family Housing**




Note: It was not possible to derive this item from the Beijing survey.

Source: Surveys carried out for this study.

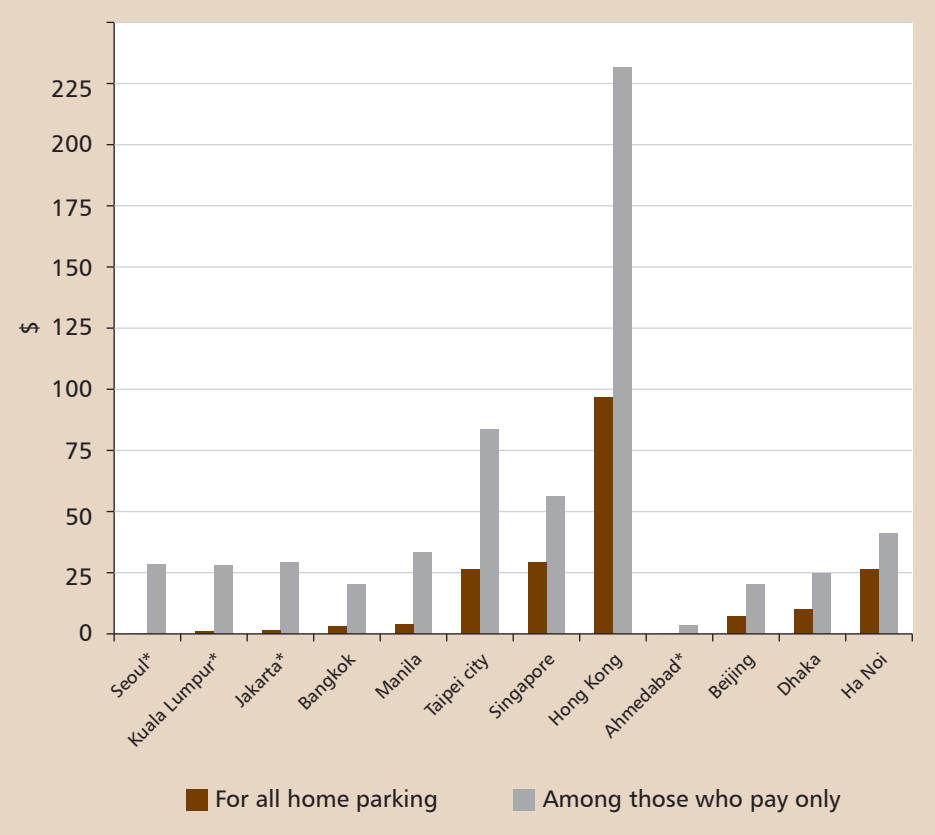
something amiss with parking policies there. However, recall from "What is the right price?" (p. 11) that the monthly cost of providing a parking space in a dense urban environment is likely to be between $150 and $350. This suggests that parking prices in Hong Kong are the only ones at close to cost recovery levels. It must also be remembered that Hong Kong is exceptional in having very low car ownership for a rich city and very high urban densities, even by Asian standards.

Singapore is a distant second in the overall averages for both categories. However, home parking prices in Taipei city faced by respondents are higher than Singapore's for those who do actually pay and almost as high for work parking. Ha Noi stands out with relatively expensive home-based parking with a high prevalence of priced home parking. Those who do pay for work parking in Ha Noi also pay a relatively high price on average, considering Ha Noi's low incomes. Jakarta and Beijing respondents report rather low work parking prices but relatively large proportions have to pay.

The overall averages for work parking here hide variations within each city, and several have much higher prices in their city centers. For example, workplace parking prices in the heart of Singapore's central business district (CBD) area are generally more than double the average seen in this survey. Seoul's low prevalence of pricing but relatively high prices when they are charged reflects the fact that workplace parking pricing there is geographically concentrated in the areas where a parking constraint policy applies (p. 52). All but one of its 13 cases of work-based parking pricing

The overall averages for work parking here hide variations within each city, and several have much higher prices in their city centers

**Figure 9 Average Home-Based Parking Prices Paid by Survey Respondents per Month** (in January 2010 $)




Note: In Ahmedabad, Jakarta, Kuala Lumpur, and Seoul, fewer than 20 respondents paid for parking at home, so these mean prices should be treated with extra caution. These are indicated with *.

Source: Surveys carried out for this study.

were in the business districts of Dongdaemun-gu, Kangnam-gu, Jung-gu, and Yeongdeungpo-gu.

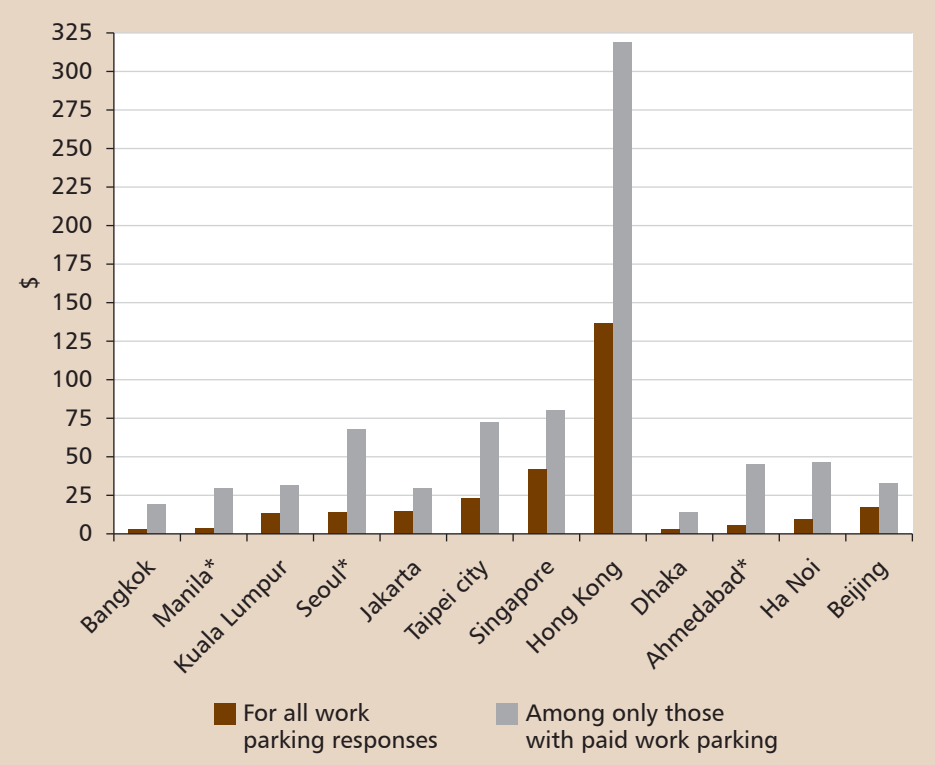
## Central business district parking prices relative to office rents

A theme in this report is the disparity in most cities between the returns on parking investments and those on other uses of real estate. The survey findings revealed remarkably cheap parking in most cities compared with the likely costs of providing parking. This disparity deters investment in parking and prompts governments to attempt to boost supply. Conversely, it tempts some building owners to divert parking space to other uses.

This section seeks further insight on this, using information from two data sets from Colliers International, one on CBD parking prices in cities around the world, and another on CBD Grade A office rents (Colliers International 2009a; Colliers International 2009b). A subset of large cities that appear in both data sets was selected. Both variables were expressed as rent per square meter per month. Despite some caveats, this comparison offers important insights. The results are portrayed in Figure 11.

Survey findings revealed remarkably cheap parking in most cities compared with the likely costs of providing parking. This disparity deters investment in parking and prompts governments to attempt to boost supply

**Figure 10 Average Work-Based Parking Prices Paid by Survey Respondents per Month** (in January 2010 $)




Note: In Manila, Seoul, and Ahmedabad, fewer than 20 respondents paid for parking at work, so their mean prices should be treated with extra caution. These are indicated with *.

Source: Surveys carried out for this study.

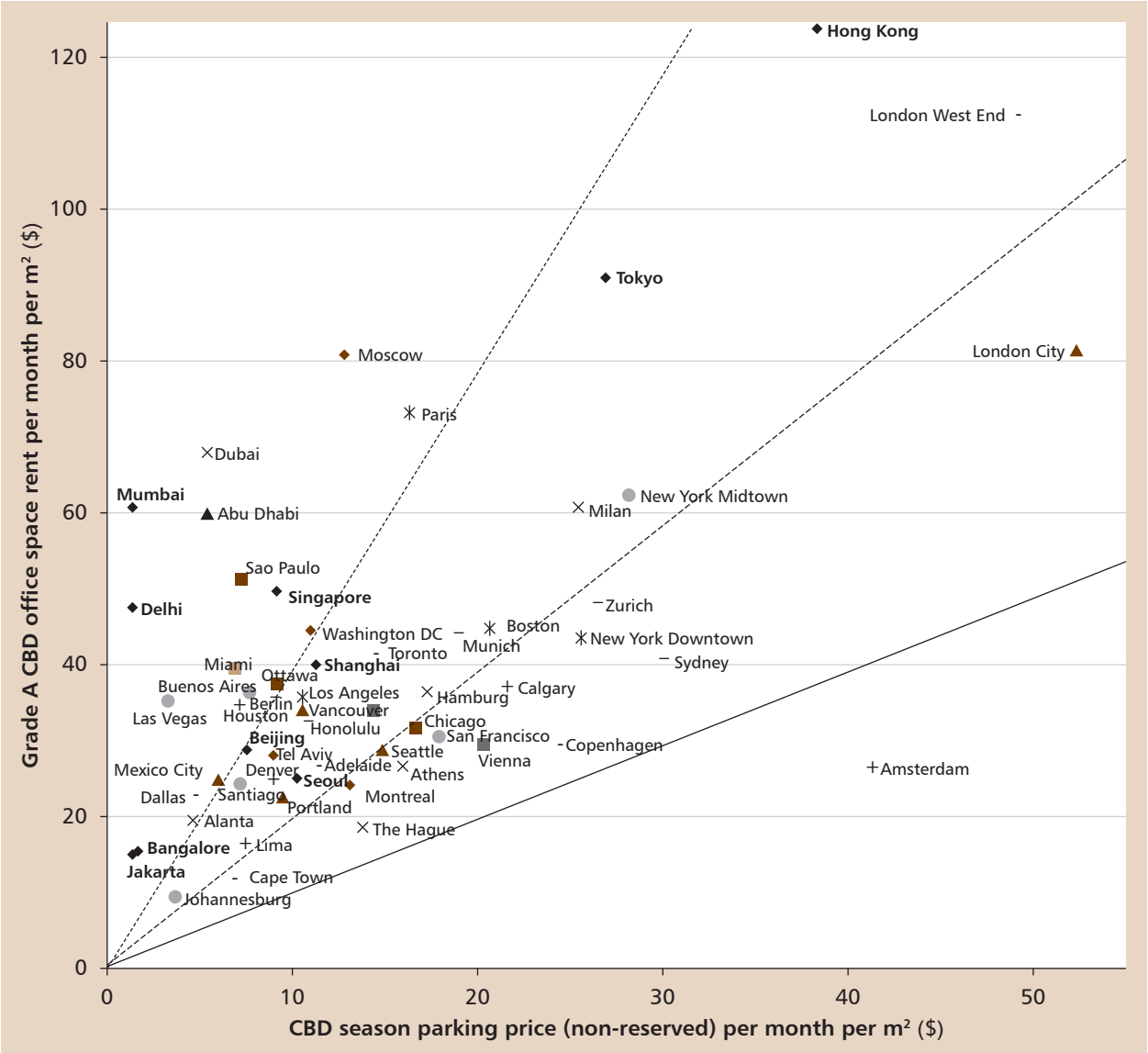
Cities in the lower left corner have low office prices and low parking prices. Amsterdam, in the lower right, has modest office prices but expensive monthly parking in its CBD. Cities between the diagonal line and the line with double its slope have a ratio of parking prices to office rentals of between 0.5 and 1. These include London City, with both parking and office space being very expensive as well as Cape Town, where both are very cheap. Some cities in this part of the graph are well known for constrained parking, often in association with a constraint-focused parking policy in the CBD, including Copenhagen, London, San Francisco, and Sydney.

The next group of cities fall between the line with a slope of 2 and the one with a slope of 4, implying ratios of parking price to office rental between 0.25 and 0.5. Beijing, Hong Kong, Seoul, Shanghai, and Tokyo fall into this group. Even though CBD parking prices in Hong Kong and Tokyo are among the highest in the world, such parking prices do not appear expensive relative to their office rents.

Cities in the upper left part of the graph have expensive office space but very cheap parking, and it is for these cities that we can most emphatically point to inefficiencies and claim that there must be sizable subsidies or cross-subsidies for parking in their city centers. The Indian cities of Delhi and Mumbai are extreme, with the lowest parking price to office rental ratios of 0.02 and 0.03. They are clearly very far from having parking prices take account of land prices as called for by India's National Urban Transport Policy. The ratios in the Gulf cities of Abu Dhabi and Dubai are almost as low. Bangalore's ratio of 0.11 is due to cheaper office space, not more expensive parking. Ahmedabad and Dhaka would probably be in this part of the graph if data were available for them. Jakarta is also in this group with a low ratio of 0.09.

Singapore also appears in this part of the graph with cheap CBD parking relative to its CBD office rentals, with a ratio of 0.18. This corroborates the observation in Chapter 3 that Singapore's parking requirements had been too high before being lowered in 2003, especially for the city center. This should gradually push Singapore to the right on the graph.

## Figure 11 CBD Parking Prices Compared with CBD Grade A Office Rents in Many International Cities

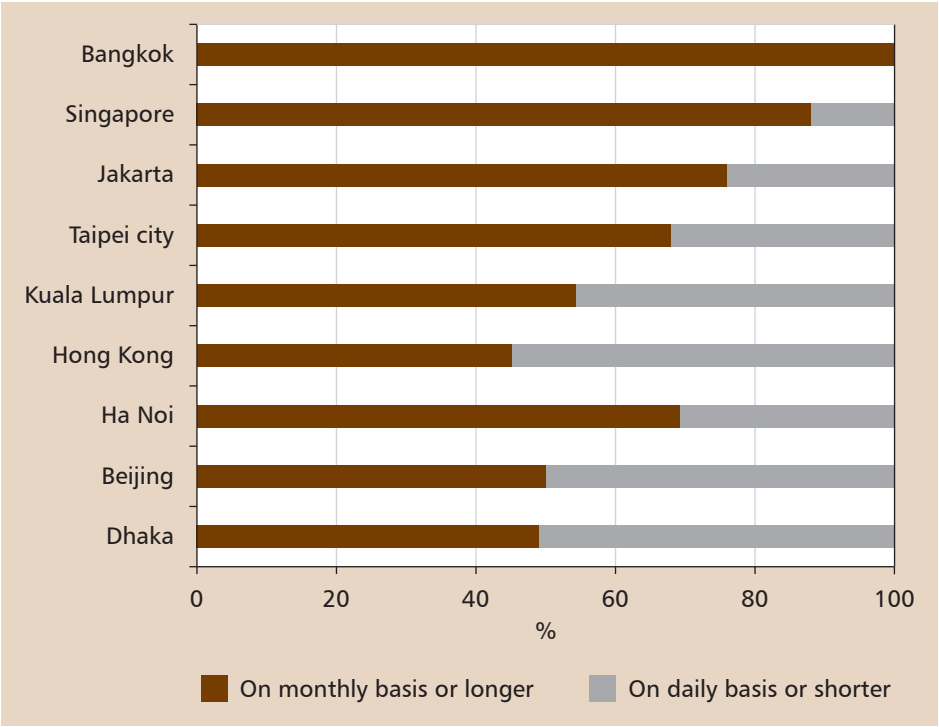



CBD = central business district, m² = square meter.

Note: In calculating the parking price per m², the Colliers figure for the monthly non-reserved price was divided by 19.5 m² (an estimate of the space required for a parking space, including aisles, etc.).

Sources: Prepared from data in Colliers International (2009a) and Colliers International (2009b).

**Figure 12 Work-Based Parking Paid on Short-Term versus Season Permit Basis** (% of paid parking responses in surveys)




Note: This graph excludes Ahmedabad, Manila, and Seoul in which fewer than 20 respondents reported paying for parking at work.

Source: Surveys carried out for this study.

## What time basis is used for work parking payments?

Returning to this study's survey results, Figure 12 shows the proportions of long-term permits versus payment on a short-term basis among respondents reporting paying for work parking. Paying for work parking under a season pass arrangement (captured by the "monthly basis or longer" category) may encourage driving every day, since parking costs cannot be reduced by not driving on any particular day. Travel behavior flexibility and responsiveness to other travel demand management signals might be higher if large numbers pay for parking anew every day. Only Bangkok and Singapore were dominated by season pass arrangements.

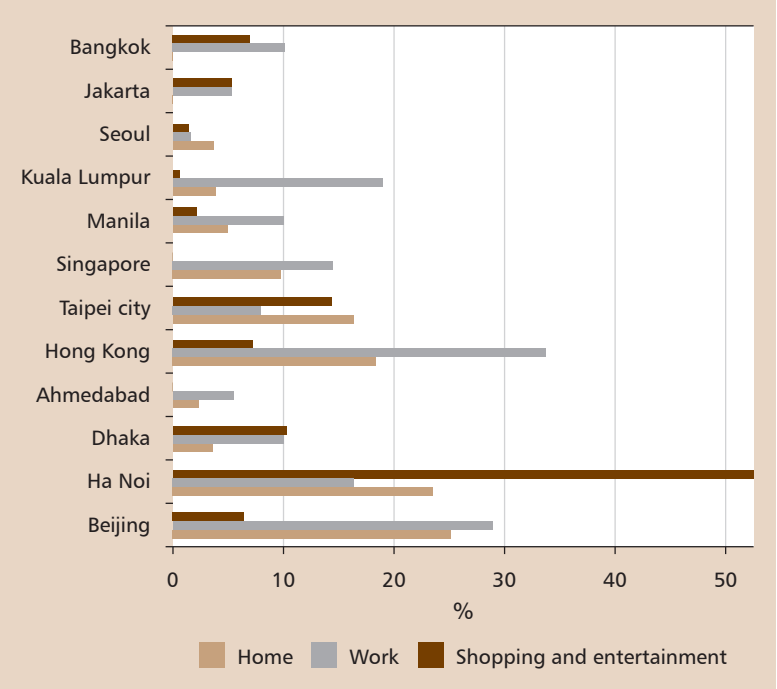
## Use of off-street parking facilities outside destination premises

How significant is priced off-street parking outside destination premises? And which is more important: public sector parking or private sector parking? These questions are interesting because priced outside parking may be helpful in providing a flexible pool of parking capable of dealing with spillover, especially if the parking prices are responsive to demand or are market-based. The graphs provide insight on the significance of off-street parking despite being outside destination premises, for each parking purpose.

Figure 13 shows private sector off-street parking outside destination premises to be especially important in Beijing, Ha Noi, and Hong Kong. Kuala Lumpur's high work-based figure may reflect the large number of vacant lot parking facilities in the city center. Figure 14 shows outside-but-off-street public sector parking, which is usually (but not always) priced. The keenness of most of the newly motorizing cities on this mode of supply shows up here.

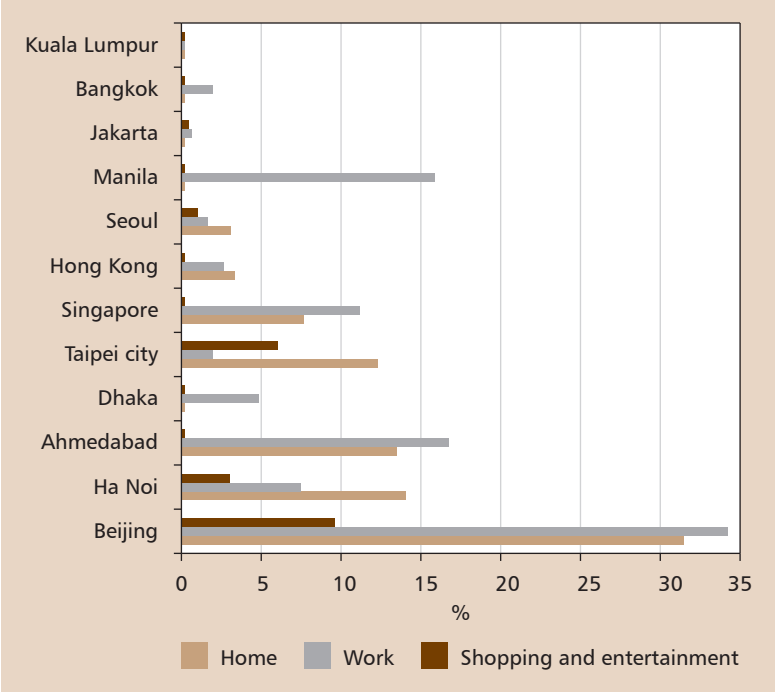
Together, these graphs suggest that priced parking outside destinations is a significant factor in Beijing, Ha Noi, Hong Kong, Singapore, and Taipei city. It is likely that this is true in Tokyo as well, based on fieldwork and other information (Morikawa et al. 2010).

**Figure 13 Importance of Parking in Priced Private Sector Off-Street Facilities Outside Destination Premises**
(as % of survey respondents' reported parking for each purpose)




Source: Surveys carried out for this study.

**Figure 14 Importance of Public Sector Off-Street Parking** (as % of survey respondents' parking for each purpose)




Note: Most of this parking is priced. However, in Manila's case, the public sector parking spaces are government-owned open-lot parking and most were free. In Singapore's home parking category, parking in public housing estates is considered inside even though these estates are open.

Source: Surveys carried out for this study.

# Motorcycle Parking

This chapter provides some perspective on motorcycle parking, albeit briefly. Motorcycle numbers are spectacularly high in Ha Noi but are also very important in Ahmedabad and Taipei city, and to some extent in the Southeast Asian cities and Japan.

## Space efficiency of motorcycle parking

Motorcycle parking is much more space efficient than car parking. This is a key reason that motorcycle parking gets relatively little attention, even in cities where motorcycles are important. For example, even in Ha Noi, the authorities (according to interviewees) see car parking as a much thornier problem than motorcycle parking, despite motorcycle ownership being at least 20 times higher than car ownership. Finding space for motorcycles is much easier than it is for larger vehicles such as cars. Where formal spaces are not created by policy or in private real estate, it is often relatively easy for motorcycle users to find informal places to store their machines. However, some of these options can be disruptive, for example, by interfering with pedestrian paths.

How many motorcycles can be parked in the equivalent of a car space? A lower bound is suggested by Western norms of about 3–5 motorcycles in one car space, but in practice in the Asian cities studied the answer is much higher at between 4.5 and 10. Singapore's parking standards specify perpendicular car slot dimensions and its minimum and preferred size for motorcycle slots. Together these suggest that between 4.6 and 6 motorcycle spaces take the same area as a car space (Land Transport Authority 2005). In India, motorcycle spaces are assumed to take 0.16 of an equivalent car space (ECS), suggesting a little over 6 two-wheelers per car space (CSE India 2009). Viet Nam's parking standards suggest a standard area of 25 square meter ($m^2$) per car and 2.5 $m^2$–3.0 $m^2$ per motorcycle, or about 8–10 motorcycle spaces per car space (Viet Nam's Ministry of Construction 2004).

In Taipei city, an upright position allows scooters to be tightly packed together

Signs of increasingly strict management of motorcycle parking on pavements in Taipei city.

## Effective motorcycle parking management?

Taipei city has the longest experience of dealing with mass motorcycle ownership and has recently had some success in tightening its management of motorcycle parking without being overly harsh. This may offer lessons for other Asian cities with large numbers of motorcycles, especially India and Viet Nam. Since 2004, the Department of Transportation of Taipei City of Taipei,China has been pricing motorcycle parking in certain areas, but it remains free in most parts of the city. Efforts to make motorcycle parking less of a nuisance to pedestrians are ongoing and are proceeding area by area.

Japan's 2006 parking enforcement reforms clamped down on motorcycle parking on footways. This has focused a little more attention on motorcycle parking, with some suggesting that there is a shortage of legal parking for motorcycle users in Japanese cities (according to interviews by the Japan team in this study). It has also been an alleged factor in the increasing popularity of e-bikes in Japan since 2006.


Motorcycles parked in Ahmedabad's old walled city area

## Prices of motorcycle parking relative to car parking

Motorcyclists appear to get a rough deal on parking prices in some cities, when we take into account their thrifty use of space. Motorcycle parking is about three times the price of car parking on a per square meter basis in Ahmedabad, Dhaka, and Jakarta and in some cases in Bangkok. If motorcycles were to be charged the same parking price per square meter of space as cars, then motorcycle parking should be about one-sixth the price of car parking (based on the discussion in p. 67). However, in these cases, motorcycle parking is usually half the car parking price. This seems unfair, especially since car users tend to be richer than two-wheeler users in these cities.

Hong Kong and Kuala Lumpur are at the other extreme with on-street motorcycle parking that

If motorcycles were to be charged the same parking price per square meter of space as cars, then motorcycle parking should be about one-sixth the price of car parking

is free of charge, while most car parking is priced. Singapore and Taipei city price motorcycle parking in some locations and tend to charge them a per session price that is similar to (or slightly lower than) the per hour rate levied on cars. For small motorcycles parking for a whole working day, this amounts to a roughly similar price per square meter as paid by car users. In Ha Noi, both motorcycles and cars are charged on the same time basis and cars pay 6 to 10 times more, about in line with the space consumption ratio.

## Motorcycle parking requirements

The discussion on minimum parking requirements (p. 14) examined regulations that require car parking with buildings but did not discuss motorcycles. Few of the Asian cities seem to require motorcycle parking in their building codes. However, note that not finding such a requirement in some of the cities does not necessarily prove that they do not exist. Table 25 provides details. The cities are arranged roughly according to the importance of motorcycles in each.

**Table 25 Motorcycles and Parking Requirement Regulations**

| | Is Motorcycle Parking Required Under the Parking Standards for Buildings? |
|---|---|
| Ha Noi | Motorcycle parking space numbers are specified for apartment buildings and for office buildings (motorcycle and bicycle spaces at 40%–70% of total office staff). Apparently not specified for other buildings, which only seem to mention car spaces. |
| Kuala Lumpur | Petaling Jaya's parking standards specify motorcycle parking spaces in as much detail as car spaces, but the national guidelines on parking standards barely mention motorcycles. |
| Ahmedabad | Implicitly yes. Space for parking is specified, together with condition that 50% must be for cars, so the other 50% is for others, including motorcycles. |
| Hong Kong | Specifies motorcycle spaces (about 5%–10% of the car parking provision). |
| Taipei city | Appears not to require motorcycle spaces. |
| Jakarta | Appears not to require motorcycle spaces. |
| Bangkok | Appears not to require motorcycle spaces. |
| Singapore | Appears not to require motorcycle spaces. |
| Manila | Appears not to require motorcycle spaces. |
| Dhaka | Appears not to require motorcycle spaces. |
| Beijing | Appears not to require motorcycle spaces. |
| Seoul | Appears not to require motorcycle spaces. |
| Tokyo | Appears not to require motorcycle spaces. |
| Guangzhou | Does not require motorcycle spaces (motorcycles are banned from the urban core of the Guangzhou metropolitan area but are plentiful in its peripheral areas). |

Source: Appendix 2 of this document.

# Parking Policy Trajectories?

One way to interpret the findings of this study is to think about parking in terms of development trajectories or pathways. Table 26 presents a concise and simplified summary of this chapter's conclusions on how parking policy is developing in the study cities.

Discussion in this report has highlighted that some of the parking policy arrangements in some of the Asian cities in the study are especially interesting and offer strong possibilities for emulation by others. These have been placed nearer the top in the table. Cities with parking policies that are apparently most urgently in need of reform are nearer the bottom. Of course, none is perfect and all have some elements of success and interest for others. For comparison, it also provides at the bottom a simplified picture of the situations in Australia, western Europe, and the United States.

**Table 26 Summary of Parking Policy Paths in Asia and Parts of the West**

| | Apparent Overall Parking Policy Trajectories |
|---|---|
| Tokyo | Remarkably market-oriented parking system with ubiquitous commercial market-priced parking. Seems to be an inadvertent result of three pragmatic policies: minimum parking requirements set very low and which exempt small buildings, limited on-street parking, and the proof-of-parking rule. |
| Hong Kong<br>Seoul<br>Singapore | Surprising that they use minimum parking requirements despite being known for transport demand management. However, some signs of shifts away from the conventional approach and away from supply expansion emphasis. Parking requirements have been moderated in Singapore and Hong Kong. Elements of constraint-focused parking management in transit-rich locations. Signs of market-based parking supply, especially in Hong Kong. Pricing is widespread (although less so in Seoul, and Singapore's public sector parking prices are not responsive). |
| Beijing<br>Guangzhou<br>Taipei city | Moderate paths with modest parking standards, exempting very small buildings. Enthusiastic for government-provided parking (although waning in Taipei city). Increasingly able and willing to manage on-street parking. Signs of interest in multi-objective parking management. Many areas with pools of shared, priced parking, raising the potential for market-oriented approaches. PRC cities have price controls on private sector parking, which may undermine this potential. |
| Ha Noi | Parking policies not yet strongly developed (since car ownership is very low). May be heading in a similar direction to PRC cities. Emphasizing government-supply and off-street parking requirements but neither of these efforts is making much difference so far. Nascent market-based provision is being undermined by price controls. |
| Bangkok<br>Jakarta<br>Kuala Lumpur<br>Manila | "Minimum parking requirement enthusiasts" with conventional approaches that seem to promote car ownership and use. However, high off-street parking standards for buildings have not solved on-street parking problems. Critiques of Western parking policies that rely on minimum parking requirements seem relevant to these cities. Nevertheless, commercial parking is common in major business districts. Price controls in Jakarta. |
| Ahmedabad<br>Dhaka | Face acute on-street parking problems as car ownership takes off. Trying to emphasize minimum parking requirements and local government-provided parking. Unrealistic expectations of cheap parking. Improving weak on-street parking management is crucial. |

*continued on next page*

Table 26 *continued*

| | Apparent Overall Parking Policy Trajectories |
|---|---|
| Australia<br>United States | Extremely auto-centric conventional in suburban areas (with no signs of reform) and even some inner city locations. Demand-realistic conventional or multi-objective parking management in many inner urban districts. Constraint-focused parking management in some central business districts. Recent experiments with Shoup-inspired market-clearing on-street pricing in small number of United States inner city areas. |
| Western Europe | Demand-realistic conventional in many suburban areas (United Kingdom has parking maximums, not minimums). Multi-objective parking management in densely built-up areas. Constraint-focused parking management in most city centers and many town centers. |

Source: Based on the author's analysis, building on the findings of this study.

In the following sections, the longer-motorizing cities are discussed first. All of the cities in this mature group initially made increasing their parking supply the main objective of their parking policies. All of them saw off-street parking supply as the primary solution for on-street parking problems. Diverging outcomes emerged from their different responses to this diagnosis rather than from different objectives. However, some later began to change their objectives and this has caused further divergence.

## Parking requirement enthusiasts with increasingly auto-centric parking policies: Bangkok, Jakarta, Kuala Lumpur, and Manila

One group among the longer-motorizing cities has seen parking trajectories shaped strongly by a faith in parking requirements for buildings. This group includes Bangkok, Jakarta, Kuala Lumpur, and Manila. Efforts to build public sector off-street parking can also be seen among these cities but none went very far with this strategy.

This group tends to use parking standards that increasingly resemble the auto-centric conventional approach (as defined in Chapter 2), although none is yet so extremely automobile-dependent in their assumptions, as in suburban American practice. Nevertheless, each seems determined to continue to increase their parking requirements as car ownership rises in an attempt to continue to meet unconstrained demand.

Parking policy trajectory is likely closely linked with ongoing traffic crises in these cities

This parking policy trajectory is likely closely linked with ongoing traffic crises in these cities. These cities are trying to accommodate unconstrained parking demand in cities with large high-density cores where road space per person is inevitably low.

These cities generally have cheap parking. In some, this takes the form of widespread pricing at low prices (as in Jakarta, Kuala Lumpur, and Manila for shopping and/or entertainment parking) and in others, most motorists pay nothing for their parking (as in Bangkok and in Manila for work parking). Jakarta has a problematic policy of controlling private sector parking prices.

Parking occupies levels 4–11 of this 19-storey building in central Bangkok

The widespread on-street parking story among these cities enthusiastic about requirements remains one of ongoing problems, saturation, and political difficulties with any price increase. In short, plentiful off-street parking does not solve on-street parking problems.

The cities in this group risk entrenching unfortunate public expectations that parking will be inexpensive or free and that it should generally be plentiful. These expectations tend to push toward further supply-side solutions in a vicious cycle that is similar to much of American parking politics. For example, Malaysian parking requirements are regularly revised upward and seem likely to be raised again soon in several municipalities in the Kuala Lumpur area. There is also pressure in the Philippines to raise the parking standards.

## Car constrainers with surprisingly conventional parking policies: Hong Kong, Seoul, and Singapore

Policy makers in Hong Kong, Seoul, and Singapore have also been surprisingly persistent in using minimum parking requirements, despite their wider traffic constraint policies. They have rather conventional (although not auto-centric) approaches, generally.

Parking standards for nonresidential buildings are lower in Hong Kong, Seoul, and Singapore than those of the requirement of enthusiast cities above. This reflects a demand-realistic conventional approach to parking supply. However, Seoul has rather high standards for residential developments. The standards in Hong Kong appear to involve a relatively relaxed view of spillover, since additional parking can usually go to priced, public parking.

In Hong Kong and Singapore, the attachment to parking requirements is surprising since most localities already have priced, shared parking so that spillover is usually easily accommodated without causing a crisis

Both Singapore and Hong Kong have relatively effective on-street parking management. However, they lack flexibility in pricing. This is due to legislation in Hong Kong and to the coupon system and to political choice perhaps in Singapore. This may be one reason for a persistent concern about spillover, which helps reinforce the attachment to parking requirements.

Although parking standards are intended to match realistic demand, there has been some tendency to overestimate. For example, the parking standards in Hong Kong from the late 1990s are now seen to have been excessive for Hong Kong, despite being low in an international perspective. Singapore's requirements developed in the context of wider policies aimed at constraining car ownership and use but that did not prevent the city-state from adopting overly generous parking requirements. Both Singapore and Hong Kong have now scaled back their earlier excessive parking requirements.

Seoul's parking demand exploded only since the late 1980s into an existing urban fabric with little space for parking. Since then, parking requirements and rapid urban redevelopment have gone together in trying to meet the demand. These have so far been perceived as excessive only for the most transit-oriented and congested areas where, since 1997, parking is being constrained.

There is also a constraint-focused element to parking policy in these cities, despite the generally demand-realistic conventional story. This is most obvious in Seoul's parking limitation areas. Singapore's city-center minimum parking requirements (which also function as de facto maximums) are low enough to have a parking constraint role. Hong Kong, has provision in its parking policies that allows it to constrain parking supply in contexts that lack road capacity, but it is unclear how often or vigorously this ability is used.

In Hong Kong and Singapore, the attachment to parking requirements is surprising since most localities already have priced, shared parking so that spillover is usually easily accommodated without causing a crisis. This suggests a potential for a shift to more market-oriented parking policy. Seoul's parking limitation areas also have ubiquitous priced public parking.

However, in Seoul, a reliance on parking requirements goes with an apparent aversion to pricing parking outside the main centers of activity, where parking remains free-of-charge for most motorists according to the surveys in this study. Seoul's wider car constraint policies have also been less robust than Singapore's or Hong Kong's. On the

other hand, Seoul has been the most active of the Asian cities in adopting and innovating with parking management policy tools, including its parking maximums, residential permits, and varying on-street parking pricing by zone, among others.

## Pragmatic approaches in Japan inadvertently fostering parking markets

Tokyo represents a unique trajectory in which spillover has come to be normal and is generally accommodated in priced, shared parking that has become a common feature of most neighborhoods. In other words, most areas have a local market in parking space. This is so in many parts of Japan's urban fabric, not just in the city centers. It has occurred via different mechanisms from those emphasized in the market-oriented parking literature.

Local markets in parking seem to have arisen as an inadvertent result of three key features of Japan's approach to parking regulation and does not seem to have been a clear objective of the policies. The three key features are

- low minimum parking requirements that exempt all small buildings,
- discouragement of on-street parking, and
- the proof-of-parking regulation.

These policies have shaped the parking situation, so that a significant proportion of home-based parking takes place outside home compounds in commercial off-street parking arrangements. For parking at other destinations, these policies have inadvertently fostered a situation in which most localities have a supply of shared public parking that is priced on a market basis and able to take the spillover of demand from the many buildings that lack internal parking.

This trajectory has occurred despite Japanese planners expressing concern about spillover just like those elsewhere. Similarly, Japanese parking policy has sought to boost supply by various means, including incentives for private developers and via government-built parking. However, such policies could not make a big difference in the large cities.

The supply of commercial off-street parking has also to some extent been inadvertent. Much commercial parking is on small plots of vacant land, which are plentiful in Japanese cities. They are not a planned outcome but are an artifact of various land, tenancy, and taxation policies and of the property price bust of the 1990s (Kanemoto 1997). For example, planning rules do not consider converting land to a parking lot a development. The coin-parking and/or vacant land parking phenomenon is said to have created an oversupply of parking in some areas.

The fact that spillover is the norm in Japanese cities rather than the exception might lead us to expect a lot of chaotic on-street parking, despite this officially being frowned upon. Indeed, there had been an ongoing problem. However, enforcement reforms in 2006 appear to have brought illegal parking under adequate control without any concomitant effort to boost off-street supply (Dogaki and Inoue 2009).

Japan's parking arrangements are not perfect. Vacant lot parking can be an eyesore and in suburban areas and smaller towns retailers tend to provide plentiful free parking (despite the low requirements). Nevertheless, Japan's experience deserves more international interest. It seems to offer reassurance that market-oriented policies with lighter regulation of supply do not necessarily lead to parking chaos. The Japanese example also suggests that market-oriented approaches to parking may be possible in diverse urban contexts, not just in central business districts.

## A middle path in Taipei city

The parking scene in Taipei city might be considered to fall between those discussed above. The requirements in Taipei city are higher than Tokyo's but lower than the requirement enthusiasts, especially when compared with its relatively high motorization. They can perhaps be considered as demand-realistic. Far fewer buildings are exempted from minimum parking requirements in Taipei city than in Tokyo. Like Tokyo, and perhaps Hong Kong, Taipei city has parking requirements that appear to reflect a relative lack of worry about spillover parking.

A considerable amount of parking does take place outside home or destination premises, shared among streets and/or alleys, public sector parking, and private commercial parking. Despite some difficulties with chaotic parking and conflict, Taipei city has refrained from responding with escalating rounds of parking requirement increases. There should be potential for a market-oriented approach to build on these features.

The city government of Taipei city has been offering floor area bonuses to developers to encourage them to provide extra parking. Importantly, this extra parking must be open to the public. So although this is a supply-side policy, it does have the benefit

of adding to the pool of shared parking. In any case, many buildings do already open their parking as priced public parking.

Taipei city government has also tried to expand public sector parking. This undermined a nascent private sector industry in stand-alone parking structures. However, pricing policies in city-owned parking and on-street have shifted to a principle of adjusting based on occupancy levels. This, together with the presence of commercial off-street parking in many existing buildings, should often help to defuse spillover problems.

The city government of Taipei city is also gradually becoming skilled at various parking management approaches, which may be pointing it toward a multi-objective parking management approach. Its pioneering initiatives in managing on-street (and pavement) motorcycle parking are also noteworthy. For now, the pragmatic muddling-through in Taipei city seems to have avoided some of the vicious cycles apparent in the parking requirement enthusiast cities. It seems to have established a parking policy trajectory in which supply-side solutions will be low on the priority list.

Now let us summarize the patterns emerging in the newly motorizing cities, which have newer parking challenges and a widespread sense that parking is in constant crisis.

## Beijing and Guangzhou

These cities show similarities to the trajectory of Taipei city. Compared with the other newly motorizing cities, Beijing and Guangzhou have been motorizing for a little longer, are richer, and have urban institutions that are able to mobilize considerable resources, including land. They have somewhat stronger capacities to enforce on-street parking regulations when they choose to (although this is reportedly weak in other cities in the People's Republic of China.

Both still see boosting supply as a priority but it appears that in neither city have the authorities been panicked into establishing very high parking requirements. This may reflect a faith in their capacities to deal with on-street problems and their strong emphasis on government-provided parking, especially in Beijing.

With motorization proceeding rapidly in these very large and dense cities, the scale of parking challenges is escalating. Public sector parking is unlikely to keep pace, so priced parking in private premises is also emerging as important, perhaps more so in Guangzhou than in Beijing.

The parking systems of PRC cities have some promising features. Pricing of parking is widespread. For example, for more than 40% of the Beijing survey respondents, work parking and shopping parking was priced. Furthermore, a significant amount of parking in Beijing takes place outside destination or home premises in priced off-street parking. This suggests that many localities tend to have a pool of priced shared parking, which offers the possibility of adopting a market-oriented approach to parking policy.

However, a policy of controlling private sector parking prices is problematic. Although not yet too tight, price controls risk undermining the ability of emerging local parking markets to respond efficiently to changing demand. They also risk reinforcing motorists' expectations of cheap parking that will be difficult to fulfill.

## Ha Noi

Ha Noi's car ownership is at a much lower level than in PRC cities and its car parking policies are less developed. An early focus has included establishing relatively high parking requirements. However, so far these only have a strong effect in modern districts near the periphery that have been newly laid out and currently form a modest proportion of the built fabric.

Another effort has focused on government-provided parking. A small but significant role for public sector parking shows up in our survey results. However, the high cost of land means that after exploiting the easy opportunities for such parking, the city is struggling to provide more. With narrow streets in all except new formally laid-out areas, on-street parking is limited and is gradually becoming more actively managed, at least in the city core.

Outside the new, modern areas, building plots are very small, so Ha Noi has much home-based parking taking place outside home compounds. Most are in various priced options, including government parking and leased spaces in workplaces.

Some of these trends could perhaps signal the beginnings of an efficient system, with priced shared parking emerging as a feature of many neighborhoods, as in Tokyo. The home-based parking especially seems to have the beginnings of local parking markets.

Unfortunately, Ha Noi also regulates parking prices. This may in part be because much parking is in the hands of a city-owned company and its prices are set by government. The price controls also seem to be a reaction to escalating parking prices, which have

caused alarm. Home-based prices and workplace prices are indeed relatively high (at least for those who pay) as shown in the survey results. Overly strict and comprehensive parking price controls prevents a legal private sector response to the growing demand for parking. Price controls greatly increase the difficulty of solving Ha Noi's parking problems.

## Ahmedabad and Dhaka

In Ahmedabad and Dhaka, weak on-street parking management and low parking prices are root causes of much parking policy difficulty.

Authorities in these cities are especially concerned about on-street parking problems in commercial areas. Enforcement is not yet up to the challenge. These problems are acute in commercial streets in Dhaka, where most cars are driven by chauffeurs, who generally remain with the vehicle when it is parked. This makes double-parking more feasible than usual and, without enforcement, it has become the norm. Ahmedabad's on-street enforcement currently focuses on motorcycles not cars.

In both cities, most decision makers see expanding supply as the top parking policy priority. They want stronger and better enforced off-street parking requirements. Both cities have recently renewed enforcement efforts against buildings that converted parking into commercial floor space. Dhaka's requirements were revised upward in 2008. However, building owners still have a large incentive to divert parking space to other uses. It remains to be seen if parking requirements do in fact emerge as the central method of expanding parking supply as is the policy intention. The example of Delhi suggests that enthusiasm for parking requirements is growing in India (CSE India 2009).

Municipal authorities in South Asia are also keen on building more off-street parking themselves, but this has been slow. Dhaka's new parking policy suggests collection of deficiency payments from old buildings that do not meet the new parking requirement standards, to generate funds for municipal parking (Dhaka Transport Coordination Board 2009). Both Ahmedabad and Dhaka are also turning to models of government-assisted private participation, but without much impact so far. Results will probably remain modest, since low parking prices make such investments inherently unattractive.

Much will depend on policy reactions to a likely gradual rise in private sector off-street parking prices as demand continues to increase. Since both cities have significant proportions of work parking and shopping and/or entertainment parking taking place outside destination premises, they may be able to enter a trajectory in which local pools of priced, shared parking play an important role. In Ahmedabad, parking pricing in private buildings such as shopping malls is emerging, and some are charging prices considered alarming by local standards (although with redemptions for customers). However, only a small proportion of respondents' parking in Ahmedabad was priced, so an expectation of free parking may have developed. In Dhaka, although parking is always cheap, pricing is at least widespread.

Unfortunately, so long as enforcement of on-street parking remains weak and so long as parking pricing remains uncommon (as in Ahmedabad), or cheap (as in Dhaka), parking policy progress will be difficult. Better management of on-street parking is essential and should not wait until there is "enough" off-street parking. However, many South Asian cities seem poised in the early stages of a conventional parking policy with the potential to gradually spiral toward a costly and destructive auto-centric approach, as seen in parts of Southeast Asia.

In Ahmedabad and Dhaka, weak on-street parking management and low parking prices are root causes of much parking policy difficulty

# Policy Lessons and Conclusions

This chapter highlights policy lessons that emerged from this study.

## Multiple, contrasting parking policy approaches

It is very important to understand that there are diverse alternatives to the auto-centric version of conventional parking policy. Parking limitation is sometimes seen as the only alternative, but it is actually only one among several options, as discussed in Chapter 2.

## Solving on-street parking problems requires on-street parking management, not necessarily off-street supply expansion

Several cities in the study (and international experience) demonstrate that successful management of on-street parking is possible and is not restricted to high-income locations. This is important, since concern over on-street chaos drives much of parking policy.

Progress on parking policy is difficult without efficient on-street parking management. There is no way to achieve orderly and efficient on-street parking except via effective on-street parking management. Despite this, many cities around the world neglect on-street parking management and try to deal with disruptive on-street parking via increased off-street parking supply. Cities in this region are no exception.

Some cities in this study have successfully reduced their problems with disruptive on-street parking by banning it completely from many or most streets (and enforced the ban). Others have taken effective steps to manage their on-street parking well, even if none of them is yet ideal. The Makati central business district (CBD) in Manila stands out in providing hope for other relatively low-income cities that it is possible to get on-street parking under strong control.

Effective enforcement is crucial to on-street parking management. Most of the success stories involve shifting this responsibility away from the police to local authorities or to contractors.

Both cities with success tackling on-street parking and those that still have chaotic on-street parking problems vary widely in their parking requirements and off-street parking supply. Creating off-street parking does not magically suck cars away from streets. Motorists will park in the most convenient spaces, in the streets, so long as the consequences or costs are minimal.

## Be skeptical of claims of parking shortage

Most of the Asian cities are concerned about a parking shortage. However, we need to be skeptical of claims that parking is lacking, as shown by a 2009 study of parking in the Daoli district of Harbin, People's Republic of China done by the Institute for Transportation and Development Policy (ITDP), with Nelson\Nygaard:

*"The analysis presented here demonstrates that there is no shortage of parking in Daoli. Moreover, the existing demand can be met entirely through the use of on-street roadway parking and existing off-street parking. There is no need for parking on walkways or in setbacks. In other words, Daoli has a parking management problem, not a parking shortage... Peak demand on a typical weekday is just over 8,000 cars. More than 3,000 spaces are available off-street (this is an underestimate as not all off-street parking could be counted). More than 7,500 spaces can be provided on the roadway (1,058 existing and 6,502 new). In addition, charging for parking is likely to reduce demand by between 5% and 25%. (The 5% reduction is a recent estimate in Shenzhen; it will be an underestimate because it involved an increase in parking charges, rather than charging for previously free parking. The 25% reduction is a typical reduction in the United States from moving from free to paid parking)... In summary, implementation of three of the recommendations listed in the following section—charging for parking, eliminating walkway parking and adding new on-street roadway parking—could yield a substantial parking surplus of about 3,000–4,500 spaces during peak times." (2009, p.16)*

This does not mean that parking shortages never happen. However, chaotic on-street parking is not necessarily a signal of shortage. It is a sign of poorly managed on-street parking.

## The opportunity cost of parking space must not be forgotten

Decision makers and motorists sometimes forget that space with cars parked in it is space that could be used for something else. The alternative uses of such space are often extremely valuable. All parking, even if it is on municipal land, has a high spatial opportunity cost especially in high-density urban contexts. This implies that high parking prices should not be surprising in Asian cities.

In most Asian cities in the study, it appears that little parking is built by private developers unless it is exempt from being counted toward the gross floor area of the building. This tells us that at today's prices, parking does not usually pay its own way relative to the alternatives. With any other kind of real estate investment, the signal we would take from this would be to reduce investment and to wait for price rises to signal that further investment is again wise. Parking is rarely treated this way, but maybe it should be.

Parking prices that match their full spatial opportunity cost would be higher than today but not astronomical. Figure 11 allowed a rough estimate based on CBD parking prices relative to office rental. Grade A office rents are an upper limit on the opportunity cost of built floor space. So, if Seoul's city-center parking prices doubled, parking would more than pay its way. Similarly, if Singapore's or Beijing's parking prices tripled. Yet, this would still leave their parking cheaper than it is in today's CBDs in Tokyo or Hong Kong. However, parking prices in Indian CBDs would need to rise manifold for parking to pay its way.

Pricing of parking is already widespread in many Asian cities (although it is uncommon in some). Priced public parking plays a significant role in East Asia especially. Nevertheless, survey results show that a surprising proportion of parking is free-of-charge for motorists, even in dense cities with high property prices (and, hence, a very high opportunity cost for parking space).

## Government-subsidized parking is a regressive use of taxpayers' money

Public sector parking supply involves a subsidy from taxpayers if payments by users and beneficiaries do not fully cover the costs. Government-subsidized parking is a regressive use of taxpayers' resources in cities with modest car ownership rates and is expensive, in light of the high opportunity cost of

Government-subsidized parking is a regressive use of taxpayers' resources in cities with modest car ownership rates and is expensive, in light of the high opportunity cost of built space in dense cities

built space in dense cities. Nevertheless, it is being expanded in several cities, especially in the People's Republic of China and South Asia.

Parking space is costly to create in dense localities and, therefore, most cities in the region have found it difficult to make much difference to parking supply with this policy. Almost every city in the study has tried but with relatively little to show for it.

On the other hand, public sector parking supply has the benefit that it is open to the public and shared. Charging market prices in city-owned facilities, as some cities in the study do, would make government-supplied parking less problematic and somewhat easier to fund. Of course, this can be politically difficult.

## Minimum parking requirements seem an easy option but should be reconsidered

International debates and Western experience suggest that the conventional approach to parking policy, which depends on minimum parking requirements, is problematic and is especially poorly suited to dense urban fabric (which accounts for much of urban Asia). Minimum parking requirements force developers to subsidize parking at everyone's expense but for the benefit of motorists, who form a wealthy minority in most of the cities in this study. This approach risks feeding a "predict and provide" spiral of ever higher parking supply. Parking requirements depend on viewing parking on a site-by-site basis, which is inflexible and difficult to get right.

Nevertheless, we have seen that all of these Asian cities do use minimum parking requirements (albeit with a variety of styles and levels). International critiques of the conventional approach are clearly relevant to some Asian cities, especially in Southeast Asia and South Asia. Others, especially in East Asia, are using moderate versions of conventional parking policy so that the problems are less obvious. It is an audacious assumption to think that we can predict parking demand associated with specific buildings even before they are built, regardless of their changing context, and still be accurate for decades into the future. However, parking policy based on parking requirements, even fine-tuned ones made on a careful case-by-case basis, rests on just such assumptions.

Many parts of most Asian cities seem well suited to the alternatives to the conventional approach, which are parking management and market-oriented parking policy. They should benefit from considering them.

Minimum parking requirements force developers to subsidize parking at everyone's expense but for the benefit of motorists, who form a wealthy minority in most of the cities in this study

## Consider including (more) parking in calculating allowed floor area of buildings

Whether parking space is exempt from counting toward the allowable floor area of building developments is an important but little-discussed aspect of parking policy. It appears to be a strong influence on developer incentives to provide parking. Such floor area exemptions are a parking subsidy (using the currency of planning powers). Such exemptions hide part of the opportunity cost of parking, encouraging oversupply. Specific policy proposals on this issue are not yet possible because there has been so little investigation of the issue. However, it is clear that it deserves more policy attention and study.

## Price controls on private sector parking are unwise

Price regulations applying to private sector parking are unusual, internationally. However, four of the cities in this study regulate parking prices even for parking that is completely owned and operated in the private sector. It is difficult to understand the rationale for this policy. After all, these cities do not regulate the prices or rents of other kinds of private sector real estate. Price controls predictably worsen shortages for any private good. Parking is no exception. Most of these cities see parking shortage as their pressing problem. Price controls can only make this worse.

## Constraint-focused parking policy has niches but faces barriers

Around the world, some cities with effective public transport systems use parking constraint policies and other travel demand management (TDM) measures to get more value from their public transport investments. This also provides congestion relief, which does not flow automatically from public transport investments, but can be achieved with a combination of TDM and efficient public transport.

Very few Asian cities have policies to constrain parking supply, even in city centers where the alternatives to driving are richest. This is surprising since radial mass transit systems are strong or expanding in many of these cities. Seoul is an exception and its experience deserves wider attention elsewhere in Asia. There would seem to be much more scope for this in the region.

However, constraint-focused parking management faces political barriers in many contexts. Politically, it is difficult to actively and explicitly constrain parking in localities that are not perceived to have excellent public transport access. Parking is problematic throughout metropolitan areas, not only in core areas with plentiful mass transit. Many of the cities in the study do not yet have the kind of public transport on which to leverage constraint-focused parking policy.

In certain cities in this region, the widespread use of professional drivers may also reduce the effectiveness of parking constraint. Trips in professionally driven cars cannot easily be deflected by parking policy and may add to traffic if parking becomes "mobile parking" (with drivers circulating in cars while they wait).

International technical advice on parking policy that is directed primarily at a constraint-focused set of parking reforms can focus on city centers and transit-oriented subcenters. However, for now it is unlikely to be heeded outside these niches.

## Multi-objective parking management has much to offer

This study has found that conventional parking policy is widespread in the cities of this region. A few are applying surprisingly auto-centric conventional parking policy but most are using a demand-realistic approach. In most of these cities, for most localities, a sudden shift to constraint-focused parking policy would be a great leap, thus unlikely in the short term.

However, a key message in this report is that a spectrum of policy approaches falls between these extremes. Most obviously, multi-objective parking management approaches are likely to offer solutions for many parking problems in the region. Yet, most Asian cities have scarcely considered the possibilities. Many of the successful parking management practices of inner cities in Europe and North America have not yet been systematically used in most of these Asian cities (with Seoul being the main exception). There is much to gain from drawing on the rich experience with parking management in dense parts of Western cities, and from studying examples in Seoul and in certain other cities in the region.

## Caution over park-and-ride

One parking management policy that is already popular in Asia is the provision of park-and-ride facilities to encourage motorists to access mass transit. These are found in Bangkok, Beijing, Guangzhou, Hong Kong, the Kuala Lumpur area, Seoul, Singapore, and Taipei city. Unfortunately, many of these are being built within high-density, inner-urban contexts where car-based park-and-ride is unlikely to be an efficient use of high-value space near mass transit. Such investments should be carefully evaluated relative to alternatives, which may be more cost-effective.

## Low minimum parking requirements do not necessarily limit parking

It is often assumed that minimum parking requirements that are set very low, as in Japan for example, mean that parking is severely limited by policy. This is not necessarily true. Nor do low requirements necessarily imply that most parking must be in streets or in government-subsidized facilities. To assume this ignores the role of private sector off-street parking businesses. These can become significant if parking prices are not controlled and if government-subsidized supply does not undermine the private sector parking industry. Tokyo, like most Japanese cities, has low minimum requirements but does not have policies to limit parking supply. Parking businesses charging market prices are ubiquitous across Tokyo.

## Proof-of-parking regulations like Japan's deserve more attention

Japan's proof-of-parking regulation deserves wider understanding and possibly emulation. It is important to note that it was not designed to limit car ownership but to solve parking problems. Seeing it as a TDM policy misses the point that it was aimed at ensuring motorists have no excuse to park illegally overnight in the streets. Proof-of-parking shifts responsibility for nighttime parking, placing it onto car owners. It creates a situation in which much residential parking is unbundled and must pay its way. It has led to local markets in overnight parking with many urban Japanese car owners leasing residential parking in their neighborhoods at local market prices.

## Park-once neighborhoods: A promising approach for Asian conditions

Most urban districts in Japan (and many areas of the other Asian cities, too) work as park-once localities, in which it is routine to pay for parking in one place and to then walk to various destinations in the neighborhood. They have plentiful market-priced, off-street parking so that in such areas, spillover is not a problem.

Even in the West, the conventional approach is ill-suited to dense, mixed-use areas. In North America, dense, mixed-use areas are increasingly advised to adopt a parking policy based on trying to create a park-once environment (Siegman 2006; Tumlin 2005). In such contexts, planners have been urged to focus on planning for the quality of parking, to minimize its negative impacts, rather than planning the quantity of parking (Mukhija and Shoup 2006).

An approach that values park-once neighborhoods seems well-suited to the existing realities of most Asian cities. In dense, mixed-use areas it makes sense to think of parking demand and supply as neighborhood-wide phenomena. In park-once localities, predicting parking supply for each individual building is probably unnecessary.

These goals are compatible with multi-objective parking management but it is even more consistent with market-oriented thinking on parking policy. Park-once neighborhoods work best with market pricing of the parking, including demand-responsive prices for any public sector parking and on-street parking. CBDs in many countries are in fact already park-once areas with market-priced off-street parking.

Most Asian cities in this study have many park-once areas with strong potential to foster more and to enhance their efficiency with market pricing

## Many Asian cities appear suited to market-oriented parking policy

Market-based parking systems in many parts of Japanese cities and to some extent in parts of other East Asian cities deserve further investigation for their potential lessons. They may demonstrate the feasibility of a market-oriented approach to parking policy, which appears to be well-suited to dense areas with highly mixed land uses, which are common in Asian cities.

Most Asian cities in this study have many park-once areas with strong potential to foster more and to enhance their efficiency with market pricing. Unfortunately, in many areas, the efficiency and responsiveness of parking systems is undermined by poorly managed on-street parking, by too much private parking, or by price controls.

More work and policy experimentation is needed to determine which policy steps can best enhance park-once neighborhoods and exploit the possibilities of market-oriented parking policy (Barter 2010).

Effective management and efficient pricing of on-street parking are clearly key steps. Others include: pricing all public sector parking at market rates, refraining from parking requirements or keeping them low and pragmatic, and encouraging private parking to be turned into public parking at market prices.

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# Appendixes

## Appendix 1 List of interviewees

This appendix lists formal interviews conducted for this study. These interviewees generously shared ideas and information. Note that all honorifics and titles have been omitted below. Names included together in one box were met as a group.

| Name | Affiliation |
|---|---|
| **Ahmedabad** | |
| Gautam Patel | Lecturer and consultant, Center for Environmental Planning and Technology (CEPT) University |
| M.M. Anarwala | Development Control Plans Traffic, Indian Police |
| Shirley Ballaney | Environmental Planning Collaborative |
| Matt Nohn | Environmental Planning Collaborative |
| Talat Munshi | School of Planning, CEPT University |
| Rushank Mehta | People in Centre Consulting |
| Bimal Patel | Environmental Planning Collaborative |
| Vatsal Patel | Ahmedabad Municipal Corporation (AMC) |
| Darshini Mahadevia | School of Planning, CEPT University |
| **Bangkok** | |
| Saksith Tan Chalermpong | Civil Engineering, Chulalongkorn University |
| Pinit Lertudomtana | Building control section responsible for parking requirements, Bangkok Metropolitan Administration (BMA) |
| Prasittichai Chalardpalt | Parking management section, BMA |
| **Dhaka** | |
| Saifuddin Ahmed | Executive Director, Work for a Better Bangladesh (WBB) Trust |
| Suman Kumar Mitra | Department of Urban and Regional Planning, Bangladesh University of Technology (BUET) |
| Mr. Anis | Dhaka City Government |
| Unnamed official | RAJUK (Rajdhani Unnayan Kartripakkha), the Capital City Development Authority |
| Mahububun Nabi | Emeritus professor, Department of Urban and Regional Planning, BUET |
| Neaz Rahman | Planning and architecture consultant |
| **Guangzhou** | |
| Hu Manying | Architect and Urban Design Program Manager, Institute for Transportation and Development Policy, Guangzhou Urban Public Transport Research Center |
| Feng Yi Sheng | Secretary General, Guangzhou Parking Association |
| Karl Fjellstrom | Institute for Transportation and Development Policy—People's Republic of China office |
| Dai Wei | Transportation Research Institute, Planning Bureau, Guangzhou City Government |
| **Ha Noi** | |
| Khuat Viet Hung | Professor, University of Transport and Communications, Ha Noi |
| Le Do Muoi | Transport Development and Strategy Institute (TDSI), Ministry of Transport, Viet Nam |

*continued on next page*

Appendix 1 *continued*

| Name | Affiliation |
|---|---|
| Ta Dinh Thang | Former Deputy Director, Hanoi Parking Company |
| Nguyen Thuy Nguyen | Director, TCI-Construction Consultant Company Ltd, Ministry of Transport, Viet Nam |
| Cao Sy Niem | Manager for Urban Development and Architectural Building Research, Viet Nam |
| Nguyen Cong Tung | Designer, Consultant and Design Division, Hanoi Urban Development, Construction and Investment Consultant Joint Stock Company (HACID), Hanoi Housing Development and Investment Corporation |
| **Hong Kong** | |
| Simon Ng | Hong Kong University of Science and Technology |
| Cheung Mun-kit and Tse Sen-yee, Amy | Engineer, Strategic Roads Division (Parking), Transport Department and Senior Transport Officer, Transport Facilities Management Section, Transport Department |
| Paul Cornish | Metro Parking Hong Kong (interviewed in Singapore) |
| Alok Jain | Transport consultant, Trans-Consult |
| William F. Barron | Institute for the Environment, The Hong Kong University of Science and Technology |
| **Jakarta** | |
| Hasbi Hasibuan | Secretary General, Transport Agency, Jakarta Metropolitan Government |
| Andyka Kusuma, Alan Marino, Heddy R. Agah, Tri Tjahjono, Jachrizal Sumabrata, Ellen S.W. Tangkudung | Department of Civil Engineering, University of Indonesia |
| Azas Tigor Nainggolan | Head, Jakarta Residents Forum (Forum Warga Kota Jakarta FAKTA) |
| Heru Sutomo | Director, Center for Transportation and Logistics Studies (PUSTRAL), Gadjah Mada University, Yogyakarta |
| **Kuala Lumpur Metropolitan area** | |
| Alias Rameli | Town and Country Planning Malaysia |
| Farizan Atifah binti Muner | Assistant Director, Treasury Department, Petaling Jaya City Council (MBPJ) |
| Faiwos Abd Hamid | Town Planner, Development Planning Department, Petaling Jaya City Council (MBPJ) |
| Norlida Abdul Hamid | Associate professor, Department of Transport, Logistics and Operations Management, Faculty of Business Management, Universiti Teknologi Mara (UiTM) |
| Rajiv Rishyakaran | Councillor, Subang Jaya Municipal Council |
| Moaz Yusuf Ahmad | Advisor, TRANSIT (Kuala Lumpur public transport advocacy group) |
| Leong Siew Mun | Director, Urban Transportation Department, Kuala Lumpur City Hall |
| **Manila** | |
| Ricardo G. Sigua | Professor, Civil Engineering, University of the Philippines |
| Rene Santiago | Consultant and former senior public servant |
| Erickberth Calupe | Ayala Property Management Corporation |
| Pantaleon P. Valencia, Jr. | Head, Administration and Finance, Makati Parking Administration (MAPA) |
| Jose Regin F. Regidor | Director, National Center for Transportation Studies, University of the Philippines (interviewed by Ramon Fernan) |
| Hussein S. Lidasan | Professor, School of Urban and Regional Planning, University of the Philippines (interviewed by Ramon Fernan) |

*continued on next page*

Appendix 1 *continued*

| Name | Affiliation |
|---|---|
| **Seoul** | |
| Ko Joon Ho | Metropolitan Planning Research Group, Seoul Development Institute |
| Lee Song Youp | Seoul Metropolitan Government |
| **Singapore** | |
| Lew Yii Der<br>Colin Lim<br>Lina Lim<br>Kenneth Wong<br>Sharon Wong | Group Director, Policy and Planning Group, Land Transport Authority (LTA)<br>Deputy Group Director, Policy and Planning Group, LTA<br>Director, Transport Planning, LTA<br>Deputy Director, Local Planning, LTA<br>Acting 2 Deputy Director, Policy, LTA |
| Adele Tan<br><br>Gerry Ong<br>Ong Thiam Huat | Deputy Director, Planning Policies Department, Physical Planning Group, Urban Redevelopment Authority (URA)<br>Car Parks Division, Land Sales and Administration Group, URA<br>Senior Administrative Officer, Car Parks Division, Land Sales and Administration Group, URA |
| Marie Lim Puay See, Arthur Ho, Cindy Neo | Car Parks Section, Housing Administration Department, Housing and Development Board (HDB) |
| APG Menon | Professor, Civil Engineering, Nanyang University of Technology (interviewed in Hong Kong, China) |
| Tyrone Lopez | Managing Director, Metro Parking, Singapore |
| **Taipei city** | |
| Jason Chang S.K. | Professor, Civil Engineering, national university of Taipei,China |
| Hong J.J | Founder, THI Consulting |
| Mr. Chen | Parking Management Office, City Government of Taipei city, Taipei,China |
| **Tokyo** | |
| Masahiko Kikuchi | Urban Transport Facilities Division, City and Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism |
| Shinji Tanaka | Civil Engineering, University of Tokyo |
| Satoru Kobayakawa | Civil Engineering, Nihon University (interviewed by the Tokyo team) |
| Haruo Ishii | Tokyo Metropolitan Government (interviewed by the Tokyo team) |
| **International** | |
| Dennis Cumming | Parking consultant, United States (US) (interviewed at the Philippines International Parking Conference) |
| John Van Horn | Editor and publisher, *Parking Today* magazine, Los Angeles, California, US (interviewed at the Philippines International Parking Conference) |
| Brendan McFarlane | Secure Parking Philippines and formerly with Secure Parking India (interviewed at the Philippines International Parking Conference) |
| Peter Guest | Parking consultant, United Kingdom (interviewed at the Philippines International Parking Conference) |

# Appendix 2 Sources of parking requirement regulations

This appendix lists the main sources of information on parking standards applied to buildings in each city.

## Ahmedabad

General Development Control Regulations provided by ITDP India Ahmedabad office: "The General Development Control Regulations govern land use development in the area under the jurisdiction of the Ahmedabad Municipal Corporation (for central areas) and the Ahmedabad Urban Development Authority (for peripheral areas)."

## Bangkok

The parking requirement regulations were obtained from the Rules chapter 7 (B.E. 2517), of the Building Control Act B.E. 2479.

## Beijing

Sources (in Chinese) were provided by Zhao Hua, assistant in Beijing, and by web searches:

Beijing to develop standards for residential parking district (http://hy.gzntax.gov.cn/k/1999-5/782144.html)

Parking standards for medium and large public buildings in Beijing (http://szj.bda.gov.cn/cms/zcfg/3091.htm)

Beijing public buildings, parking lot construction and management of large and medium—Interim Provisions (On 5 May 1989, the Beijing Municipal People's Government issued Decree No. 14. According to 17 January 1994, the Beijing Municipal People's Government approved modifications) (www.chinalawedu.com/news/2003_10/5/1734461153.htm)

Ministry of Public Security and Ministry of Construction on the issuance of "parking lot construction and management of the Interim Provisions" and "parking lot planning and design rules (for Trial Implementation)" (www.fl168.com/Lawtext-View-36726)

## Dhaka

Translation of Dhaka's parking requirements (in Bengali) was provided by Maruf Rahman of the Work for a Better Bangladesh Trust.

## Guangzhou

Guangzhou parking standards information were translated and interpreted by Jiao Feng of ITDP China. The main source was www.gz.gov.cn/vfs/content/newcontent.jsp?contentId=496818&catId=133

## Ha Noi

Ha Noi parking standards information sources were translated and interpreted by Trinh To Oanh.

Viet Nam National Standards TCVN 4601: 1988 "Office building design standard" (in Vietnamese)

Viet Nam National Standards TCVN 4391: 2009 "Hotel—Classification" (in Vietnamese)

Viet Nam Building Code. QCXDVN 01: 2008/BXD Regional and Urban Planning and Rural Residential Planning, Ha Noi—2008 (Ministry of Construction) (in Vietnamese)

Viet Nam TCXDVN 276: 2003 "Public Building—Basic rules for design" (in Vietnamese)

Circular 14/2008/TT-BXD Apartment buildings (2 June 2008) (in Vietnamese)

## Hong Kong

Hong Kong Planning Department, Hong Kong Planning Standards and Guidelines, Chapter 8 Internal Transport Facilities, May 2009 edition. (www.pland.gov.hk/pland_en/tech_doc/hkpsg/index.html)

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## Jakarta

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Building Construction (in Indonesian) [Peraturan Menteri Pekerjaan Umum Nomor: 29/PRT/M/2006 Tentang Pedoman Persyaratan Teknis Bangunan Gedung].

## Kuala Lumpur

Planning Guidelines and Directions for Calculating Car Parking Requirements, Kuala Lumpur City Hall document. (in Malay) [Garis Panduan and Arahan Pengiraan Keperluan Peruntukan Tempat Letak Kereta, Dewan Bandaraya Kuala Lumpur].

Planning Guidelines and Standards: Car Parking, Department of Town and Country Planning Peninsular Malaysia, Ministry of Housing and Local Government, Kuala Lumpur May 2000 (in Malay) [Garis Panduan dan Piawaian Perancangan: Tempat Letak Kereta, Kuala Lumpur: Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia (JPBD), Kementerian Perumahan dan Kerajaan Tempatan Malaysia].

Development Control Guidelines: Transport and Traffic Management. Alteration (1) Petaling Jaya Local Plan B5-B5-10 to 20. Petaling Jaya City Council. (in Malay) [Garis Panduan Kawalan Pembangunan: Penhangkutan dan Pengurusan Lalu Lintas. Pengubahan (1) Rancangan Tempatan Petaling Jaya B5-10 to B5-20. Majlis Bandaraya Petaling Jaya.]

## Manila

Government of the Philippines. The National Building Code and its Implementing Rules and Regulations, Presidential Decree No. 1096 (1977 revised in 2004). (in particular, Section 70, No. 4c.)

Orquina et al. (2003) (see reference list).

## Seoul

Seoul Metropolitan Government, Department of Parking Planning (2009) (see reference list).

Documents in Korean from the Seoul City Government and Republic of Korea government websites.

Seoul parking installation and management ordinance 2009.07.30 4823.30 July 2009. Ordinance No. 4823 Printer (revised) Chapter 4 annex parking lot

Regulations on Housing Standards [Presidential Decree No. 21811, Partial Revision on 5 November 2009].

## Singapore

Land Transport Authority (2005). Handbook of Vehicle Parking Provision in Development Proposals.

## Taipei city

Parking space requirements for new developments issued by the Construction and Planning Agency, Minister of Interior (obtained and translated by Chi-Hong Tsai).

## Tokyo

Documents in Japanese on Tokyo parking regulations (and examples from elsewhere in Japan).

Regulations for parking to accompany large-scale buildings, Bureau of Urban Development, Tokyo Metropolitan Government. www.toshiseibi.metro.tokyo.jp/kenchiku/parking/kn_k12.htm

Description of Tokyo's parking ordinance, with worked examples. www.archi-navi.com/archinavitool/a-kikaku-v1/setumei/tokyo-park.pdf

Case studies of rules under the ordinance in Tokyo Parking. www.shibuya-kyogikai.jp/pdf/5th/2.pdf

Yokohama parking requirement details. www.city.yokohama.jp/me/toshi/toshiko/pressrelease/h19/07041700/pdf/osirase.pdf

Regulations regarding parking facilities in buildings (Kagoshima). www.city.kagoshima.lg.jp/_1010/shimin/1kurashi/1-9tyusyajo/0000534.html

Regulations regarding parking facilities in buildings (Okayama). www.city.okayama.jp/toshi/tosai/tyuusyahuchi_gaiyou.htm

## Sydney

Sydney metropolitan area parking requirements information is based on Development Control Plans (DCPs) for the City of Sydney, Leichhardt DCP 2000, Ryde Development Control Plan (DCP 2006).

# Appendix 3 Sources of car ownership estimates

| Jurisdiction | Population estimate | Private car numbers estimate | Cars per 1,000 persons | Sources |
|---|---|---|---|---|
| Ahmedabad City 2007 | | | 55 | Estimate provided by Rutul Joshi of CEPT University, based on various sources, including BRT Phase II 2008 feasibility documents. |
| Bangkok 2009 | | | 330 | A rough estimate based on extrapolation from earlier, more reliable figures. Official data gave implausibly high car ownership levels (485 cars per 1,000 for BMA area) possibly due to vehicles owned by residents of neighboring jurisdictions. |
| Beijing 2008 | 16,950,000 | 1,744,000 | 103 | Beijing population as reported in www.chinapost.com.tw/china/local-news/beijing/2009/01/27/193705/Beijings-population.htm Beijing cars as reported at www.motorlink.cn/html/statisticDate/1000011fa06f2e8c2009022394645640.html (not total vehicles as is often reported). |
| Dhaka Corporation 2009 | 7,300,000 | 200,318 (cars + jeeps) | 27 | Based on data in Bangladesh Pocket Statistics Book. Use of corporation population may overstate motorization. |
| Guangzhou 2008 | 11,482,000 | 969,096 | 84 | Vehicle numbers and population estimates provided by the Guangzhou City Government Planning Bureau. |
| Ha Noi 2008 | | | 18 | Linear extrapolation from 2001 estimate of 8 and 2005 estimate of 13 given in World Bank (2007, p. 24). |
| Hong Kong, China 2009 | 6,988,900 | 383,000 | 55 | Pocket Data Guide "Hong Kong in Figures" via www.censtatd.gov.hk |
| DKI Jakarta 2006 | 8,960,000 | 1816702 | 203 | Based on data from the Central Statistics Office (Badan Pusat Statistik). Consider this rough, since DKI Jakarta is merely the core of the urban region. |
| Kuala Lumpur area 2009 | | | 314 | Estimate based on linear extrapolation from earlier reliable household surveys. Official data give implausibly high figures—possibly due to inclusion of defunct vehicles or vehicles owned by residents of neighboring jurisdictions. |
| Metro Manila 2007 | 11,553,427 | 751,000 (car) + 193,000 (SUV) | 82 | Vehicle data provided by Prof. Ric Sigua of the University of the Philippines; population figure from www.nscb.gov.ph/secstat/d_popn.asp |
| Seoul 2005 | 9,747,972 | 2,209,526 | 227 | Seoul Metropolitan Government statistics for Seoul City only. |
| Singapore | 4,839,400 | 540,455 | 112 | 2009 Yearbook of Statistics Singapore (Statistics Singapore) |
| Taipei City + Taipei County of Taipei,China 2007 | 6,427,274 | 1,623,872 | 253 | 2007 statistics publications of the Department of Transportation, Taipei City Government, Taipei,China |
| Tokyo region total 2008 | 34,990,000 | 11,718,000 | 335 | Data on Tokyo-to, Saitama, Chiba, and Kanagawa from Japan Yearbook of Statistics 2010 (Car ownership in Tokyo-to alone is only 242 per 1,000). |

SUV = sports utility vehicle.

# Appendix 4 Sample survey form

Below, as an example, is the English-language pre-translation version for the survey carried out in Taipei city.

*[Text inside square brackets is for surveyor instructions. Do not read aloud!]*
*[Approach only drivers of 4-wheel private vehicles (cars, SUVs that are not obviously being used as goods vehicles).]*

**Seeking agreement to participate**
Hello, my name is _____. Can I please ask you a few questions for a study on urban transport. It should take no more than 5 minutes. We hope the study will help to improve parking policy.

☐ [1] No [go to (the end)].

☐ [2] Yes [Proceed with section 1]

**Section 1. Initial screening questions**
Thank you very much. Let's begin then.

1. Is this the vehicle that you usually drive?

   ☐ [1] Yes

   ☐ [2] No [go to Section 5 (the end)].

1A. Is this vehicle used mainly as a commercial or goods vehicle or mainly for personal passenger transport?

☐ [1] Commercial [go to Section 5 (the end]

2. Is this your own private vehicle or does someone else own it? [determine which of the following it is]

   ☐ [1] private vehicle owned by you or someone in the household

   ☐ [2] your employer's and you are a professional driver for a private household

   ☐ [3] a company car or official car and you are a professional driver

   ☐ [4] a company car or official car that you can use

   ☐ [5] others _____

**Section 2. Overnight home-based parking**

3. Where does this vehicle get parked at night? *[Each city in the study will need a slightly different list here.]*

   ☐ [1] Within own home compound or home garage [go to 5]

   ☐ [2] Within own condominium/apartment parking lot [go to 4]

   ☐ [3] Street [go to 4]

   ☐ [4] Municipal off-street parking lot [go to 4A]

   ☐ [5] Leased space in a private parking lot [go to 4A]

   ☐ [6] Others _____

4. Is there a payment for that parking (that someone with no car would not have to pay)?

☐ [1] Yes → 4A. How much is the payment?

☐ [1] _____

4B. Is that price

☐ [1] Per month ☐ [2] Per year

☐ [3] One-time payment to buy the slot

☐ [4] Others _____

☐ [2] No [go to 5]

5. What kind of housing is it? [skip this if question 3 and 4 already made this clear]

☐ [1] Business and residential mixed-use buildings

☐ [2] Private condominium or apartment (residential building)

☐ [3] Landed property

☐ [4] Others (please specify) _____

6. What estate (or area/neighborhood) is the house located in?

_____

*[This does not need to be precise. It is only to check for adequate scatter of respondents.]*

**Section 3. Work parking (including attendance at education)**

7. Do you use this vehicle for your trip to work?
[for professional drivers: 'Does your employer get driven to work in this vehicle?]

☐ [1] No (or *not often* or *rarely*) [jump to Section 4]

☐ [2] Yes (or *usually* or *often*) [go to 8]

8. Think of the most recent trip to work with this vehicle. Where was it parked? (or where did it wait, if driver waited with vehicle) *[Each city in the study may need a different list here.]*

☐ [1] Parking lot in workplace premises

☐ [2] Parking lot in another building or another organization's premises

☐ [3] Private independent (stand-alone) parking lot

☐ [4] Municipal parking lot

☐ [5] Street

☐ [6] Didn't park (person going to work was dropped off and car proceeded elsewhere)

☐ [7] Others _____

9. [If parked] Was there a payment for that parking?

☐ [1] Yes

☐ [2] No [go to 10]

If **YES**, priced:

9A. How much? _____

9B. Is that payment per

☐ [1] day ☐ [2] month ☐ [4] year

☐ [5] One-time payment to buy the slot

☐ [6] Others _____

9C. Who pays that money?

☐ [1] vehicle owner pays

☐ [2] Employer [of vehicle owner] pays

☐ [3] Employer [of vehicle owner] pays part.
In that case, how much does vehicle owner pay?

_____

☐ [4] Others _____

10. In what area or estate or neighborhood is the workplace located?

_____

## Section 4. Parking for Shopping or Entertainment

11. Think of the most recent trip with this vehicle to go shopping or to eat out or to go to an entertainment. Did it take place within the last 2 weeks? And which was it: shopping, eating, out or entertainment?

☐ [1] No, more than 2 weeks ago [go to Section 5]

☐ [2] Yes, shopping

☐ [3] Yes, eating out

☐ [4] Yes, entertainment (e.g., movie, bar, etc.)

☐ [5] A combination of shopping, eating out and/or entertainment

12. Think of that trip with this vehicle (in question 11). Where did the vehicle get parked (or where did it wait, if driver waited with vehicle)?

☐ [1] Parking lot on premises of destination shop, restaurant, or entertainment place

☐ [2] Private parking lot on different premises from the shop

☐ [3] Municipal parking lot

☐ [4] Street

☐ [5] Valet parking

☐ [6] Didn't park (those going shopping were dropped off and car proceeded elsewhere)

☐ [7] Others _____

13. [If parked] Was there a payment for that parking?

- ☐ [1] No payment
- ☐ [2] Free for customers only
- ☐ [2] Yes (full price)
- ☐ [3] Yes, but discount for customers

Section 5.

Thank you very much for your time. That is all. Have a great day/evening.

[Do not ask. But make a note of estimated age group and sex].

14. Age Group (estimated)

- ☐ [1] 15 – 25
- ☐ [2] 25 – 35
- ☐ [3] 35 – 45
- ☐ [4] 45 – 55
- ☐ [5] 55 – 65
- ☐ [6] older than 65

15. Sex

- ☐ [1] Male
- ☐ [2] Female

Date: _____
Time: _____

Location of interviews: _____

Interviewer's initials: _____

# Appendix 5 Data on parking in real buildings

The table below details data from buildings that were used for Table 10 (p. 25). These are based mainly on an internet-based search in November and December 2009. In some cases, the accuracy may be in some doubt, especially for the floor area figures, so these results should be treated as preliminary and indicative.

| City | Building Name | Use | Parking per 100 $m^2$ | Source |
|---|---|---|---|---|
| Jakarta | The Plaza | office, retail | 4.38 | Colliers international property listings, accessed 13 December 2009 |
| Guangzhou | Aspen Residential | residential | 3.70 | ITDP survey, early 2009 |
| Kuala Lumpur | Menara Atlan | office | 2.99 | www.atlan.com.my/propid.php |
| Kuala Lumpur | Menara Great Eastern | office | 3.89 | www.lifeisgreat.com.my/lig4/newlig/corporate/c_properties.htm |
| Kuala Lumpur | Plaza Pantai | office | 3.74 | www.33estate.com/corporate/kl_5.htm |
| Sydney | Westfield Bondi Junction | retail | 3.17 | http://en.wikipedia.org/wiki/Westfield_Bondi_Junction |
| Jakarta | Sudirman Square | retail mainly | 2.00 | http://dibyakusyala.blog.friendster.com/2008/04/membayangkan-jakarta-dalam-angka/ |
| Kuala Lumpur | Wisma UOA Pantai | office | 1.99 | www.33estate.com/corporate/kl_5.htm |
| Guangzhou | Skycity | office, commercial, residential | 1.90 | ITDP survey, early 2009 |
| Bangkok | CentralPlaza Ladprao | retail | 2.60 | www.mallsindex.com/ |
| Metro Manila | SM Megamall | retail | 1.51 | www.mallsindex.com/ |
| Jakarta | The Energy | office | 1.49 | Colliers international property listings |
| Melbourne | 564 St Kilda Rd | office | 2.06 | Colliers international property listings |
| Jakarta | Menara Prima | office | 1.42 | www.colliersid.com/161/ |
| Metro Manila | Exportbank Plaza | office | 1.25 | http://en.wikipedia.org/wiki/Exportbank_Plaza |
| Kuala Lumpur | Menara Weld | office | 1.77 | www.lifeisgreat.com.my/lig4/newlig/corporate/c_properties.htm |
| Guangzhou | Bonfacio Heights | residential | 1.23 | ITDP survey, early 2009 |
| Guangzhou | Two Serendra | residential | 1.23 | ITDP survey, early 2009 |
| Jakarta | Wisma Mulia | office mainly | 1.71 | Data from http://buildingdb.ctbuh.org |
| Guangzhou | Victoria Towers | office, commercial, residential | 1.11 | ITDP survey, early 2009 |

*continued on next page*

Appendix 5 *continued*

| City | Building Name | Use | Parking per 100 m² | Source |
|---|---|---|---|---|
| Metro Manila | ICEG/LKG Tower | office | 1.08 | Tall buildings of Asia & Australia, By Georges Binder |
| Fukuoka | Mitsui Building minami | office | 1.08 | www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html |
| Guangzhou | Poly Center | office | 1.04 | Colliers International listings accessed 13 December 2009 |
| Melbourne | 71 Palmerston Crescent | office, retail | 1.48 | Colliers International listings accessed 13 December 2009 |
| Fukuoka | Mitsui Fudosan Building Yasuda | office | 1.01 | www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html |
| Metro Manila | Ecoplaza | office and retail | 1.00 | www.joneslanglasalleleechiu.com.ph/Philippines/EN-GB/Pages/PropertyDetail.aspx?ItemID |
| Bangkok | Gaysorn Plaza | retail | 0.99 | www.mallsindex.com/ |
| Taipei city | Asia Plaza A,B,C | office | 0.99 | www.libertytimes.com.tw/2007/new/apr/26/today-e7.htm |
| Jakarta | Kuningan City | office, retail, residential | 0.88 | www.skyscraperlife.com/skyscraper-news-proposed-projects/19809-jakarta-projects-2009-finish-asias-most-booming-city.html |
| Seoul region (Kyonggi-do) | Kolon E&C Institute of Technology | office | 0.82 | www.asiapacificpartnership.org/pdf/BATF/5th_meeting/IV.Green_Buildings_in_Korea.pdf |
| Jakarta | Thamrin Residences | residential, office, hotel | 0.81 | www.agungpodomoro.com/projects1.php?menu=2&idx=4 |
| Guangzhou | Grand Emerald Tower | office, commercial, residential | 0.80 | ITDP survey, early 2009 |
| Tokyo | colliers id 1358 | office | 1.11 | Colliers International listings accessed 13 December 2009 |
| Guangzhou | Cityplace | residential, hotel | 0.75 | ITDP survey, early 2009 |
| Metro Manila | PBCom Tower | office | 0.74 | www.lifeisgreat.com.my/lig4/newlig/corporate/c_properties.htm |
| Singapore | Ngee Ann City | Office, retail | 0.72 | Colliers International listings accessed 13 December 2009 |
| Bangkok | Siam Paragon Thai | retail | 1.00 | www.mallsindex.com/ |
| Taipei city | Nei Hu District bldg. | office | 0.69 | www.colliersid.com |
| Singapore | Mapletree Business City | office and business park | 0.69 | www.corporatelocations.com.sg/future_developments.html |
| Tokyo | 19 8 Kyobashi 1-chome | office | 0.68 | www.ohno-kogyo.co.jp/front/bin/ptlist.phtml?Category=1716 |
| Guangzhou | Tiffany Court | residential | 0.66 | ITDP survey, early 2009 |
| Fukuoka | Hakata Mitsui Building, Building 2 | office | 0.65 | www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html |

*continued on next page*

Appendix 5 *continued*

| City | Building Name | Use | Parking per 100 m² | Source |
|---|---|---|---|---|
| Shanghai | 1211 Mudanjian Rd | office | 0.65 | Colliers International listings, accessed 13 December 2009 |
| Guangzhou | Mayfair Tower | residential | 0.64 | ITDP survey, early 2009 |
| Singapore | SPRING Singapore | office | 0.61 | www.colliers.com/Markets/Singapore/News/SPRING_Singapore |
| Guangzhou | La Casarita | commercial, residential | 0.59 | ITDP survey, early 2009 |
| Guangzhou | Academic Condominium a, b | commercial, residential | 0.58 | ITDP survey, early 2009 |
| Shanghai | Huang Pu Bldg | office | 0.57 | www.colliersid.com |
| Fukuoka | Nishizima Mitsui Building | office | 0.55 | www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html |
| Shanghai | 116 Nanjing Rd W | office | 0.53 | Colliers International listings, accessed 13 December 2009 |
| Taipei city | Taipei 101 | office mainly | 0.52 | http://buildingdb.ctbuh.org |
| Shanghai | 1600 Zhong Hua Rd | office | 0.51 | Colliers International listings, accessed 13 December 2009 |
| Beijing | Tian Yuan Gang Center | office mainly | 0.51 | Colliers International listings, accessed 13 December 2009 |
| Bangkok | Baiyoke Tower II | hotel | 0.50 | http://buildingdb.ctbuh.org |
| Guangzhou | 7527 Santillan House | residential | 0.49 | ITDP survey, early 2009 |
| Sydney | 234 Sussex St. | office | 0.68 | Colliers International listings |
| Nanjing | Chengkai international? | office, residential, retail | 0.46 | www.njbx.gov.cn/webpage/english/inner.jsp?funcId=18977&detailId=34249 |
| Shanghai | Colliers id 1431 | office | 0.46 | Colliers International listings |
| Guangzhou | G.A. Sky Suites | office, commercial, residential | 0.45 | ITDP survey, early 2009 |
| Guangzhou | 7 CITIC Plaza | office | 0.44 | ITDP survey, early 2009 |
| Hong Kong | Landmark East | office | 0.41 | http://forum.skyscraperpage.com/showthread.php?t=145138 |
| Fukuoka | 1-1-1 Tenjin Chuo-ku | office | 0.41 | www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html |
| Tokyo | Sasazuka Center Building | office | 0.41 | www.iino.co.jp/kaiun/english/estate/building.html |
| Guangzhou | Riverfront Residences | residential | 0.41 | ITDP survey, early 2009 |
| Seoul | Seoul Central Post Office | office, services | 0.41 | www.asiapacificpartnership.org/pdf/BATF/5th_meeting/IV.Green_Buildings_in_Korea.pdf |
| Shanghai | 299 Tong Ren Rd | office | 0.39 | Colliers International listings, accessed 13 December 2009 |

*continued on next page*

Appendix 5 *continued*

| City | Building Name | Use | Parking per 100 $m^2$ | Source |
|---|---|---|---|---|
| Guangzhou | Burgundy Forbes Tower | commercial, residential | 0.38 | ITDP survey, early 2009 |
| Guangzhou | Rosewood Pointe | residential | 0.38 | ITDP survey, early 2009 |
| Guangzhou | The Capital Towers | office | 0.38 | ITDP survey, early 2009 |
| Shanghai | 488 Yincheng Rd (M) | office | 0.35 | Colliers International listings, accessed 13 December 2009 |
| Shenzhen | 8 Shun Hing Square | office | 0.32 | http://buildingdb.ctbuh.org |
| Shanghai | 318 Fu Zhou Rd | office | 0.32 | Colliers International listings, accessed 13 December 2009 |
| Tokyo | Fujimi Building | office | 0.32 | www.iino.co.jp/kaiun/english/estate/building.html |
| Shanghai | 288 Nanjing Rd W | office | 0.32 | Colliers International listings, accessed 13 December 2009 |
| Tokyo | Shiodome Shiba-Rikyu Building | office | 0.29 | www.iino.co.jp/kaiun/english/estate/building.html |
| Hong Kong | 10 Bank of China | office | 0.27 | http://buildingdb.ctbuh.org |
| Tokyo | Sakurada Building | office | 0.27 | www.iino.co.jp/kaiun/english/estate/building.html |
| Tokyo | Nihombashi Mitsui Tower | office, hotel, retail | 0.27 | www.mitsuifudosan.co.jp/english/home/news_20050729.html |
| Singapore | Straits Trading Building | office | 0.22 | Colliers International listings, accessed 13 December 2009 |
| Sydney | 66 Goulbourn St | office, retail | 0.23 | Colliers International listings, accessed 13 December 2009 |
| Tokyo | Iino Takehaya Building | office | 0.15 | www.iino.co.jp/kaiun/english/estate/building.html |
| Tokyo | Chiyoda bldg | office | 0.15 | www.mgpa.com/news_20060822a.html |
| Hong Kong | 9 Central Plaza | office | 0.14 | http://buildingdb.ctbuh.org |
| Sydney | 80 Clarence St | office, retail | 0.16 | Colliers International listings, accessed 13 December 2009 |
| Fukuoka | TENJIN 216 | office | 0.00 | www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html |

ITDP = Institute for Transportation and Development Policy, $m^2$ = square meter.

## Parking Policy in Asian Cities

Most Asian cities are facing an acute parking crisis as a result of rapid urbanization and motorization, and high urban densities. Parking policy is an important component of a holistic approach to sustainable urban transport across the region. The report provides an international comparative perspective on parking policy in Asian cities, while highlighting the nature of the policy choices available. It is a step in building a knowledge base to address the knowledge gap on parking and the lack of adequate guidance for parking policy in Asia.

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