

Lee Kuan Yew School of Public Policy

Consultant's report

Parking Policy in Asian Cities

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This report should be of interest to those with an interest in Asian cities, urban policy or planning, transport policy or planning, infrastructure regulation and policy and/or parking policy.

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Parking Policy in Asian Cities

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For the Sustainable Infrastructure Division (RSID)



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Asian Development Bank

Unless otherwise noted, \$ refers to US dollars.

The title page photograph shows an automated coin parking lot in Ueno in central Tokyo with a daytime price of ¥200 per 20 minutes.

All photographs are by the author unless otherwise noted.

In this report, the term “Taipei city” refers to the metropolitan area centered on the City of Taipei of Taipei, China and “Hong Kong” refers to the entire urbanized area within Hong Kong, China.

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 (US-based non-profit organization)
LTA	Land Transport Authority (Singapore)
MAPA	Makati Parking Authority (Manila)
PPP	purchasing power parity
TDM	travel demand management
URA	Urban Redevelopment Authority (Singapore)

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Executive Summary

There is much confusion and uncertainty over the parking policy choices facing 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:

- In East Asia: Beijing, Guangzhou, and Hong Kong of the People's Republic of China, Seoul in the Republic of Korea, Taipei city of Taipei, China, and Tokyo in Japan
- In South Asia: Ahmedabad in India and Dhaka in Bangladesh
- In Southeast Asia: Bangkok in Thailand, Hanoi in Vietnam, 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
- 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 include 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 local government is a particularly important audience for this report.

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

1. "conventional" approaches (with two variations, 1a. auto-centric and 1b. demand-realistic) which focus on ensuring adequate parking supply by using minimum parking requirements;
2. "parking management" approaches (with two variations, 2a. multi-objective and 2b. constraint-focused) in which complex parking management is seen as a tool for wider policy goals, such as traffic limitation; and
3. "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, the mainland cities have price controls on private-sector parking which may undermine this potential.
- Hanoi'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 Chinese cities. Hanoi 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 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 towards 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 mainland China 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 night-time 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, Hanoi 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 which may be well-suited to dense areas with highly mixed land uses, which are common in Asian cities.

1 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.

1.1 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.

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?



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

1.2 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.

ADB's Sustainable Transport Initiative (STI) 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.

1.3 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.
- Ask if any of the parking approaches of Asian cities offer policy lessons for each other and for other cities.

1.4 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, Hanoi in Vietnam, 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 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, Chapter 9 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.

1.5 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 which could not be included in any detail. These include:

- 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 Chapter 0 that several cities could do better on this;
- Enforcement issues except to point towards their importance and to suggest that success is possible (Section 4.9);
- Bicycle parking, despite its importance in several cities;

- Goods vehicle parking and loading/unloading;
- Curbside management to balance the needs of parking, taxi modes, non-motorized 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 Booz Allen Hamilton (2006). Other organizations, including GTZ's 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.

1.6 Methods

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

1.6.1 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; and news media reports on parking, etc.

1.6.2 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 12.1.

1.6.3 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, of a diversity of locations across each city, making careful observations of parking phenomena and questioning locals involved in parking activities. Photographic documentation from teams in the study was supplemented by photography during these walks.



Coin-operated parking in Ueno, central Tokyo

1.6.4 *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 number of valid responses from each city was: Dhaka 350; Hong Kong 264; Seoul 210; Jakarta 206; Singapore 201; Taipei city 200; Bangkok 199; Hanoi 198; Beijing 187; Manila 183; Ahmedabad 180; and Kuala Lumpur 158.

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 which 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;
- 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. Section 8 describes the results of the surveys and Appendix 12.4 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.

1.7 **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 Hanoi, 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 mainland Chinese cities, even though they now have car ownership higher than in Hong Kong or Manila.

1.8 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) on 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
Hanoi	2.4 ^b	179 (urban core 2001); 82 ^b	18 (2009 est.)	2,788
Dhaka	10.1 ^b	401 ^b	27 (2009)	1,501
Sydney	3.7 ^b	19 (1995); 20 ^b	516 (1995)	36,417

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). Hanoi’s 2001 urban core density is the gross density for the urban districts (1.506 million people in 84.3 km²). Gross domestic product (GDP) per capita figures for the countries/territories that contain each city are from Asian Development Bank (2009). Appendix 12.3 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

2 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	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)
		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	Infrastructure. Government responsibility mainly.	Plan parking to serve wider urban & transport policy goals	A source of conflict, but expected and manageable with active policy efforts	Supply and demand both need to be managed
		Key relevant goal is constraint of car travel (to certain locations)		Constraint of parking supply is a key mobility management/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

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

2.1 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:

1a. 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).



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

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.

1b. 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 below, multi-objective parking management.

2.2 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:

2a. 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 management¹ (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.

2b. 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) (Booz Allen 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 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.

2.3 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

¹ Mobility management and Travel Demand Management (TDM) are used here as synonyms.

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-viceinity 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).

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.



Competing commercial parking operators in Auckland's CBD

2.4 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.

2.4.1 *Whose responsibility is parking supply?*

It has usually been taken as reasonable that 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 the onus for parking supply on 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 (Section 6.6) 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.

2.4.2 *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 over which kind of economic good to treat parking as. 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-for 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 non-residents 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).

2.4.3 *Is parking "infrastructure"?*

Although the term infrastructure is not a precisely defined one, 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 the 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.

2.4.4 *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.

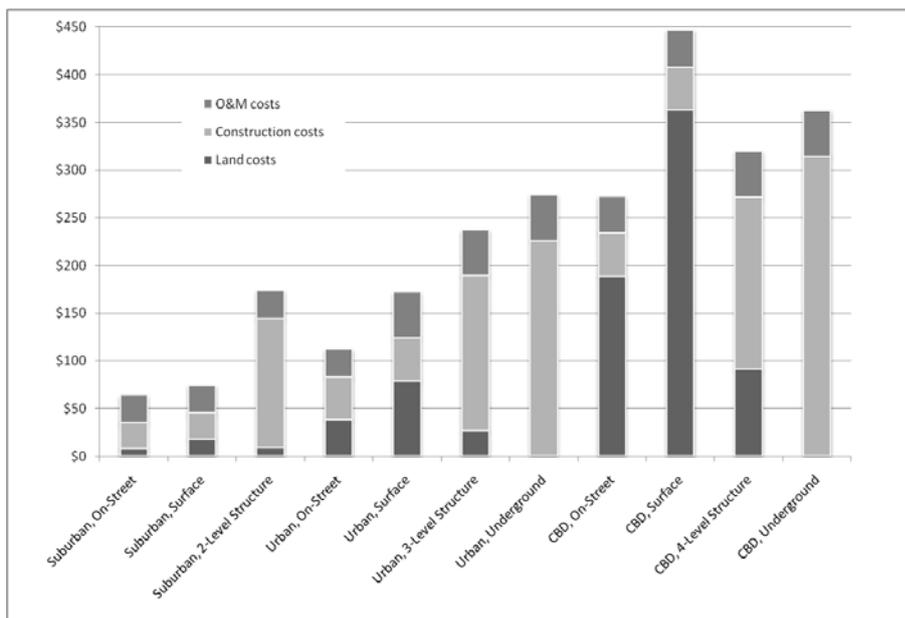
The pricing principle when parking is a stand-alone business is generally “what the market will bear.” However, most parking is not run as a stand-alone business but in association with other activities, whose managers manage parking as a complement to their main business. For many, pricing is merely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

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 (Section 8.5).

Figure 1 shows typical costs of providing parking for American conditions from 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.

Figure 1 Typical US Parking Costs (annualized and expressed on a monthly basis, 2007 \$ per space)



O&M = operation & maintenance.

Source: Adapted from data in Litman (2009).

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.

2.4.5 *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 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.

2.5 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.

In order 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. The final section above highlighted some of these hidden assumptions. It would be useful for such assumptions to be made explicit in discussions of parking policy.

3 Minimum Parking Requirements and the 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 towards 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.

3.1 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).

3.1.1 Commercial uses, office buildings, and retail

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

Table 3 Car Parking Required with Example Office and Retail Buildings (per 100 m² 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
Hanoi	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	3.3	4.0	2.83

CBD = central business district

Notes:

1. The "standard buildings" used for the comparisons here were: a CBD office building of 25,000 m² gross floor space; a "non-central" office building of 25,000 m² gross floor space; and a medium-sized, non-central shopping center with 25,000 m² gross floor space.

2. The "average" column is the average of the shopping center figure and the average of the two office figures.

Sources: Appendix 12.2

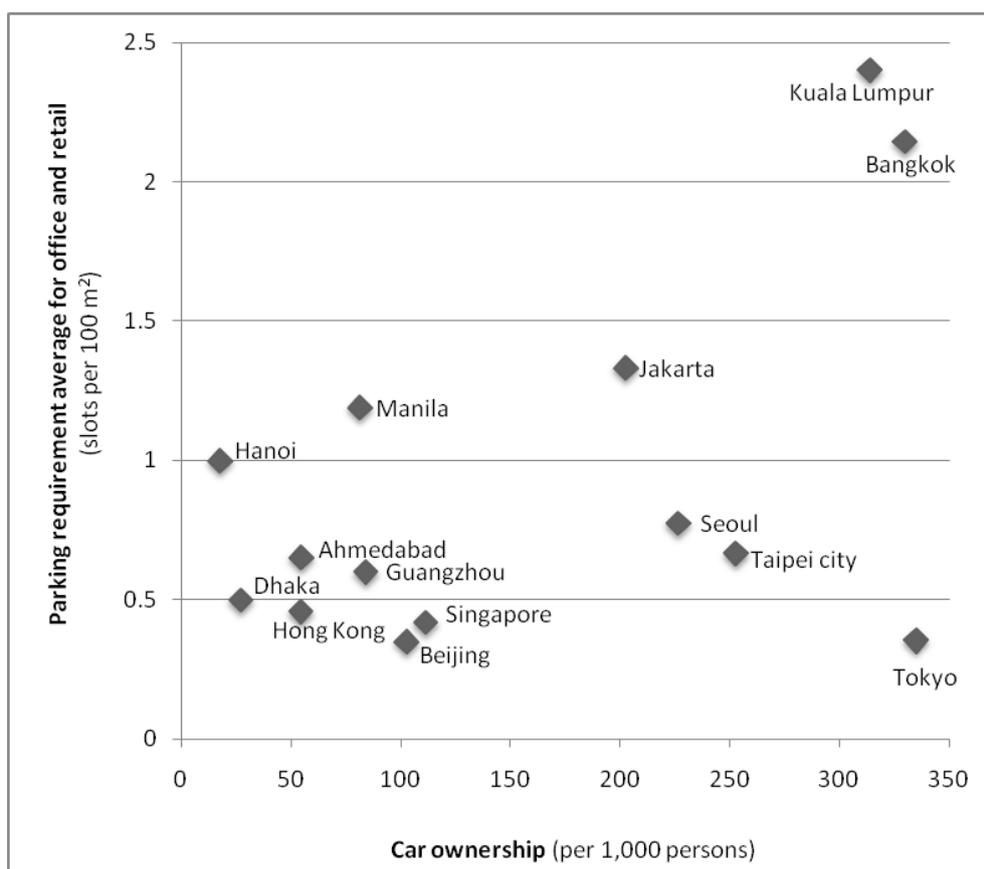
Among the longer-motorizing cases, it is striking that the richer cities (Tokyo, Singapore, Hong Kong, Taipei city, and Seoul) all have lower parking requirements than the middle-income cities (Kuala Lumpur, Bangkok, Jakarta, and Manila). The Kuala Lumpur metropolitan area and Bangkok stand out from the others with especially high requirements, averaging above 2 spaces per 100m² 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 m² (Shoup 2005, 81; Victoria Department of Planning and Community Development 2008; Planning SA 2001).

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

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).

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



Sources: See Appendix 12.2 for parking standards and Appendix 12.3 for car ownership estimates

With this perspective, Tokyo, Taipei city, and Seoul 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 the Chinese ones 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 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.

3.1.2 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, Hanoi, 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 happens in Singapore and Kuala Lumpur for example).

The three rightmost columns in the table below are expressed as parking slots per 100 m² 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 m² is actually just slightly lower than the requirement on a per unit basis (since the calculations were based on a building consisting of 110 m² apartments).

Table 4 Parking Required with Apartment Buildings

Urban Area	Small flats (slots per unit)	Small flats (slots per 100m 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
Hanoi	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

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 m²) and medium flats (middle-suburb, slots for a 100 unit block each of 110 m²).
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.

Sources: Appendix 12.2

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.



Parking floors in a residential condominium in Subang Jaya in the Kuala Lumpur region.

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?

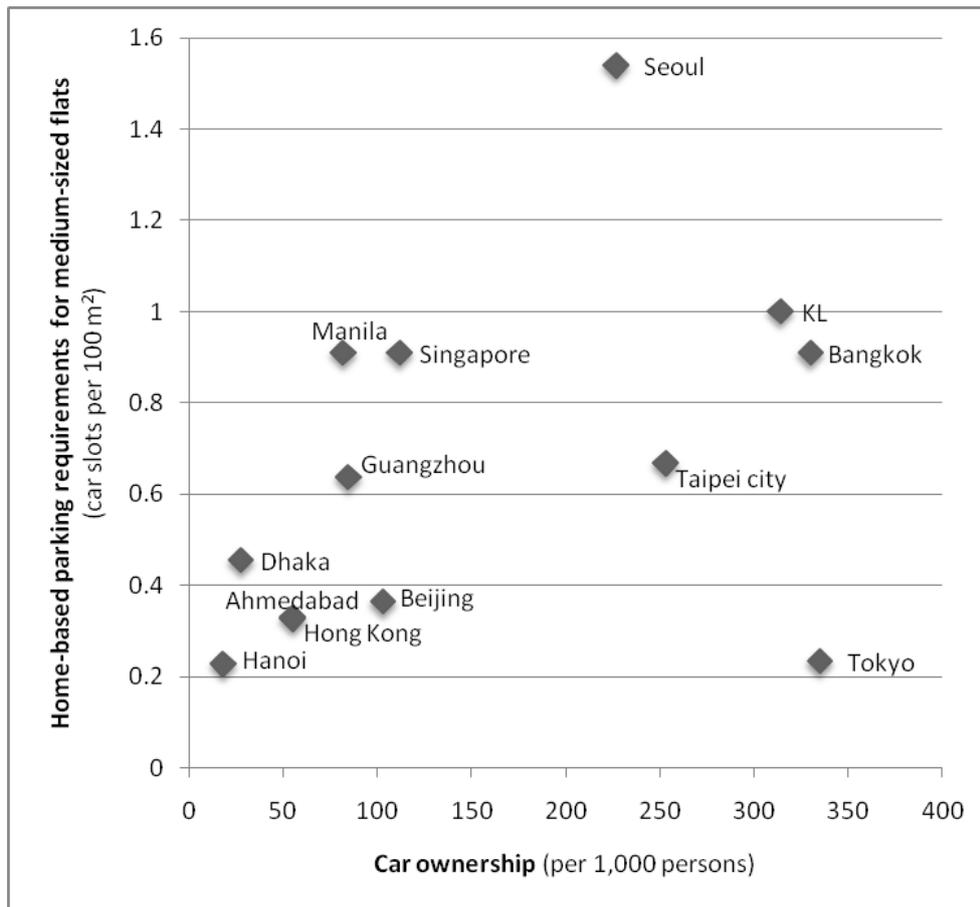
One might expect smaller flats to have lower (or no) requirements imposed on them, both in the interests of affordability and because smaller apartments are likely to accommodate lower-income people or small households. Indeed, several cities do impose lower requirements on small apartments. In some, 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 which vary depending on the size of the units and very much lower requirements for subsidized housing. In Bangkok, apartments below 60 square meters 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 above, Singapore's relatively high parking standards here 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 serves businesses located in HDB estates.

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



Sources: Appendix 12.3 for car ownership estimates and Appendix 12.2 for parking standards

3.2 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.

Japan's approach is especially striking, since the thresholds are set quite high, usually at 1,500 m² or 2,000 m² 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 m² and 10,000 m² in floor area. Buildings larger than 10,000 m² are assigned parking requirements slightly lower than the full rates, and very large buildings slightly lower again.

Taipei city, Guangzhou, Bangkok, Ahmedabad, and (apparently) Beijing also have

thresholds, but a smaller proportion of buildings are exempt. Hanoi 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.

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)
Hanoi	Low-rise residential buildings exempt
Beijing	Yes?
Seoul	No?
Jakarta	No?
Singapore	No
Kuala Lumpur	No
Manila	No
Dhaka	No

Source: Appendix 12.2.

3.3 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 (Booz Allen Hamilton 2006).

Asian parking standards vary in the extent to which they provide local tailoring of their details. Table 6 provides examples in the Asian cities in our group arranged according to the extent of such tailoring. The variations are most significant for Seoul, Singapore, and Hong Kong.

Table 6 Variations in 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 non-residential 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 lower in core areas
Beijing	Some requirements lower in core areas
Ahmedabad	Old Walled City is a special case, where many buildings are exempt.

Variations depending on location?	
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 towards parking nearby).
Bangkok	Little variation. But perversely, some requirements are higher in central areas.
Jakarta	Not found
Taipei city	Not found
Dhaka	Not found
Hanoi	Not found

Source: Appendix 12.2.

3.4 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 Hanoi.

3.5 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 for the Asian cities in this study the number of 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 departmental 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 & universities; library; community centers; welfare houses; churches, mosques & temples; columbarium; funeral parlor & crematorium; sports complex (a) administrative & related uses; sports complex (b) snack/coffee bar, restaurant; sports complex (c) multi-purpose hall with gymnasium, indoor courts, etc; sports complex (d) indoor games rooms, clubrooms, health clubs, and related uses; sports complex (e) spectators' gallery; tennis, squash/ badminton courts, <i>sepak takraw</i> , 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 sub-station 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” (non-residential use); boarding houses and hostels; showflat
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; public schools; private schools; public colleges and universities; private colleges and universities; mental hospitals; public hospitals; private hospitals; nursing homes; transport

Land uses or building types with specific parking requirements	
	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, 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: 1. entertainment facilities; 2. 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; 3. "category 1" neighborhood facilities, "category 2" neighborhood facilities and lodging facilities; 4. non-apartment complex independent houses; 5. apartment complex, shared living facilities (except foreign officials' residential areas and dormitories) and office-residence complex apartments; 6. golf courses, golf practice facilities, outdoor pools, and concert halls; 7. outdoor schools, factories, and development facilities; 8. storage facilities; 9. other facilities.
Ahmedabad	9 types: 1. residential (flats/ apartments); 2. cinema theater, public assembly, stadium, hall etc.; 3. industrial; 4. commercial and business establishments; 5. community and religious buildings; 6. primary schools; 7. secondary and higher secondary schools; 8. colleges and coaching classes; 9. special buildings: stock exchange and wholesale trade markets.
Hong Kong	7 types: subsidized housing; private housing; village housing; office; retail markets; hotels; commercial entertainment facilities.
Bangkok	6 types: 1. entertainment buildings; 2. hotels; 3. residential; 4. restaurants; 5. shopping malls; 6. office buildings.
Hanoi	5 main types: 1. includes three-star hotels and upper class hotels; 2. includes high-class office buildings, foreign affairs head-office buildings; 3. includes supermarkets, big shopping centers, conference centers, exhibition centers, showroom buildings; 4. includes high-class (class 1) apartment buildings; 5. 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: 1. includes theaters, international hotels, clubs, offices, markets, shopping malls, restaurants, shops; 2. residential buildings; 3. includes hotels, museums, libraries, hospitals, funeral parlors, religious facilities; 4. includes warehouses, schools, factories, and slaughterhouses; 5. others.
Tokyo	2 categories: 1. 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); 2. non-specific uses (others).

Sources: Appendix 12.2.

3.6 Does parking space count towards allowable floor space?

Jurisdictions vary in the extent to which parking space is counted towards the built space allowed in buildings by the planning system². This is an under-researched issue, little discussed in the parking literature. It may have a strong impact on the incentives developers have to construct parking space.

If parking is included in allowable floor space every extra car slot reduces the allowed leasable space by about 15 m² to 25 m². Conversely, where parking is excluded from being counted towards 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 for which reliable information could be obtained on this question.

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.

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).

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) generally exempt; public parking generally not exempt
Singapore	Only required parking exempt, but for residential buildings all parking is exempt
Taipei city	Required parking (and parking encouraged with a floor area bonus) exempt up to a cap
Kuala Lumpur (Petaling Jaya)	Exempt if outside or basement; if in-building, above-ground only required 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 12.2.

3.7 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 in our group, 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 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. Akter 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 since then conforms 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/commercial developments aiming at high-end customers to provide much more parking than required while developments aimed at lower-income market

segments are said to provide only as much parking as required.

Table 9 How Common is Diversion of Required Parking Space to Other Uses?

City	Diversion of required parking reported?	Enforcement action reported?
Ahmedabad	Many shopping centers (2009 reports), in common with most other Indian cities reportedly.	Demolitions of basement shops in 2009 along important streets
Dhaka	Some basement parking diverted to retail (2009 reports).	Basement shop demolitions 2009
Bangkok	Various shopping centers (2006 reports). Car wash businesses etc. appear in shopping center parking lots.	Police were to act.
Beijing	Reports suggest some buildings fail to open required parking.	Not found
Kuala Lumpur	Shophouse areas, in 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 in policy documents of concern to prevent this, suggesting it sometimes happens. But no specific reports.	Not found
Singapore	Yes, but legally and with permission, after requirements were reduced in 2003, by shopping centers which found themselves with extra parking within their GFA allowance.	No
Hanoi	Hinted at by some interviewees but not confirmed.	Not found

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



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 in enforcement action)

3.8 Parking supply outcomes for real buildings

As mentioned above, today's parking requirements do not necessarily completely determine the actual provision of parking in new buildings. Parking minimums don't 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 12.5. This is obviously a small and unrepresentative sample of buildings. Nevertheless, it provides some corroboration for the parking requirement discussions in the sections above.

Table 10 Buildings (found in a small search) within Each Parking Provision Range for Various Cities

	Number of buildings found with parking spaces per 100 m ² 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 region		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 12.5.

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 the table above.

- Provision of parking in excess of requirements seems to be common in Jakarta, Kuala Lumpur, Manila and Guangzhou. 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 example provided more than the guidelines call for.
- However, three of four Manila office buildings and one office/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 thirteen 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 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 building 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.

3.9 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.

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 try 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 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 a 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 to via 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, etc.
- 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.

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)
Hanoi	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.

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 autocentric 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 which may contribute to the rather market-based parking arrangements in these cities (as we will see in later chapters). Japanese parking standards appear to 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 with 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 the mainland Chinese 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).

3.10 Views on parking supply as a problem

This section briefly summarizes local perspectives on parking supply and 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 above 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 policymakers’ 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 which 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.
Hanoi	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 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.
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/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, towards considering limiting supply in centers. Illegal parking is a problem, 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 towards current main view that supply 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/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 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.

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

4 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 indispensable key to parking policy overall. International experience and successes in some of the Asian cities demonstrate that it is possible to manage their on-street parking effectively.



Saturated on-street parking in Kuala Lumpur

4.1 Is there a problem?

Table 13 below 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 Section 8.1 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 US, 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 towards On-street Parking as a Source of Problems

	Chaotic/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	Especially of motorcycles in the Walled City. 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)	In some middle-class low-rise residential areas and street-oriented commercial areas
Manila	Widespread illegal parking but enforcement generally effective on main roads	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
Hanoi	Some reports but not apparently 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/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 major problem	Legitimate on-street parking allegedly not saturated or only rarely

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

4.2 Disruption of pedestrian environment

The section above 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 Jakarta, Manila, and Ahmedabad.

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 photograph below Table 14).

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 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.
Hanoi	Serious: Motorcycles on footways and sometimes cars (some illegal but often institutionalized).
Kuala Lumpur	Motorcycles 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 on footways in places; frontage parking 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)

4.3 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.

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).

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 awarded & contractor 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
Hanoi	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.

4.4 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).

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 HDB 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.

4.5 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).

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 Dhaka, Ahmedabad, Jakarta, Bangkok, 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. If Beijing proceeds with its announced April 2010 doubling of city-center on-street parking prices, its rates will be comparable with those of these three rich cities.

The policy of the city government of Taipei 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 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.

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\$/hr)	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 hrs)
Bangkok	Limited to a set of older commercial streets	Uniform price, where priced	0.60 (B10)	No
Hanoi	Extensive	Two zones	0.81 (D5000)	No
Guangzhou	Extensive	Zones with different prices	1.05 (CNY4)	?
Beijing	Extensive	Two(?) zones with different prices	1.32 (CNY5)	?
Hong Kong	Many streets, throughout	Uniform legislated price	1.46 (HK\$8)	Yes (2 hrs if demand high)
Manila	Extensive within Makati but in few other commercial areas of Metro Manila	Different prices around Metro Manila under various cities	1.71 (P40 last hr, P35 first 2 hrs)	Yes (3 hrs)
Singapore	Extensive in older commercial streets	S\$1/half hr in central area, elsewhere S\$0.50/half hr	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 > 6 th 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

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

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

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 Malaysia; Japan; Hong Kong and the Makati CBD in Manila.

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



MAPA parking pricing on-street in the Makati CBD in Manila

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

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, Kuala Lumpur, and Jakarta suggest that demand rationing is not the main objective. In most of the municipalities of the Kuala Lumpur metropolitan area, monthly payment is an option³. 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 in legislation, as is Hong Kong's. Some pricing mechanisms (discussed below in Section 4.6) 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.

4.6 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.

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

Table 18 On-street Parking Pricing Mechanisms

On-street pricing mechanisms deployed	
Jakarta	Attendants (are supposed to) issue paper tickets and receive cash payment. Late 2009 decision to have annual permits for on-street parking anywhere in Jakarta.
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 and receive cash payment.
Dhaka	Attendants who issue paper tickets and receive cash payment.
Hanoi	Attendants who issue paper tickets and 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 PDAs 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 that use contactless payment cards. Attendants who issue tickets and take cash work some areas. Sometimes both attendant and meters in same location.
Beijing	Parking meters like in Hong Kong, using contactless payment cards and serving adjacent spaces to left and right. 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 non-payment 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. Meters are placed between two spaces and serve both.

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

4.7 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).

Table 19 Practices That Reserve On-street Parking Space 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/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.
Hanoi	Motorcycle parking on footways or roadways in front of shop fronts is informally controlled by the shop owners/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/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 CBD allows reserved spaces by businesses for a premium monthly fee.
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.

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 Hanoi, 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, 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 on 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.

4.8 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 Hanoi (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.

4.9 Enforcement

Enforcement of on-street parking rules and of on-street pricing are complex issues which 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.

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. 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 offences. Police-issued fines have high payment rate, because otherwise road tax cannot be renewed. Local government-issued fines have extremely low payment rates, since they lack effective powers to act against non-payers. 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 offences. Gradually escalating battle against illegal parking wherever especially disruptive. Tactics include closed-circuit television (CCTV) monitoring. Steady improvement with much remaining to be done.

Notable enforcement-related initiatives and approaches	
Hanoi	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 offences. Designated on-street parking spaces run by the Urban Redevelopment Authority (URA), 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 local government, often at the very lowest level, the <i>Barangay</i> . Makati CBD parking under the Makati Parking Authority (MAPA) is said to have efficient and effective enforcement of both the pricing arrangements and against chaotic or disruptive parking.
Tokyo	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.

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

- *Placing legal responsibility for parking offences 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 an administrative offence.* In Europe, this is seen as an element in the relative success of the Netherlands, Spain, and the UK. This seems to be the case in Malaysia, Singapore, and the Philippines 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 for vehicles parked obstructively, which is feasible even where vehicle registration systems are unreliable.

5 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 boosting 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 which 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 ambitions, and whether this remains an important expanding program or not.



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

5.1 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 taxpayer 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.

5.2 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-property price urban cores, the resources needed to provide additional off-street parking can be very large (recall Figure 1).

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.
Hanoi	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 govt.) 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 photograph at beginning of Chapter 5). 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 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, URA, 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	Bangkok Metropolitan Administration (BMA) 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.

Most cities use land which 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. 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 (Section 7.4).

Ahmedabad, Dhaka, and Hanoi 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.

5.3 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 long had a 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.

5.4 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 under-utilization.

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. Hanoi'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. 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 roughly in line with those of private operators in the vicinity. Parking facilities of the city government of Taipei 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 HDB, 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.

5.5 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 Hanoi 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.

6 Policy towards Public Parking as a Business

Most of the policies reviewed up to this point in the report 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 for 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.

6.1 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 policymakers (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 the Chinese cities, including Hong Kong, as well as in Hanoi (Section 8.7). 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 which 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.

6.2 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.



Priced public parking in a private building in Taipei city

The insights in Table 22 are based on observations in each city, interviews, and on the survey results presented in Section 8. 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). Chinese cities are also trying to encourage this.

Table 22 Prevalence of Parking in Private Buildings Being Opened to the Public

	Public priced parking in private buildings obvious in centers of activity?	Explicit policy encouraging public parking in developments?
Ahmedabad	Some	Not found
Dhaka	Some	Not found
Manila	Common, but also much private, customer-only parking	Not found
Jakarta	Common but also much private, customer-only parking	Not found
Bangkok	Common	Not found
Kuala Lumpur	Common	Not found
Singapore	Common	Not found
Tokyo	Common	Not found
Hanoi	Some, especially for nighttime	Not found
Beijing	Common	Policy encourages non-residential buildings to make parking open to nearby residents at night
Guangzhou	Common	Policy encourages non-residential 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 also incentivized to do so (as in Pusan)

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

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, 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 to public.

6.3 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 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.

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
Hanoi	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)
Beijing	?
Taipei city	A 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.

6.4 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.

Table 24 Prevalence of Temporary Private Vacant-lot Parking Facilities

	Private vacant lot parking common?
Dhaka	None or very few
Hanoi	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 urban fabric

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

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 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 URA also creates parking on state land (of which Singapore has a large amount). This is done in locations which 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 (Section 6.6).

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

6.5 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, etc. This is

common in Hanoi, Tokyo, and to some extent in Taipei city. Sometimes, parking within residential complexes forms a part of the local parking market by allowing non-residents to rent or buy parking rights or spaces.

6.6 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.

It is likely that the policy 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.

A number of places in this study have considered emulating Japan's proof-of-parking policy. Hanoi 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.

6.7 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 upwards.

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).

6.8 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 (Section 6.9 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.

6.9 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, Hanoi, 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.

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 Hanoi 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 are reportedly being 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/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 HDB'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 HDB 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.

7 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.

7.1 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 CBD by roughly 3% per year. The Swiss cities of Bern and Zurich tightly constrain parking in their city centers, especially all-day parking (Booz Allen 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). These parking limitation areas thus do not have an overall parking cap. 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 (Section 8.2).

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 m² 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/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 in Section 7.

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 two 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. Disappointment in most of these cities with existing public transport was also raised as a reason that such parking constraint would be politically impossible for now.

7.2 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 Tokyo, Taipei city, and Hong Kong can also be seen as having a travel demand management (TDM) element perhaps.

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. Indian national government guidance urges parking prices to reflect land prices of each vicinity and this is linked with a TDM rationale (Government of India 2006). The adoption of higher on-street parking prices in central areas of the Chinese cities is also a sign of TDM thinking, although it must be set against efforts to boost public-sector parking supply.

7.3 Parking levies and taxes

Parking taxes or levies are sometimes used as a parking constraint mechanism, such as in Sydney and in some UK 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.

7.4 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 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 2001).

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 HDB public housing estates.



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

7.5 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.

7.6 Workplace mobility management and parking

In North America and in Europe, workplace-based mobility plans (or green transport plans) or 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 transportation allowance instead of the free parking (Shoup 1995).

In the Asian cities studied, there was little of 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 (Section 8.2) might be taken by some as a sign of a mobility management role for parking.

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

Debates over proof-of-parking policies in the Republic of Korea, 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.



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

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 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.

8 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 Section 8.5, 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, etc.

The survey respondents were asked about the car that they drive most (in case of 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 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 two weeks before the interview.

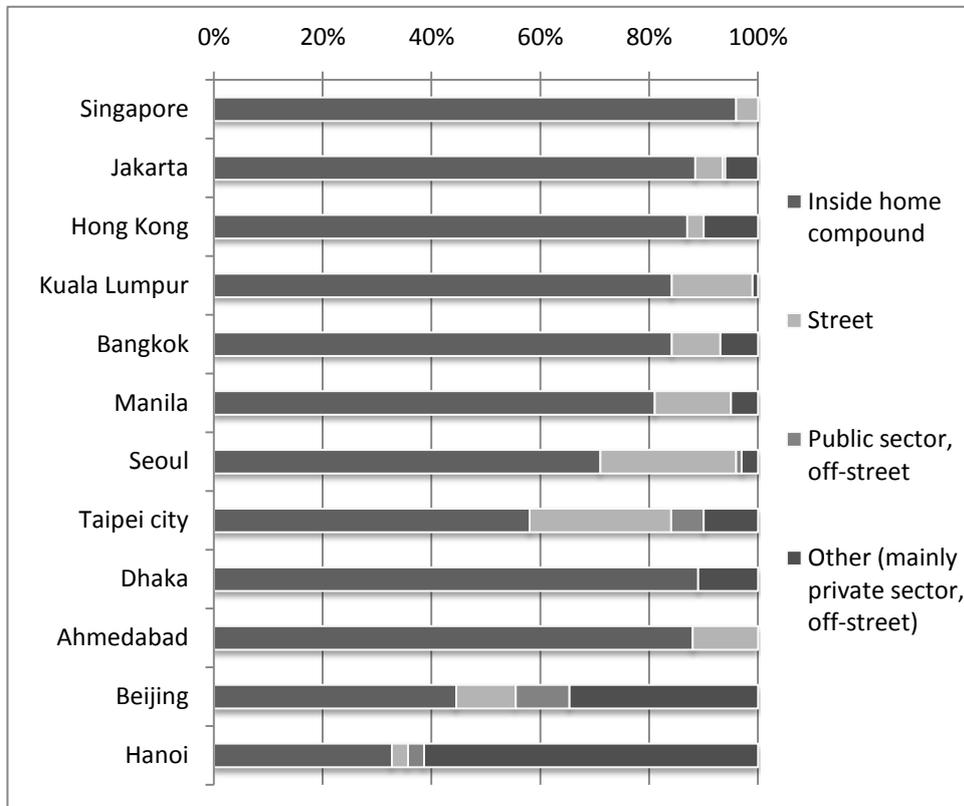
8.1 Where do motorists park?

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.

8.1.1 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).

Figure 4 Locations of Home Parking by Survey Respondents



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

Conversely, Taipei city, Beijing, and Hanoi, 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 Hanoi and Beijing, it was mostly in private-leased parking places (although some of Hanoi'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).

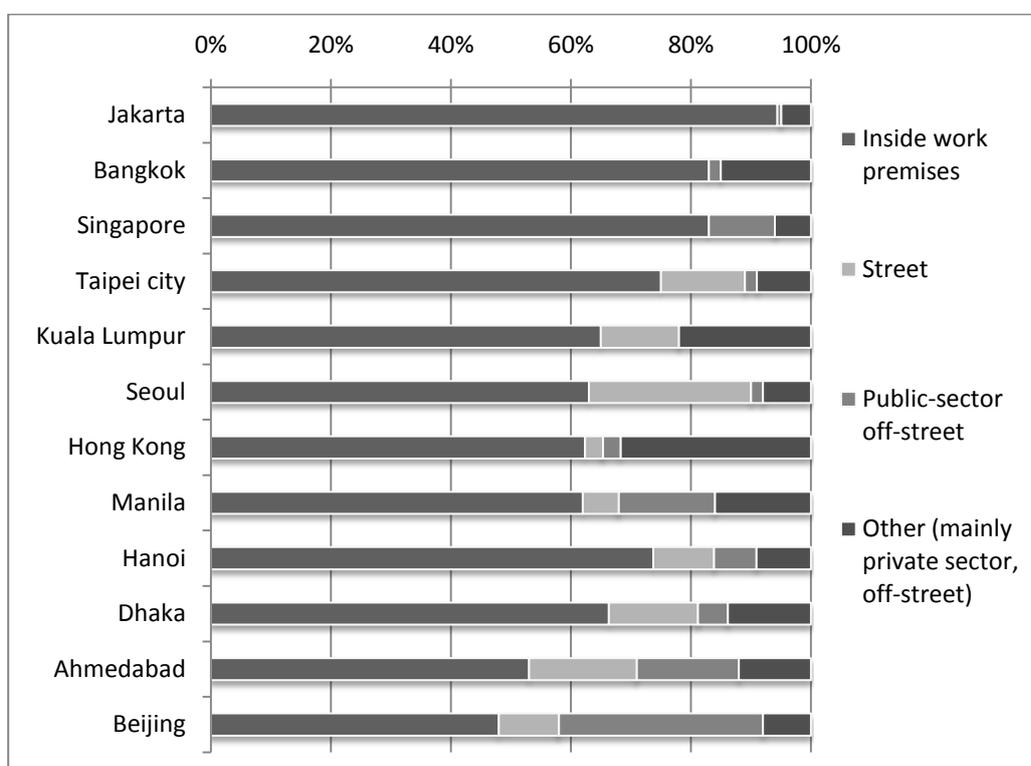
Tokyo was not covered by the same kind of survey. However, a very small exploratory survey with 18 valid home parking results showed 22% of respondents parking outside their own housing compound, all of them in leased off-street neighborhood parking. This corroborates field observations and can be seen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

Only for Taipei city, Beijing, and Hanoi 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.

8.1.2 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.

Figure 5 Locations of Work-based Parking by Survey Respondents



Except for Jakarta, Bangkok, 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 (Seoul, Ahmedabad, Dhaka, Taipei city, and Kuala Lumpur). 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 Singapore, Bangkok, Jakarta, Manila, and Hong Kong. This is interesting in the cases of

Manila and Hong Kong since it shows that relatively high proportions of work parking outside the workplace premises does not necessarily end up in the streets. Similarly, only a modest fraction of Beijing respondents' spillover beyond work premises appears as street parking.

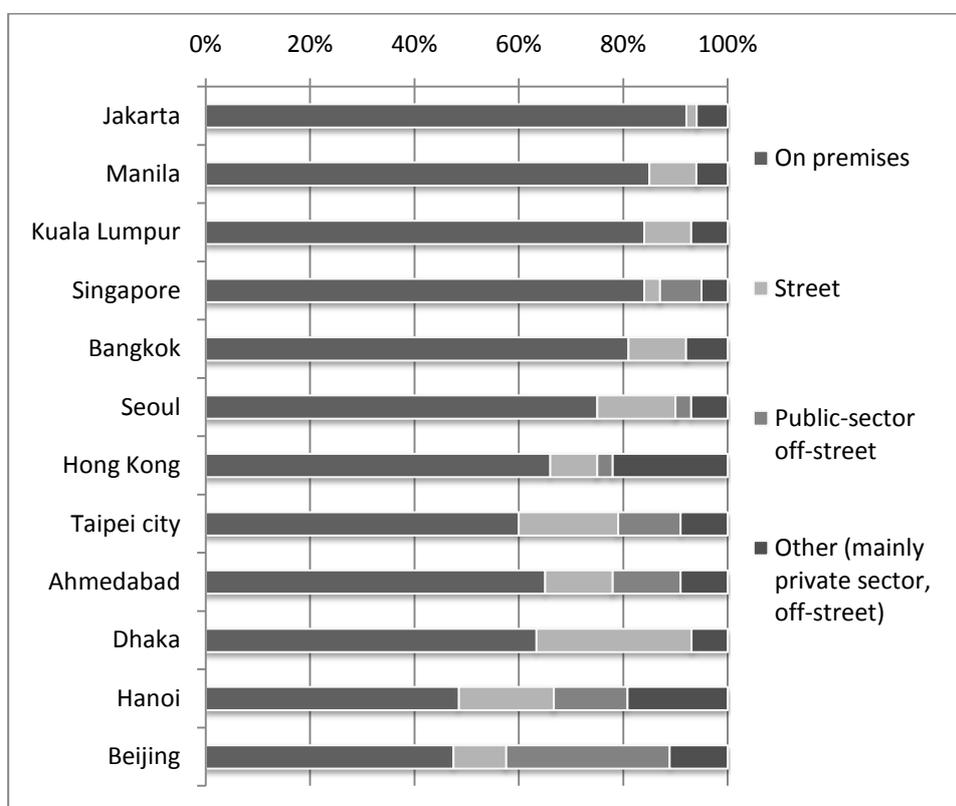
Only Beijing, Ahmedabad, Manila, and Singapore reveal significant roles for government-provided parking, mostly in priced government-provided parking either in structures or at-grade (although the Manila case involved 16 cases of parking on state-owned open lots without payment).

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

8.1.3 Parking at shopping and entertainment destinations

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

Figure 6 Locations for Shopping/Entertainment Parking by Survey Respondents



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.

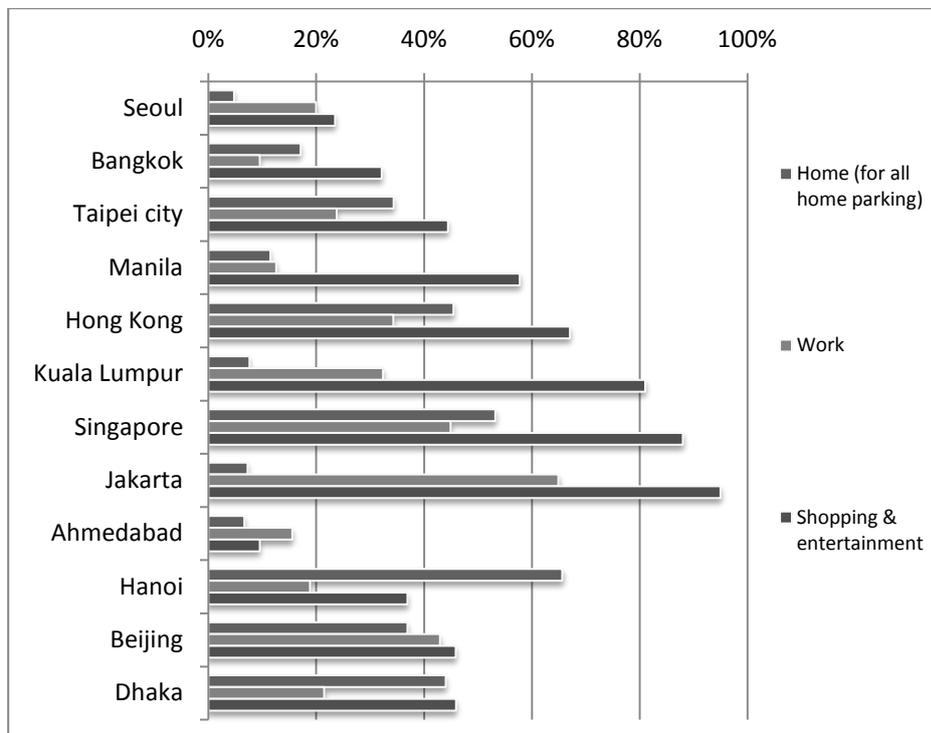
High rates of parking within the destination premises in Kuala Lumpur, Jakarta, Manila, Singapore, and Bangkok might perhaps be seen as a triumph for an emphasis on parking requirements in parking policy (Chapter 3). However, Beijing; Hong Kong; Hanoi; Ahmedabad; and Taipei city demonstrate that off-site 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).

8.2 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 Jakarta, Singapore, and Beijing did more than 40% of workplace parking respondents pay anything for their parking.

Figure 7 Proportion Paying for Parking (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.

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?

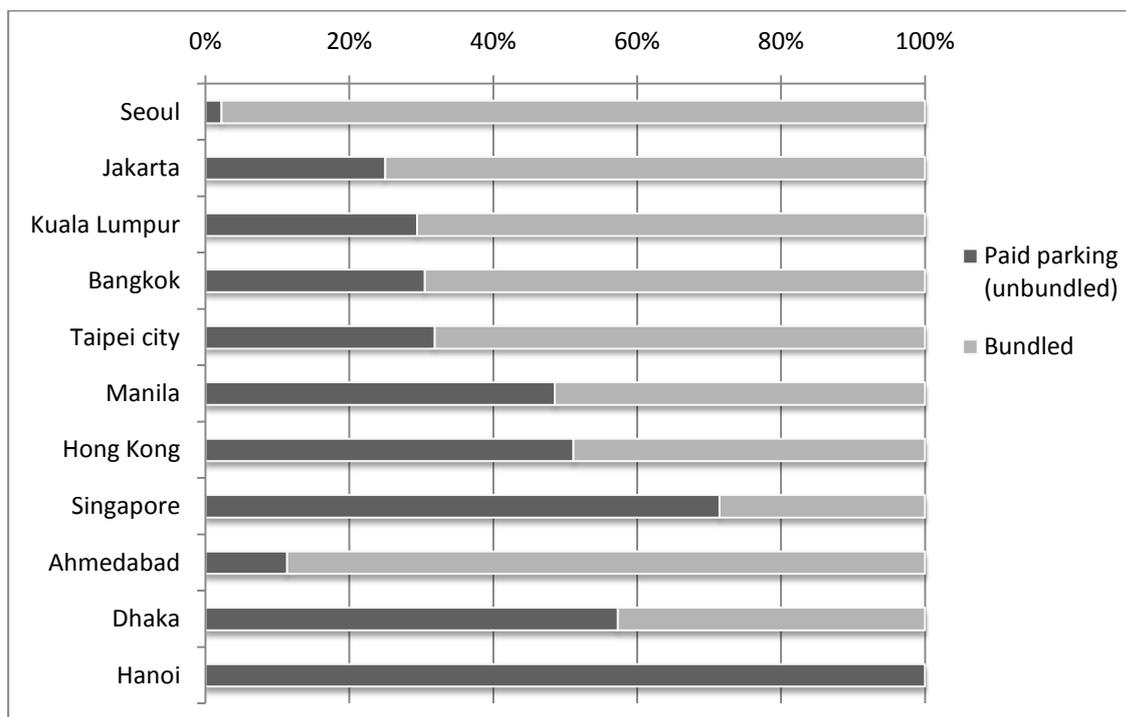
Jakarta and Kuala Lumpur have surprisingly high proportions of paid work and shopping/entertainment parking despite their relatively auto-centric approaches to parking requirements. However, we will see below in Section 8.4 that the prices paid are low.

8.3 Bundled versus unbundled home parking

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

Figure 8 Bundling versus Unbundling for Survey Respondents Parking inside Multi-family Housing



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

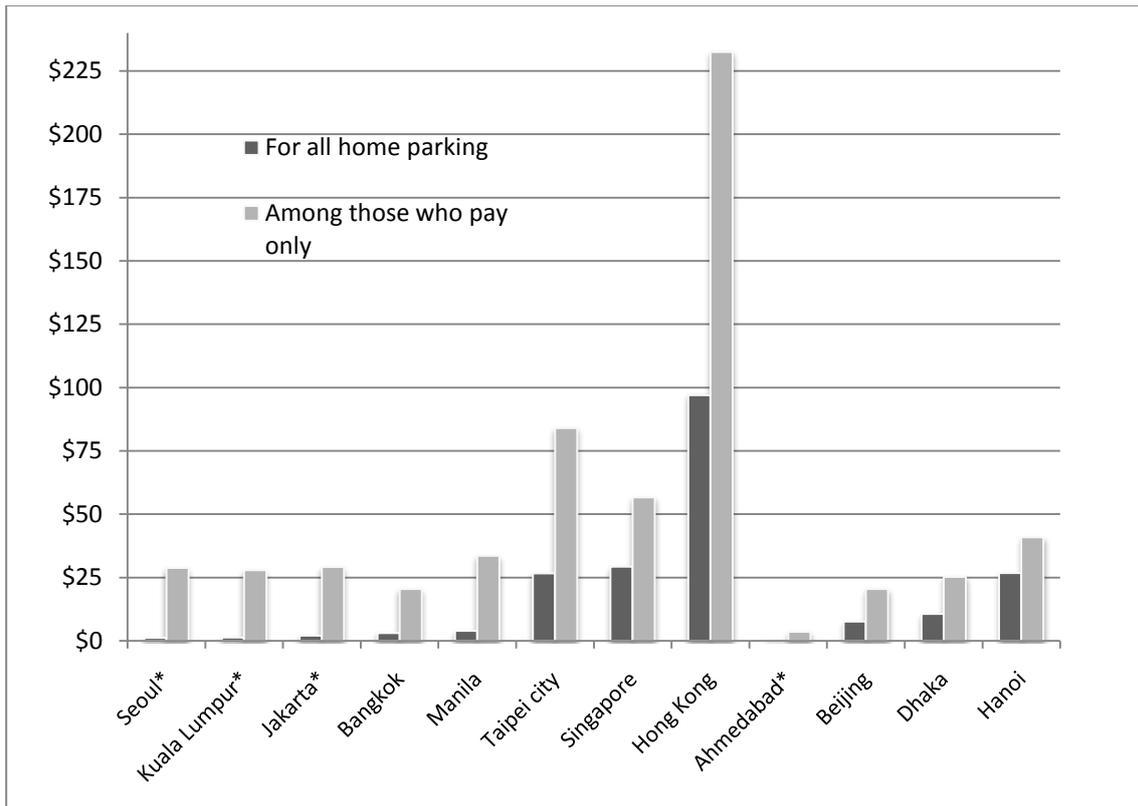
8.4 How much do they pay?

The following two figures 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 something amiss with parking policies there. However, recall from Section 2.4.4 that the monthly cost of providing a parking space in a dense urban environment is likely to be between about \$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.

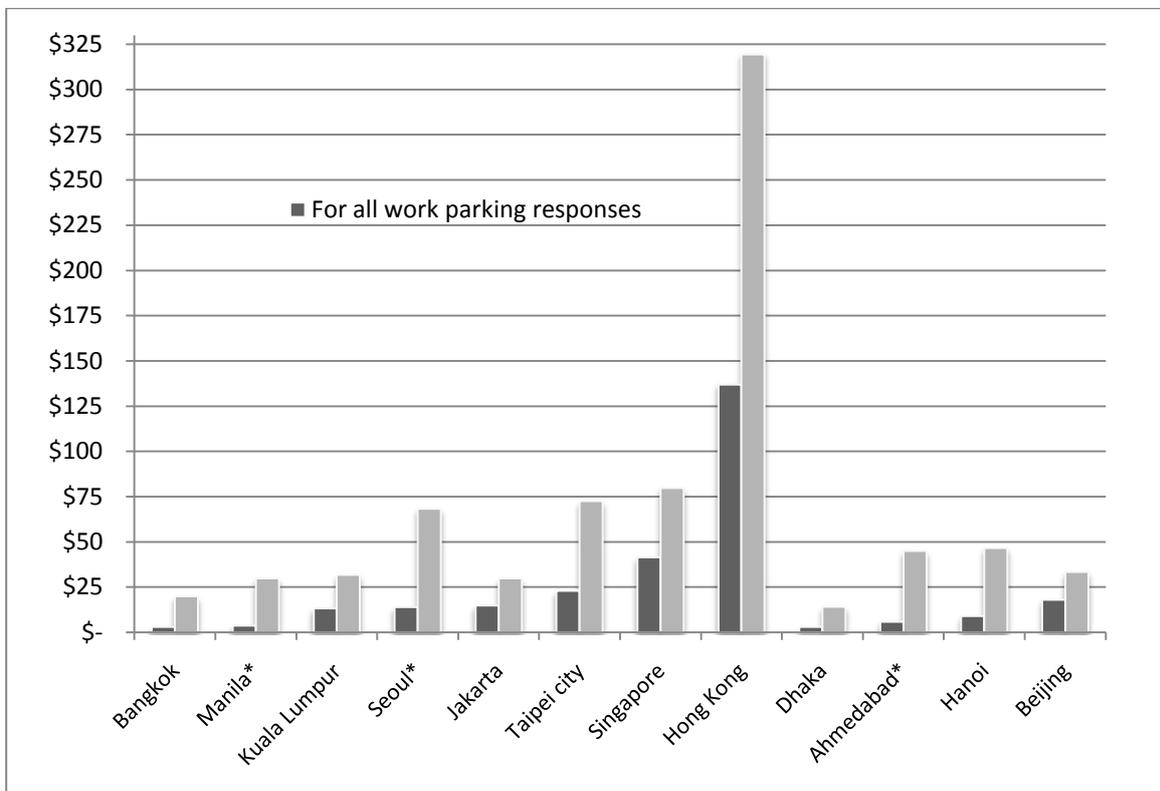
Singapore is a distant second in the overall averages for both categories. However, home parking prices in Taipei city faced by respondents are higher than Singapore's for those who do actually pay and almost as high for work parking. Hanoi stands out with relatively expensive home-based parking with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

Figure 9 Average Home-based Parking Prices Paid by Survey Respondents per Month (in Jan 2010 \$)



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

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



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 *.

The overall averages for work parking here do of course 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 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 (Section 7.1). All but one of its 13 cases of work-based parking pricing were in the business districts Dongdaemun-gu, Kangnam-gu, Jung-gu, and Yeongdeungpo-gu.

8.5 CBD parking prices relative to office rents

A theme in this report is a disparity in most cities between the returns on parking investments and those on other uses of real estate. The survey findings above 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.

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 London, Copenhagen, Sydney and San Francisco.

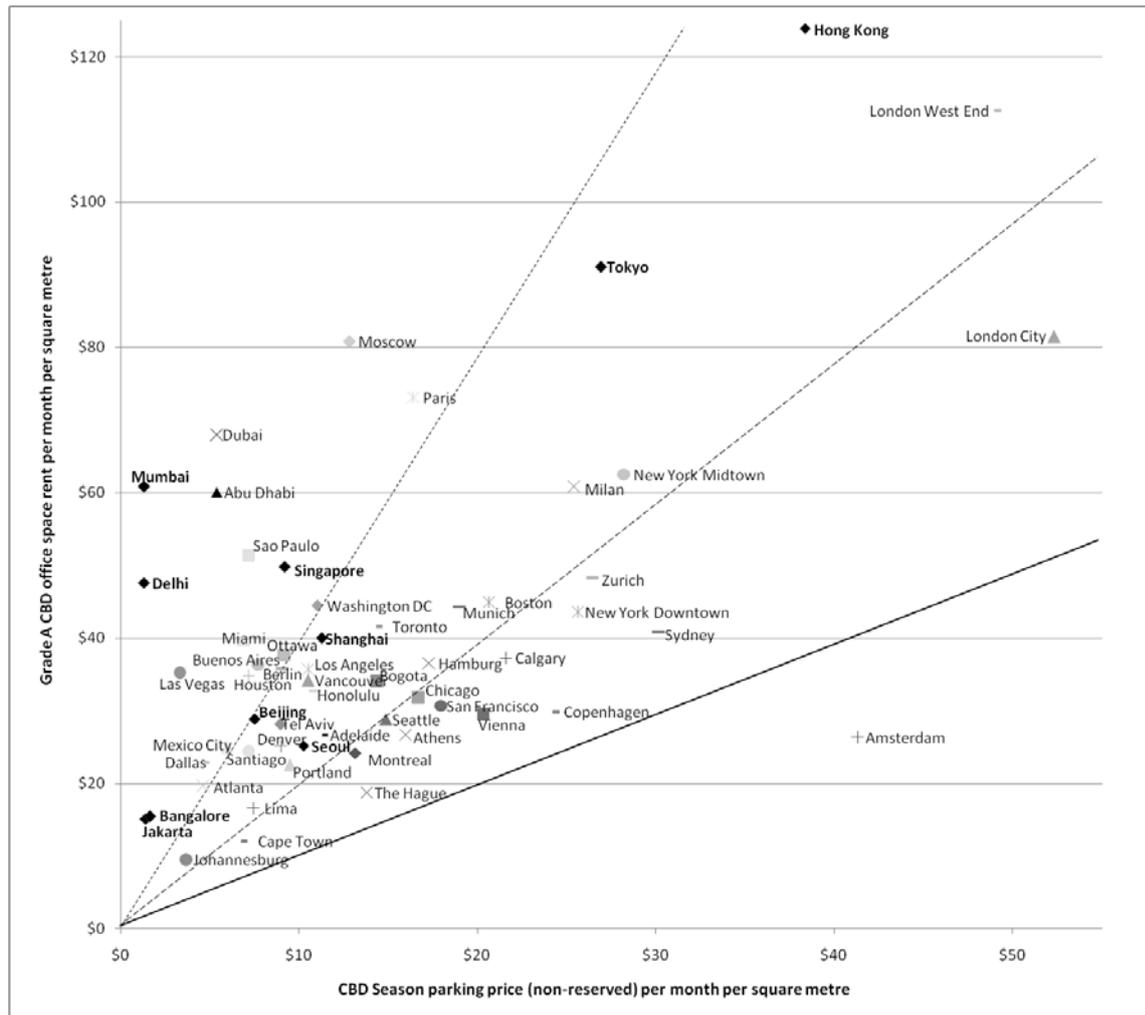
The next group of cities fall between the line with a slope of 2 and the one with a slope of 4, implying ratios of parking price to office rental between 0.25 and 0.5. Beijing, Hong Kong, Seoul, Shanghai, , and Tokyo fall into this group. Even though CBD parking prices in Hong Kong and Tokyo are among 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 sizeable 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 (on a rent per square meter basis) in Many

International Cities, based on Colliers International data sources

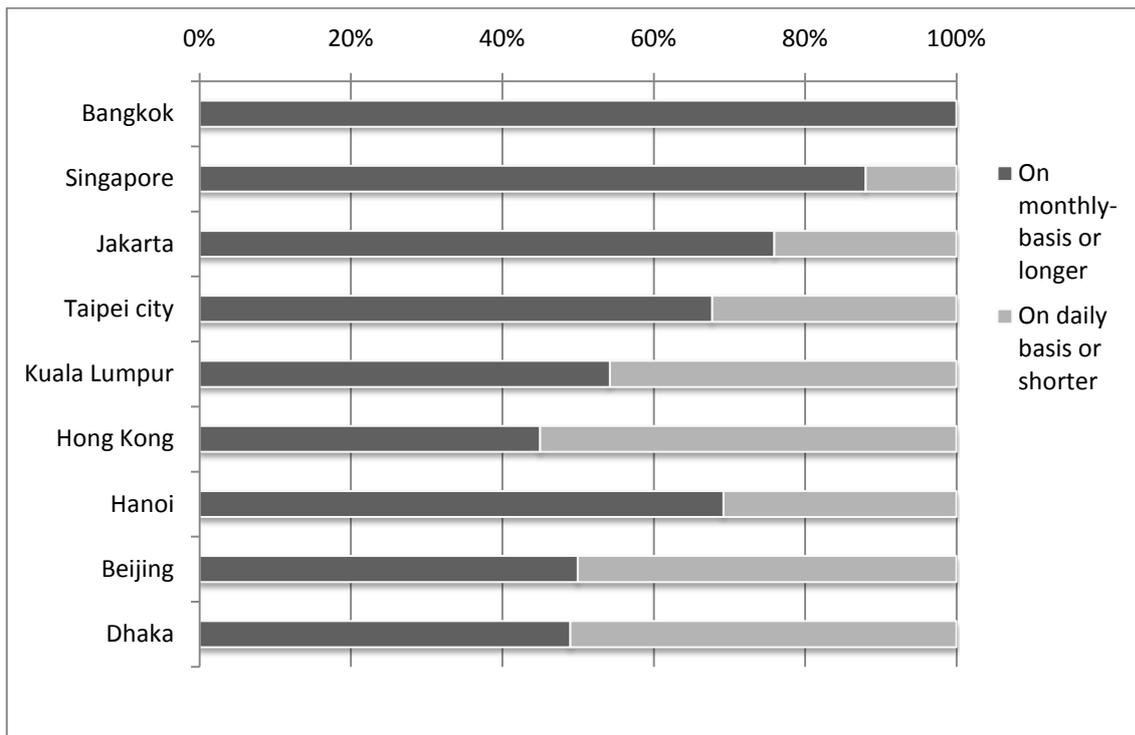


Sources: Prepared from data in Colliers International (2009a) and Colliers International (2009b)
 Note: In calculating the parking price per square meter, the Colliers figure for the monthly non-reserved price was divided by 19.5 m² (an estimate of the space required for a parking space, including aisles, etc.).

8.6 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 TDM signals might be higher if large numbers pay for parking anew every day. Only Bangkok and Singapore were dominated by season pass arrangements.

Figure 12 Work-based Parking Paid on a 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.

8.7 Use of off-street parking facilities outside destination premises

How significant is priced off-street parking outside destination premises? And which is more important in this, 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, Hanoi, 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, Hanoi, 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)

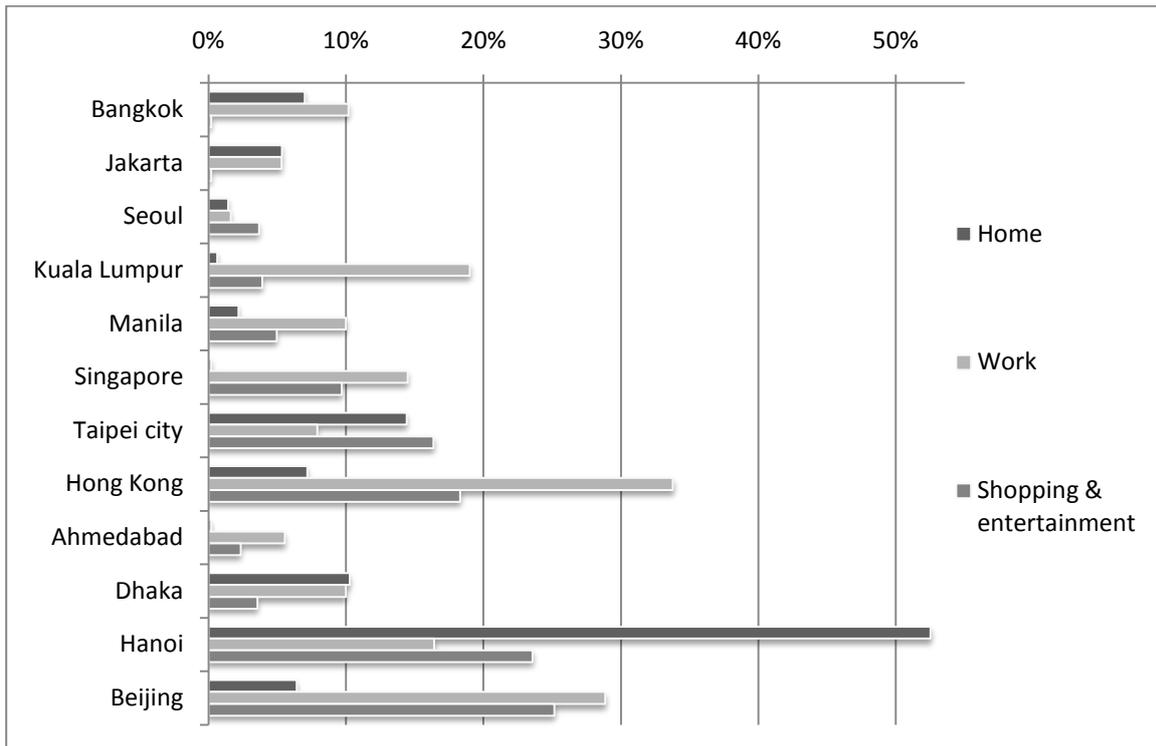
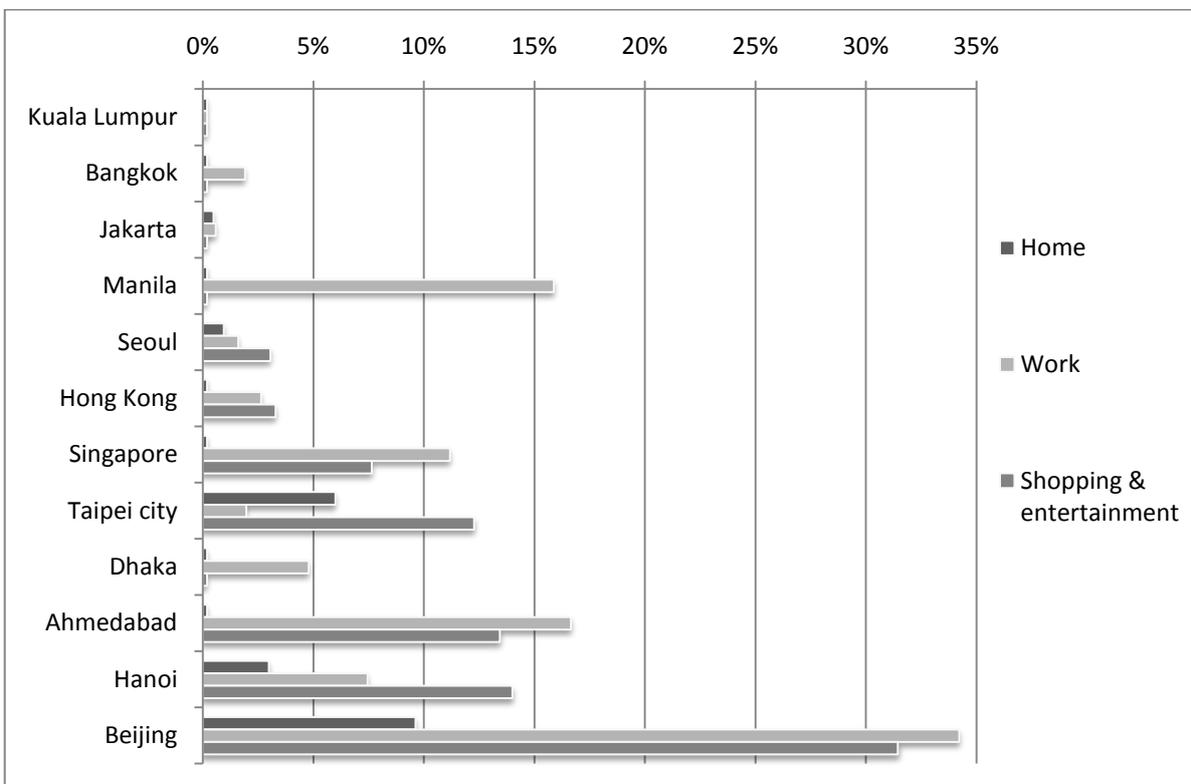


Figure 14 Importance of Public-sector Off-street Parking (% of survey respondents' parking for each purpose)



Notes: 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.

9 Motorcycle Parking

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

9.1 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 Hanoi, 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 to 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 m² per car and 2.5 m² to 3.0 m² per motorcycle, or about 8 to 10 motorcycle spaces per car space (Vietnam Ministry of Construction 2004).



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

9.2 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.



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

9.3 Prices of motorcycle parking relative to prices for cars

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 Section 9.1 above). 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 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 Hanoi, 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.



Motorcycles parked in Ahmedabad's old walled city area

9.4 Motorcycle parking requirements

Chapter 3 discussed regulations which 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 don't exist. Table 25 provides details. The cities are arranged roughly according to the importance of motorcycles in each.

Table 25 Motorcycles in Parking Requirement Regulations

	Motorcycle parking required under the parking standards for buildings?
Hanoi	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)

Note: See Appendix 12.2 for more information on sources of parking requirement regulations.

10 Parking Policy Trajectories?

One way to interpret the findings of this study is to think about parking in terms of development trajectories or pathways. The table below 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 based are nearer the bottom. Of course, none are 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, the US, and western Europe.

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

Apparent parking policy trajectories overall	
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 Seoul 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 HK. 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 Guangzhou 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. Mainland cities have price controls on private-sector parking which may undermine this potential.
Hanoi	Parking policies not yet strongly developed (since car ownership is very low). May be heading in a similar direction to the mainland Chinese 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 Jakarta Kuala Lumpur 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 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.
Australia 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 CBDs. Recent experiments with Shoup-inspired market-clearing on-street pricing in small number of US inner city areas.
Western Europe	Demand-realistic conventional in many suburban areas (in UK with 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.

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

In the sections below, 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.

10.1 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 are 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 occupies levels 4 to 11 of this 19-storey building in central Bangkok

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/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.

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 towards further supply-side solutions in a vicious cycle that is similar to much American parking politics. For example, Malaysian parking requirements are regularly revised upwards

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.

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

Policymakers 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 non-residential buildings are lower in Hong Kong, Seoul, and Singapore than those of the requirement 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.

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, China 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, China has language 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.

10.3 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 which 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 too, 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/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 CBDs.

10.4 A middle path in Taipei city

The parking scene in Taipei city of Taipei, China 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/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 towards a multi-objective parking management approach. Its pioneering initiatives in managing on-street (and pavement) motorcycle parking is 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.

10.5 Beijing and Guangzhou

These cities show similarities to the trajectory of Taipei city of Taipei, China. 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 various other Chinese cities).

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 Chinese cities' parking systems have some promising features. Pricing of parking is widespread. For example, more than 40% of 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.

10.6 Hanoi

Hanoi's car ownership is at a much lower level than in the Chinese 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 which 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 Hanoi has much home-based parking taking place outside home compounds. Most is 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, Hanoi 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 Hanoi's parking problems.

10.7 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 the top parking policy priority as expanding supply. They want stronger and better enforced off-street parking requirements. Both cities have recently renewed enforcement efforts against buildings where required parking was converted to commercial floor space. Dhaka's requirements were revised upwards 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/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 towards a costly and destructive auto-centric approach, as seen in parts of Southeast Asia.

11 Policy Lessons and Conclusions

This chapter highlights policy lessons that emerge from this study.

11.1 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.

11.2 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 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.

11.3 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.

11.4 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 of the Asian cities in the study it appears that little parking is built by private developers unless it is exempt from being counted towards 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 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, the 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).

11.5 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 built space in dense cities. Nevertheless, it is being expanded in several cities, especially in 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.

11.6 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.

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

Whether parking space is exempt from counting towards 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.

11.8 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.

11.9 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 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.

11.10 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 (Seoul is 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.

11.11 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 Singapore, Hong Kong, Seoul, Beijing, Guangzhou, Bangkok, the Kuala Lumpur area 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.

11.12 Low minimum parking requirements do not necessarily limit parking

It is often assumed that minimum parking requirements which 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.

11.13 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 travel demand management 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 night-time 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.

11.14 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.

11.15 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.

12 Appendixes

12.1 List of interviews

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 below were met as a group.

Name	Affiliation
Ahmedabad	
Gautam Patel	Lecturer and consultant, Center for Environmental Planning and Technology (CEPT) University
M.M. Anarwala	DCP 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 Karttripakkha), 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 – PRC office
Dai Wei	Transportation Research Institute, Planning Bureau, Guangzhou City Government
Hanoi	
Khuat Viet Hung	Professor, University of Transport and Communications, Hanoi
Le Do Muoi	Transport Development and Strategy Institute (TDSI), Ministry of Transport, Viet Nam
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-ye, 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.	Department of Civil Engineering, University of Indonesia

Name	Affiliation
Tangkudung	
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)
Seoul	
Ko Joon Ho	Metropolitan Planning Research Group, Seoul Development Institute
Lee Song Youp	Seoul Metropolitan Government
Singapore	
Lew Yii Der	Group Director, Policy and Planning Group, Land Transport Authority (LTA)
Colin Lim	Deputy Group Director, Policy and Planning Group, LTA
Lina Lim	Director, Transport Planning, LTA
Kenneth Wong	Deputy Director, Local Planning, LTA
Sharon Wong	Acting 2 Deputy Director, Policy, LTA
Adele Tan	Deputy Director, Planning Policies Department, Physical Planning Group, Urban Redevelopment Authority (URA)
Gerry Ong	Car Parks Division, Land Sales and Administration Group, URA
Ong Thiam Huat	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 Taiwan University
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, US (Interviewed at Philippines International Parking Conference)
John Van Horn	Editor and publisher, Parking Today magazine, Los Angeles, CA, US (Interviewed at Philippines International Parking Conference)
Brendan McFarlane	Secure Parking Philippines and formerly with Secure Parking India (Interviewed at Philippines International Parking Conference)
Peter Guest	Parking consultant, UK (Interviewed at Philippines International Parking Conference)

12.2 Sources on parking requirement regulations

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

12.2.1 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)."

12.2.2 Bangkok

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

12.2.3 Beijing

Sources in Chinese below were provided by Mr. 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) (http://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)" (<http://www.fl168.com/Lawtext-View-36726>)

12.2.4 Dhaka

Translation of Dhaka's parking requirements (in Bengali) was provided by Maruf Rahman of WBB Trust.

12.2.5 Guangzhou

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

12.2.6 Hanoi

Hanoi parking standards information sources were translated and interpreted by Ms. 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, Hanoi - 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)

12.2.7 Hong Kong

Hong Kong Planning Department, Hong Kong Planning Standards and Guidelines, Chapter 8 Internal Transport Facilities, May 2009 edition. (http://www.pland.gov.hk/pland_en/tech_doc/hkpsg/index.html)
Buildings Department, Practice Note for Authorized Persons and Registered Structural Engineers 13, Calculation of Gross Floor Area and Non-accountable Gross Floor Area Building (Planning) Regulation 23(3)(a) and (b). Ref: BD GP/BREG/P/9 (VII). First issue December 1974. Last revision July 2006. This revision April 2007 (AD/NB1) – (Paragraph 12 revised). Index under: B(P)R 23(3) – Calculation of Gross Floor Area and Non-accountable Gross Floor Area] via http://www.susdev.org.hk/en/pdf/Pnap013_eng.pdf.

12.2.8 Jakarta

Guidelines on the technical details of urban planning, released by the Office of Planning, DKI Jakarta, March 1995 (in Indonesian) [*Pedoman Detail Teknis Ketatakotaan Dikeluarkan oleh Dinas Tata Kota DKI Jakarta, Maret 1995*]. Archived at <http://personal.rad.net.id/atelia/idx-dtk.htm>
Ministry of Public Works Regulation Number 29/PRT/M/2006 Regarding Technical Requirements for Building Construction (in Indonesian) [*Peraturan Menteri Pekerjaan Umum Nomor : 29/PRT/M/2006 Tentang Pedoman Persyaratan Teknis Bangunan Gedung*]

12.2.9 Kuala Lumpur

Planning Guidelines and Directions for Calculating Car Parking Requirements, Kuala Lumpur City Hall document. (in Malay) [Garis Panduan dan 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.]

12.2.10 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 below)

12.2.11 Seoul

Seoul Metropolitan Government, Department of Parking Planning (2009) (see reference list below)
Documents in Korean from Seoul City Government and Republic of Korea government websites:
Seoul parking installation and management ordinance 2009.07.30 4823 July 30, 2009 Ordinance No. 4823
Printer (revised) Chapter 4 annex parking lot
Regulations on Housing Standards [Presidential Decree No. 21811, Partial Revision on November 5, 2009]

12.2.12 Singapore

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

12.2.13 Taipei city

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

12.2.14 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, http://www.toshiseibi.metro.tokyo.jp/kenchiku/parking/kn_k12.htm
Description of Tokyo's parking ordinance, with worked examples. <http://www.archi-navi.com/archinavitool/a-kikaku-v1/setumei/tokyo-park.pdf>
Case studies of rules under the ordinance in Tokyo Parking <http://www.shibuya-kyogikai.jp/pdf/5th/2.pdf>
Yokohama parking requirement details
<http://www.city.yokohama.jp/me/toshi/toshiko/pressrelease/h19/07041700/pdf/osirase.pdf>
Regulations regarding parking facilities in buildings (Kagoshima)
http://www.city.kagoshima.lg.jp/_1010/shimin/1kurashi/1-9tyusyajo/0000534.html
Regulations regarding parking facilities in buildings (Okayama)
http://www.city.okayama.jp/toshi/tosai/tyuusyahuuchi_gaiyou.htm

12.2.15 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).

12.3 Sources for 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 http://www.chinapost.com.tw/china/local-news/beijing/2009/01/27/193705/Beijings-population.htm Beijing cars as reported at http://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.
Hanoi 2008			18	Linear extrapolation from 2001 estimate of 8 and 2005 estimate of 13 given in World Bank (2007, 24).
Hong Kong, China 2009	6,988,900	383,000	55	Pocket Data Guide "Hong Kong in Figures" via http://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 University of the Philippines; population figure from http://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).

12.4 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 have the use of
- [5] other _____

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] Other _____

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

- [1] Yes 
- [2] No [go to 5]
- [1] 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] Other _____

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] other (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] Other _____

9. [If parked] Was there a payment for that parking?
- [1] Yes →
- [2] No
- 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] Other _____
- 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?
- _____

10. What area or estate or neighborhood is the workplace located in?

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] Other _____

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: _____

12.5 Data on parking in real buildings

The table below details data from buildings that were used for

Table 10 Buildings (found in a small search) within Each Parking Provision Range for Various Cities. 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	http://www.atlan.com.my/propid.php
Kuala Lumpur	Menara Great Eastern	office	3.89	http://www.lifeisgreat.com.my/lig4/newlig/corporate/c_properties.htm
Kuala Lumpur	Plaza Pantai	office	3.74	http://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	http://www.33estate.com/corporate/kl_5.htm
Guangzhou	Skycity	office, commercial, residential	1.90	ITDP survey early 2009
Bangkok	Central Plaza Ladprao	retail	2.60	http://www.mallsindex.com/
Metro Manila	SM Megamall	retail	1.51	http://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	http://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	http://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
Metro Manila	ICEG/LKG Tower	office	1.08	Tall buildings of Asia & Australia, By Georges Binder
Fukuoka	Mitsui Building minami	office?	1.08	http://www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html
Guangzhou	Poly Center	office?	1.04	Colliers International listings accessed 13 December
Melbourne	71 Palmerston Crescent	office, retail	1.48	Colliers International listings accessed 13 December
Fukuoka	Mitsui Fudosan Building Yasuda	Office?	1.01	http://www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html
Metro Manila	Ecoplaza	office and retail	1.00	http://www.joneslanglasalleechiu.com.ph/Philippines/EN-GB/Pages/PropertyDetail.aspx?ItemID
Bangkok	Gaysorn Plaza	retail	0.99	http://www.mallsindex.com/
Taipei city	Asia Plaza A,B,C	office	0.99	http://www.libertytimes.com.tw/2007/new/apr/26/today-e7.htm
Jakarta	Kuningan City	office, retail, residential	0.88	http://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	http://www.asiapacificpartnership.org/pdf/BATF/5th_meeting/IV.Green_Buildings_in_Korea.pdf
Jakarta	Thamrin Residences	residential, office, hotel	0.81	http://www.agungpodomoro.com/projects1.php?menu=2&idx=4
Guangzhou	Grand Emerald	office, commercial, residential	0.80	ITDP survey early 2009

City	Building Name	Use	Parking per 100 m ²	Source
Tokyo	Tower colliers id 1358	office	1.11	Colliers International listings accessed 13 December
Guangzhou	Cityplace	residential, hotel	0.75	ITDP survey early 2009
Metro Manila	PBCom Tower	office	0.74	http://www.lifeisgreat.com.my/lig4/newlig/corporate/c_properties.htm
Singapore	Ngee Ann City	Office, retail	0.72	Colliers International listings accessed 13 December
Bangkok	Siam Paragon Thai	retail	1.00	http://www.mallsindex.com/
Taipei city	Nei Hu District bldg.	office?	0.69	http://www.colliersid.com
Singapore	Mapletree Business City	office and business park	0.69	http://www.corporatelocations.com.sg/future_developments.html
Tokyo	19 8 Kyobashi 1-chome	office	0.68	http://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	http://www.mitsuidosan.co.jp/corporate/branch/kyushu/office/index.html
Shanghai	1211 Mudanjiang Rd	office	0.65	Colliers International listings accessed 13 December
Guangzhou	Mayfair Tower	residential	0.64	ITDP survey early 2009
Singapore	SPRING Singapore	office	0.61	http://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	http://www.colliersid.com
Fukuoka	Nishizima Mitsui Building	office?	0.55	http://www.mitsuidosan.co.jp/corporate/branch/kyushu/office/index.html
Shanghai	116 Nanjing Rd W	office?	0.53	Colliers International listings accessed 13 December
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
Beijing	Tian Yuan Gang Center	office mainly	0.51	Colliers International listings accessed 13 December
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	http://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 1-1-1 Tenjin Chuo-ku	office?	0.41	http://www.mitsuidosan.co.jp/corporate/branch/kyushu/office/index.html
Tokyo	Sasazuka Center Building	office	0.41	http://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	http://www.asiapacificpartnership.org/pdf/BATF/5th_meeting/IV.Green_Buildings_in_Korea.pdf
Shanghai	299 Tong Ren Rd	office	0.39	Colliers International listings
Guangzhou	Burgundy Forbes Tower	commercial, residential	0.38	ITDP survey early 2009
Guangzhou	Rosewood Pointe	residential	0.38	ITDP survey early 2009

City	Building Name	Use	Parking per 100 m ²	Source
Guangzhou	The Capital Towers	office?	0.38	ITDP survey early 2009
Shanghai	488 Yincheng Rd (M)	office	0.35	Colliers International listings
Shenzhen	8 Shun Hing Square	office	0.32	http://buildingdb.ctbuh.org
Shanghai	318 Fu Zhou Rd	office	0.32	Colliers International listings
Tokyo	Fujimi Building	Office	0.32	http://www.iino.co.jp/kaiun/english/estate/building.html
Shanghai	288 Nanjing Rd W	office?	0.32	Colliers International listings
Tokyo	Shiodome Shiba-Rikyu Building	office	0.29	http://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	http://www.iino.co.jp/kaiun/english/estate/building.html
Tokyo	Nihombashi Mitsui Tower	office, hotel, retail	0.27	http://www.mitsuifudosan.co.jp/english/home/news_20050729.html
Singapore	Straits Trading Building	office	0.22	Colliers International listings
Sydney	66 Goulbourn St	office, retail	0.23	Colliers International listings
Tokyo	Iino Takehaya Building	office	0.15	http://www.iino.co.jp/kaiun/english/estate/building.html
Tokyo	Chiyoda bldg	office	0.15	http://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
Fukuoka	TENJIN 216	office?	0.00	http://www.mitsuifudosan.co.jp/corporate/branch/kyushu/office/index.html

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