

Off-Street Parking Policy Surprises in Asian Cities

Paul A. Barter

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ABSTRACT

This paper analyses findings on policy towards non-residential, off-street parking supply from a study of large metropolitan areas in East, Southeast and South Asia. The study provides the first international comparative perspective on the issue for a region where parking challenges are widespread and acute. It utilises (and helped to refine) a new typology, which groups parking policy approaches into ‘conventional’, ‘parking management’ and ‘market-oriented’ categories. Several distinct parking policy orientations are identified among the cities studied. Given their characteristics (most have relatively low car-ownership, high-density development and with high usage of public transport) most of these Asian cities might be expected to have off-street parking policies akin to those found in older areas of western cities that have comparable characteristics. Yet, parking policies that are surprisingly conventional and promoting of automobile-dependence prevail in most of the Southeast and South Asian cities studied. It is less surprising that a number of Asian cities (mostly in East Asia) do not have such an auto-centric conventional approach. However, it is a surprise that their parking policy approaches still involve minimum parking requirements and have generally not adopted the most common western alternative to the conventional approach (parking management).

Keywords: parking, parking policy, Asian cities, planning

Introduction

This paper places the off-street, non-residential parking policies of Asian cities into international perspective, drawing on the results of a wider study of many aspects of car parking policy in these cities (Barter, 2010b). Attention to parking policy in this region is important because parking has been neglected in the urban policy and transport policy literatures on non-western cities. This is despite parking policy having significant urban consequences and being increasingly debated in the west (Shoup and Pickrell 1979; Ison and Rye 2006; Kaehny 2008). In particular, the suburban supply-focused approach to parking policy, with its emphasis on minimum parking requirements, has come under sustained criticism for wastefully shifting parking costs from car users to everyone in society and for contributing to car-dependence, among other problems (Litman 2006; Shoup 2005).

Furthermore, the parking situations in many Asian cities are already problematic, despite relatively modest motorisation, and there are reasons to expect parking to be a growing challenge. Rapid urbanisation in the region means that today's choices will shape a vast future stock of urban fabric. Rapid motorisation and its uncertain future pace make planning for parking difficult. High urban densities make parking space especially disruptive and give it a high opportunity cost.

Informed parking policy-making is hindered by an existing literature that is short of international comparisons. There are limited exceptions in the grey literature (Booz Allen Hamilton 2006; de Wit 2006; Seoul Metropolitan Government 2009). There are scattered studies of parking policies in various countries but they are not easily used to build a comparative perspective. There appear to be no comparative overviews of this topic for regions outside the Global North.

The focus here on off-street non-residential parking requires explanation. Off-street parking supply is widely believed to be a pre-requisite to solving on-street parking problems in commercial streets and centres of activity. Parking problems (or perceived problems) in such locations generally involve parking by employees, clients, customers and other visitors. Arguably, getting efficient on-street parking outcomes depends primarily on effective *on-street* parking management. However, this is difficult both practically and politically. Many jurisdictions therefore make *off-street* non-residential parking the main focus of their efforts to address on-street problems, making off-street parking policy a key feature of urban management in the most intensely-used, high-profile parts of most cities. Although on-street parking policy is generally beyond the scope of this paper, it often interacts with off-street parking policy and will need to be briefly mentioned in several places. Similarly, although residential parking policy cannot be completely divorced from other parking, it has its own distinctive complexities and could not be addressed in this paper.

The cities in the study are diverse (Table 1). Among this group, car ownership and income levels vary widely. None of these Asian cities has western levels of car ownership (generally over 500 cars per 1000 residents). Ahmedabad, Beijing, Dhaka, Guangzhou and Hanoi are ‘newly motorising’ cities. They are discussed together when appropriate, although car ownership in the Chinese cities has overtaken that of some longer motorising cities, such as Manila and Hong Kong.

A key aim of the paper is to provide a clear comparative perspective on the approaches to off-street non-residential parking in these Asian cities. This is achieved with the help of a conceptual framework which categorises parking policy approaches based on contrasting fundamental assumptions and objectives (see Conceptual Framework: Approaches to Parking Supply Policy). The results reveal surprises and significant policy implications.

Table 1: Key data on the cities in the study

	Population (millions)	Car ownership (per 1000 persons)	Economy GDP/capita (PPPS 2008)
Singapore	4.6	112 (2008)	50,456
Hong Kong	7.1	55 (2008)	43,954
Tokyo	35.2	335 (2008)	34,173
Taipei	6.3	253 (2008)	30,942
Seoul	19.9	227 (2005)	27,620
Kuala Lumpur	5.8	314 (estimate)	13,816
Bangkok	8.3	330 (estimate)	8,216
Beijing	14.0	103 (2008)	5,958
Guangzhou	13.2	84 (2008)	5,958
Jakarta	22.0	203 (2006)	3,975
Manila	20.8	82 (2007)	3,507
Ahmedabad	5.4	55 (2007)	2,923
Hanoi	2.4	18 (estimate)	2,788
Dhaka	10.1	27 (2009)	1,501

Sources are listed in Appendix 1

Methods

Local field assistants and collaborators helped gather data in each city in the second half of 2009 (see Acknowledgements). More than 65 interviews were conducted. A wide range of documents were sought and consulted, including parking policy documents, academic studies, planning regulations, transport policies and studies, local area parking studies and news media reports on parking. Specific sources for comparisons of parking regulations in this paper are listed in Appendix 2. Surveys of motorist parking behaviour were carried out in most of the cities. These inform some of the analysis here but are not reported on directly in this paper. Direct observations played a role in the study but we did no new parking inventories, occupancy surveys, turnover studies or measurements of cruising for parking. Systematic walking tours were used to examine parking in a diversity of locations across each

city. The focus was not just on Central Business Districts (CBDs) but on parking across whole metropolitan areas.

Conceptual Framework: Approaches to Parking Supply Policy

This section presents a typology of parking policy approaches (Table 2) that builds on previous work by the author (Barter, 2010a) and is based on the international literature on parking supply policy, including Asian examples. This study of Asian parking provided a test of the utility of this framework outside western contexts and prompted some refinements.

Table 2: Contrasting approaches to parking policy

Approaches to parking policy		Central goals	View of spillover	View of supply and demand
Conventional	<i>Auto-centric</i>	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
	<i>Demand-realistic</i>	Avoid both scarcity and wasteful surplus	To be avoided. Small risk of it accepted and mitigation planned for	Supply planned to meet demand, which is assessed based on actual context
Parking management	<i>Multi-objective</i>	Plan parking to serve wider urban & transport policy goals	A source of conflict but expected and managed with active policy	Both supply and demand may be managed or planned
	<i>Constraint-focused</i>	Constraint of car travel to certain locations		Constraint of parking supply is a key demand management tool
Market-based		Ensure demand, supply and prices are responsive to each other	Defused as a problem. An expected part of parking market	Supply and demand both shaped by market actors' behaviour, informed by market- prices

Source: Based on discussion in this section.

Much of the world's urban fabric is subject to the conventional approach in which minimum parking standards are the key tool, aiming to eliminate any risk of 'spillover' of parking from the premises (especially into the streets). Off-street parking is seen as an ancillary service for each site. One stream within this conventional approach is consistent with and promoting of automobile-dependence. It is used in suburban North America and Australasia where minimum parking requirements are estimated based on data from isolated buildings with no pricing of parking (Shoup 1999). The typology terms this the 'auto-centric conventional' approach.

One alternative to the above approach falls within the 'conventional' category but is distinguished by its less automobile-dependent assumptions about the 'demand' for parking. This stream is called 'demand-realistic conventional parking policy'. It involves minimum parking requirements based on more realistic assessments of demand for each site in its actual context (Forinash et al. 2003; Litman

2006). This applies in some older parts of American and Australian cities and is widespread in Europe as well as in parts of Asia, as we will see.

The second broad approach can be called ‘parking management’, in which parking is viewed as part of the transport infrastructure for each locality and as a potential tool for wider transport policy and urban planning goals. Since transport policy and urban planning involve multiple objectives, parking management usually does too. These may include efficiency, reducing parking conflict, revenue, urban regeneration and mobility management (Marsden 2006; McShane and Meyer 1982). Ensuring ‘adequate’ supply may sometimes remain an objective to be achieved by various means but this will be just one of several goals.

Parking management is a broad school with considerable variation, depending on the relative priorities given to the objectives being pursued. Multi-objective parking management often accepts some risk of parking spillover and includes tools to minimise it, manage its impacts (including in the streets), and deal with any conflict (Litman 2006). It has been increasing in sophistication and is credited with success in dense urban contexts and activity-centres in Europe (de Wit 2006).

Parking management also has a second important sub-stream. This arises when traffic demand management becomes the overriding objective so that parking supply is actively constrained (Booz Allen Hamilton 2006). Such ‘constraint-focused parking management’ has been applied in many city centres in the west.

Market-oriented parking thinking is the third broad approach. It is less familiar than the first two, although it has a long history (see for example, Roth 1965). It has rarely been consciously applied via stated policy but, in practice, many city centres have functioning market-based parking arrangements. This policy stream has become prominent through the work of Donald Shoup (2005). He suggests an integrated set of parking reforms for American cities: i) charge demand-responsive market-clearing prices for on-street parking (in order to defuse spillover as a problem); ii) make this politically attractive by having the revenue managed locally and devoted to local civic improvements; and iii) abolish planning requirements for off-street parking. Market-oriented thinking on parking does not require parking policy to explicitly serve other urban objectives. Instead it seeks to ‘let prices do the planning’.

Both the parking management and the market-oriented streams of parking policy see parking demand as a vicinity-wide phenomenon not as something to be associated with specific buildings. They are suited to ‘park-once’ localities and may actively foster them.

The typology enables more clarity than usual on the alternatives to automobile-oriented conventional parking policy. It highlights that these alternatives are fundamentally different from each other, with contrasting assumptions about the objectives of parking policy and about the nature of parking problems. These approaches are so different that it is not surprising that participants in parking policy debates often seem to lack a common framework for thinking about parking, let alone common thinking on what should be done.

I now proceed to compare the various key elements of off-street parking policy in the Asian cities in the study. It might be expected, given that most of the Asian cities have high population densities, relatively low car ownership, and a high modal share by public transport, that many of them will have parking policies dominated by constraint-focused parking management. In the west, this is the approach most closely associated with the least car-oriented localities. However, the actual findings in the Asian cities were more diverse and interesting, as we will see.

Parking Requirements

This section examines car parking supply standards as they are applied to non-residential real estate developments. These standards usually involve specifying the minimum number of parking spaces that must be built with each development ('minimum parking requirements').

All of the Asian cities studied have minimum parking requirements (Table 3). This is surprising since this policy is often associated in the west with fostering automobile dependence. However, the parking standards in the Asian cities do vary substantially in their style and their levels (Barter forthcoming).

Table 3: Car parking required with office and retail buildings (spaces per 100m² of gross floor area)

	CBD office building	Non-central office building	Shopping centre (non-central)
Tokyo	0.3	0.3	0.4
Beijing	0.5	0.5	0.3
Singapore	0.2	0.5	0.5
Hong Kong	0.4	0.6	0.4
Dhaka	0.5	0.5	0.5
Guangzhou	0.6	0.6	0.6
Ahmedabad	0.7	0.7	0.7
Taipei	0.7	0.7	0.7
Seoul	0.1	1.0	1.0
Hanoi	1.0	1.0	1.0
Manila	1.3	1.4	1.0
Jakarta	1.0	1.0	1.7
Bangkok	1.7	1.7	2.6
Kuala Lumpur	1.5	2.6	2.7

Note: Comparing complicated parking requirements was made feasible by examining hypothetical standard buildings

(office and retail). The 'standard buildings' used were: a CBD office building of 25,000m² gross floor area; a 'non-central' office building of 25,000m² gross floor area; and a medium-sized, non-central shopping centre with 25,000m² gross floor area.

Sources: Listed in Appendix 2.

It is striking that the richest cities in the study (Tokyo, Singapore and Hong Kong) have among the lowest minimum parking requirements. The highest parking requirements are in middle-income cities (Kuala Lumpur, Bangkok, Jakarta and Manila), although these are still below the extremes found in suburban areas of the USA, where it is common for more than 3.0 parking spaces to be required per 100m² of floor space (Shoup 2005, 81).

In the west it is increasingly common for CBDs to have particularly low parking requirements. Among the Asian cities this is seen only in Singapore and in Seoul, although Hong Kong also has the flexibility to allow low levels of parking in its financial district. In major business districts in Seoul there are also parking maximums (or limits on the parking that can be provided with each building) (see Parking as a Travel Demand Management Tool below).

It is useful to examine parking standards in light of the car ownership estimates in Table 1. Of course, parking supply policy for non-residential destinations is only indirectly connected with rates of car ownership. It would be expected to be more influenced by parking demand, and hence by rates of car use generally. Nevertheless, car ownership provides one simple and relatively easily-obtained indicator of the importance of automobiles in the transport system. A comparison of parking standards and car ownership estimates (Barter, forthcoming) reveals that Tokyo has surprisingly low minimum parking requirements for commercial buildings relative to its level of motorisation. Seoul's and Taipei's parking standards are also modest, being little higher than those of most of the newly motorising cities and lower than those of Manila and Hanoi, despite Seoul and Taipei having much higher car ownership levels.

A noteworthy feature of parking standards in some Asian cities is that they exempt small buildings below a certain floor area. Japan's approach is especially striking, since the thresholds are set quite high at 1500 or 2000 m². Furthermore, above the threshold the requirements phase in only gradually so that they are at full force only from 6000 m² floor area and above. Several other cities also exempt small buildings but have much lower thresholds (500 m² or below). These include Taipei, Guangzhou, Hong Kong, Bangkok and Ahmedabad.

What influences the parking supplied with buildings?

It is usually expected that minimum parking requirements will result in more parking than would be provided otherwise. There is some uncertainty over this in the United States, although the evidence is strengthening that minimum requirements do increase supply (Franco, Cutter, and DeWoody 2010). However, this is complicated by various factors. Minimum parking requirements do not prevent extra parking for example. Incentives to provide such additional parking may also be influenced by the extent to which parking is counted in the allowable built space (gross floor area or GFA) of the building under the planning rules. This has generally been ignored in the literature on parking supply policy.

Parking standards are also sometimes defied, especially in South Asia, suggesting that some building owners would prefer less parking than regulations require (CSE India 2009). This is allegedly an opportunity for corruption in local government (Mahmud 2007). In Ahmedabad and Dhaka, the practice has led to enforcement action involving demolitions of basement shops that were occupying space which was designated as parking in the approved plans (Figure 1). Isolated examples of diversions of required parking were also reported in Bangkok, Beijing and Hanoi. The exercise of flexibility by planners may also cause deviations from published requirements and many existing buildings may have been built under earlier requirements. More research is needed into the effects of parking regulations in practice.



Figure 1: Basement in Dhaka presumably planned as parking space then used for shops which have now been demolished in enforcement action.

Source: Author's photograph. *[Colour file submitted for web and Black and White version submitted for print]*

Government Resources Devoted to Off-Street Parking Supply

Many local governments worldwide devote public-sector resources to boosting parking supply. This usually involves investments in parking structures or open-lot parking on public-sector-owned land. It is revealing to observe the extent to which parking is deemed worthy of taxpayer money despite poor returns on the investment. However, one advantage of government-provided parking is that it is usually open to the general public and becomes shared parking for its vicinity.

Most local governments in this study have tried to directly supply off-street parking but few have been able to create much. Table 4 presents a qualitative assessment of these efforts. It is notable that the East Asian cities which rely less on parking requirements have tended to put more effort into public-sector shared parking facilities than the middle-income Southeast Asian cities which have higher parking standards. Recently, the affluent East Asian cities have been reducing their emphasis on parking supply expansion, scaling back public-sector parking investments and shifting existing facilities to market prices. However, newly motorising cities in the study remain keen on government-built parking.

Table 4: 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	Modest but expanding	Local government runs some parking facilities. Seeking to build many more. Underground parking in key activity centres. Parking structures at subway stations. Progress said to be slower than expected.
Guangzhou	Modest but expanding	City government runs some multi-storey facilities, is building more and has plans for more. Progress said to be slower than expected.
Ahmedabad	Small but seeking to expand	One municipal multi-storey facility. Seeking private participation for more. Parking on parcels of municipal land, some free, some priced and managed by contractors.
Hanoi	Modest but seeking expansion	A city-government company runs 4 major open-lot or covered ground-level lots. In 10 inner districts, there are 338 tiny government-owned parking 'points' for cars (most are sections of street or pavement). Identifying more sites is hindered by high land prices. Private participation proposed.
Dhaka	Very small but wants to expand	One government-owned multi-storey public parking facility has been built in Motijheel office-district. Remains partially empty, despite saturation of 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.
Seoul	Small relative to all parking	Local government builds parking under parks and schools and open lot facilities in some districts. Expanding only in certain residential areas.
Taipei	Modest and not expanding	City government has underground or multi-storey facilities, often under parks. Development bonus for private-sector public parking (until 2010)
Tokyo	Small and not expanding	Tokyo Government and Ward governments run underground or multi-storey facilities in various districts. Small subsidies for private-sector public parking.
Singapore	Important if public housing parking is counted	Government-built parking is mostly in public housing estates. It is open to the public to some extent and serves some commercial activity. The planning agency, URA, runs a few surface parking areas.
Hong Kong	Significant if public-housing included	Public Housing Authority has divested a large proportion of its parking. A few other government-built multi-storey facilities exist. Some open lot ('short-term tenancy') sites on government land are leased to private operators.
Bangkok	Small and little expansion except for park-and-ride	City government runs at least one multi-storey parking facility (in the old city) and a small number of other off-street parking lots. Other agencies run some park-and-ride parking facilities.
Kuala Lumpur	Small and not expanding	Some local governments, primarily Kuala Lumpur and Petaling Jaya, run a small number of facilities.

Manila	Small and not expanding	Some local governments run one or more parking facilities. Some open lot municipality-owned lots.
Jakarta	Tiny and little interest	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.

Pricing practices also provide insight on the role of government-provided parking. City parking agencies are usually under contradictory political pressure to keep prices low and to recover costs. Public-sector parking prices are also rarely adjusted in light of changing demand. The resulting dilemmas are made worse if on-street parking is underpriced or poorly managed (as it often is). This can cause under-utilisation of city-owned off-street parking even at low prices. Dhaka’s Motijheel business district provides a prominent example.

Underpriced government parking (both off-street and on-street) risks crowding out private-sector parking investments (see *Parking as a Business*). However, market-pricing of government-provided parking would make it less disruptive of private sector parking businesses. City-owned parking in Tokyo and Hong Kong is now priced roughly in line with the private-sector operators in each vicinity. In Taipei, the city’s parking facilities have adopted demand-responsive pricing (albeit moderated by political negotiations) in which price reviews are triggered if occupancy is consistently above 80% or below 50%.

Some city governments offer incentives for the private sector to build more parking (and usually to open it to the public). Japan is an example, although the payments are relatively small. Until recently, Taipei used a planning bonus approach to encourage developers to build extra parking in return for up to 20% extra floor space. Such development bonuses may seem cheap but they do have an opportunity cost. The same bonus could have been used to promote something else, such as low-cost housing or public space.

Parking as a Business

The policies discussed above which seek to boost off-street parking supply are motivated by an assumption that private sector initiative alone would not provide enough parking. Nevertheless, many cities do have much parking which is operated as a business. Such commercial parking is usually open to the public rather than serving specific buildings or clients. Specific parking facilities are thus seen as serving a whole vicinity, in ‘park-once neighbourhoods’.

A set of policies that fosters a rich local market of commercial parking could be considered a market-oriented approach. Planners should, in theory, be able to worry less about spillover in localities that

have a supply of commercial parking (with market prices that influence both supply and demand) compared with areas that lack such a pool of market-responsive parking. This is apparently already the situation in many urban neighbourhoods of various eastern Asian cities, as we will see below.

Commercial parking can be in open lots, in stand-alone structures, or within the premises of buildings where it may be run in-house or by a professional parking operator. Privately-owned parking structures that stand alone, apart from other buildings, are a common feature of city centres in the west but they are relatively rare in the Asian cities studied. Only in inner Tokyo and central Seoul were many of these observed, often in the form of automated parking towers.

In what contexts do we find ubiquitous commercial parking? It is currently rare to have parking policy that is explicitly market-oriented but commercial parking can emerge in other contexts too. It requires at least some scarcity to prompt high enough prices for profitable operation. For example, inner areas of many cities have parking scarcity as a result of having many older buildings that lack parking. Policies that deliberately constrain parking supply, as in many city-centres in the west, can also prompt pricing and a commercial parking industry. However, note that some parking management thinking is wary of private-sector commercial parking because such parking is usually outside the direct control of parking policy makers (de Wit 2006; Marsden 2006). Interviewees in Taipei reported that a nascent industry of private for-profit parking structures was undermined in the 1990s by local government parking investments. Parking as a business is usually absent in areas with an auto-centric conventional parking policy, since the emphasis on supply tends to drive parking prices towards zero.

Most of the Asian cities in the study have at least some privately-owned public parking, especially in central commercial areas. Pricing and being open to the public are common features of parking in shopping centres and office buildings in busy urban localities in most of these Asian cities. Parking as a business is especially widespread in Tokyo and Hong Kong, even beyond their central areas. Several East Asian cities explicitly encourage owners of private parking to open it to the public. For example, Japan's subsidy policy and Taipei's development bonus incentive for parking (mentioned in the previous section) carry conditions that the extra parking must be open to the public. Seoul and the mainland Chinese cities have incentives for commercial buildings to open their parking to residents at night (Seoul Metropolitan Government 2009).

Commercial parking lots on vacant land are another common form of parking business in some cities. Tokyo is especially striking for its numerous small vacant lot parking facilities. These can contribute to the depth of local parking markets but they are also a source of concern. In Japan and in central Kuala Lumpur they are said to play a role in causing localised oversupply of parking. Hong Kong's

allegedly undermine incumbent parking facilities that have higher fixed costs and sunk investments. Surface parking is a low-value long-term use of inner city land but it can be inadvertently encouraged by property taxation based on actual rather than potential use (or land value). In Tokyo, tenancy regulations also inadvertently encourage plots to be held vacant (Kanemoto 1997) and it is very easy (or automatic) to get permission to use such spaces for parking.



Figure 2 A tiny coin-operated parking lot on a vacant building plot in central Tokyo

Source: Author's photograph. [*Colour file submitted for web and Black and White version submitted for print*]

Internationally, it is rare for the prices of parking run as a business to be regulated. Any such regulation is obviously inconsistent with fostering local markets in parking. However, Beijing, Guangzhou, Hanoi and Jakarta do control private-sector parking prices. This unfortunately opens them to the difficult politics of public-sector price setting. It also suppresses supply, inflates demand and discards the information value of market prices. In both Hanoi and Jakarta, reports of violations of the price caps suggest that the official prices are much lower than market prices would be, at least in the urban core. However, observations in the Chinese cities of Beijing and Guangzhou suggest that the official parking price caps are not yet too divergent from market prices.

Parking as a Travel Demand Management Tool

Despite widespread traffic congestion and a desire for solutions to it, surprisingly few of the Asian cities in this study use parking as a deliberate mobility management (or travel demand management – TDM) tool. Such policies would generally reflect a ‘parking management’ approach to parking policy.

The only really clear Asian example is Seoul where parking maximums apply to buildings in its core centres of activity. Seoul's 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 new parking maximums are set at about 50% of the usual minimums (Seoul Metropolitan Government 2009). In Seoul's case, it is the parking linked with each building that is constrained, not parking overall. This differs from most western parking constraint which more often caps overall supply within a central area and, in some cases, bans new public parking garages (Booz Allen Hamilton 2006; Kaehny 2008). Parking businesses have become common in Seoul's parking limitation areas to take the spillover. The Seoul survey for the wider study revealed that user payments for parking were common in these business districts but rare elsewhere in Seoul.

In North America and in Europe, workplace-based mobility plans or TDM programs frequently include a parking element, such as efforts to contain parking demand (Litman 2002). These can pay off by helping enterprises avoid the expense of parking expansions or by allowing reductions (in negotiation with local government). However, in the Asian cities studied only Seoul had such a program. Eliminating free parking for employees is the most widely adopted element of the Seoul Metropolitan Government's workplace TDM program, taken up by around 1200 workplaces as of 2008 (Ko 2009).

Beijing, Guangzhou and Taipei show signs of a shift towards a parking management approach and away from 'conventional' supply-side policies. For example, their on-street and public-sector parking prices have concentric zones with the highest prices in the urban cores. In early 2010, Beijing lowered the price of public-sector off-street parking in order to discourage cruising for on-street places.

The only TDM-related parking management policy that is widespread among the Asian cities in the study is the promotion of park-and-ride facilities, in which commuters are encouraged to park at mass transit stations and complete their journey by public transport. The largest park-and-ride efforts were found in Beijing and Guangzhou but modest programs were also found in Bangkok, Kuala Lumpur, Hong Kong, Seoul, Singapore and Taipei. Unfortunately, many of these Asian park-and-ride facilities are located in densely built-up areas where the opportunity cost of such subsidised parking space is high and where other approaches to increasing the accessibility of mass transit are likely to be more cost effective.

Parking Policy Trajectories

It is now possible to synthesise the findings above in order to categorise the broad parking policy approaches of these Asian cities. Table 5 is organised with cities closest to the auto-centric conventional approach towards the top and with the most market-oriented at the bottom. Some in the

middle show signs of parking management. A simplified picture of parking policy in the USA, Australia and northwest Europe is also presented for comparison.

Table 5 Summary of parking policy paths in Asia and parts of the west

Apparent parking policy trajectories overall	
USA Australia	Auto-centric conventional in suburbs. Demand-realistic conventional or multi-objective parking management increasingly used in inner urban districts. Constraint-focused parking management in some CBDs where there is also priced, commercial parking.
K. Lumpur Bangkok Jakarta Manila	Parking requirement enthusiasts with increasingly auto-centric conventional parking approaches. Nevertheless, commercial, priced parking is common in major business districts. Price controls in Jakarta.
Ahmedabad Dhaka Hanoi	Focus on minimum requirements and on government supply although neither has been very effective so far. Weak on-street parking control and low prices undermine off-street policies. Price controls in Hanoi.
Beijing Guangzhou	Conventional parking requirements but not excessive. Keen on government-provided parking. On-street parking control increasing. Widespread pricing but with price controls. Trend towards multi-objective parking management.
Northwest Europe	Demand-realistic conventional in many suburban areas (and some auto-centric conventional). Multi-objective parking management in denser built-up areas. Constraint-focused parking management in many city centres.
Singapore Seoul Hong Kong Taipei	Conventional parking policy approaches (although not auto-centric). Mostly modest, pragmatic parking standards. Each has been shifting away from earlier supply expansion emphasis. Increasing signs of parking management, especially in Seoul. Priced, commercial parking in centres of activity (which are park-once neighbourhoods) is especially widespread in Hong Kong and Taipei.
Tokyo	On paper, parking policy is conventional (but not auto-centric). However, a market-oriented parking system has apparently emerged (inadvertently) across wide areas due to very low, pragmatic, parking requirements that exempt small buildings (and due to other policies not discussed in this paper, such as strict limits on street parking and the proof-of-parking rule). Ubiquitous park-once neighbourhoods (priced parking as a business is common in most localities).

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

The findings reveal a contrast between two broad groups among the Asian cities, with the mainland Chinese cities between them. The low and middle-income Southeast Asian cities together with the South Asian cities have relatively auto-centric and conventional parking policy with a supply-side approach to parking problems.

The high-income cities in East Asia, together with Singapore, have less auto-centric parking policies. Although these cities still have 'conventional' parking policies, they have parking requirements that are demand-realistic or pragmatically modest. Many of these cities have sought to boost parking supply in the past, including via government-provided parking. However, they tend now to be easing or reversing such supply-expansion efforts. Most have a significant role for priced and shared public parking (both private-sector and public-sector) so that park-once neighbourhoods are ubiquitous. This could open the way to fully embrace parking management approaches. It also gives them the potential for market-based parking and for market-oriented parking policies. However, any market-oriented

parking arrangements (as in Tokyo) have emerged inadvertently rather than being a result of a stated market-oriented parking policy.

The mainland Chinese cities fall between the two groups above. They have parking policies with more in common with those of the wealthier East Asian cities but Beijing and Guangzhou have not yet turned away from a desire to expand supply and to keep prices low. They have relatively modest parking requirements but remain keen to expand state-supplied public parking.

Conclusion and Implications

The wider study that this paper draws upon has provided the first international comparative perspective on the parking policy choices being adopted in Asian cities. This paper has focused on non-residential off-street parking policies. It has sought to provide useful insights for stakeholders with an interest in parking policy choices in rapidly developing and motorising cities.

There were surprises among the findings. Given their characteristics, many Asian cities might have been expected to have off-street parking policies akin to those found in older areas of western cities which have comparable characteristics. It has therefore been a surprise that the so-called conventional approach, centred on a policy associated in the west with automobile dependent contexts (minimum parking requirements), is used so widely in the region. It was also surprising to find auto-centric parking policy increasingly becoming entrenched in Southeast and South Asia. It seems likely that these cities would benefit from considering alternatives to the path they are following.

It was more in line with expectations to find that East Asian cities, together with Singapore, are generally avoiding parking policy approaches that promote automobile-dependence. However, most of these cities have surprisingly not turned to the most common alternative western approach, which is parking management. Most have policies that still fall within the 'conventional' category, although without extreme automobile-oriented assumptions. These cities may be suited to a shift towards a parking management approach which would more explicitly seek to make parking policy serve their wider urban policy goals. The most affluent cities in this group are certainly shifting away from efforts to expand parking supply. Finally, some of these Asian cities may have potential for market-oriented approaches. This possibility probably deserves further investigation.

These conclusions underline that every city faces choices between fundamentally different approaches to parking policy. However, a lack of clarity on these choices and on international comparisons of parking policy in the literature is hindering the necessary policy deliberations. This paper has sought

to put Asian cities' non-residential off-street parking policies into a clearer international perspective. It is hoped that it will contribute to better informed debates over parking policy.

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Appendix 1: Sources for the basic data presented in Table 1

Population figures are for whole metropolitan regions from Demographia (2010).

GDP per capita figures are from Asian Development Bank (2009) and are for the whole wider economies, not just these urban areas.

The sources for the car ownership estimates are as follows:

- Ahmedabad: estimate provided by Rutul Joshi of CEPT University, based on various sources, including BRT Phase II 2008 feasibility documents;
- Bangkok: An 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 neighbouring jurisdictions;
- Beijing: Based on population as reported in <http://www.chinapost.com.tw/china/local-news/beijing/2009/01/27/193705/Beijings-population.htm> and Car numbers as reported at <http://www.motorlink.cn/html/statisticDate/1000011fa06f2e8c2009022394645640.html>;
- Dhaka: Based on data in Bangladesh Pocket Statistics Book. The use of the ‘corporation’ population may slightly overstate motorization;
- Guangzhou: Based on vehicle numbers and population estimates provided by the Guangzhou City Government Planning Bureau;
- Hanoi: Linear extrapolation from 2001 estimate of 8 and 2005 estimate of 13 given in World Bank (10 August 2007) Project Document on a Proposed Global Environment Facility Trust Fund Grant in the Amount of USD 9.8 Million to the Socialist Republic of Vietnam for a Hanoi Urban Transport Development Project. World Bank Transport, Energy and Mining Unit, Sustainable Development Department East Asia and Pacific Region, Washington D.C. (p. 24);
- Hong Kong: Pocket Data Guide "Hong Kong in Figures" via <http://www.censtatd.gov.hk>;
- Jakarta: Based on data from the Central Statistics Office (Badan Pusat Statistik). The data are for DKI Jakarta, which is the core of the urban region;
- Kuala Lumpur: Estimate for the metropolitan area 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 neighbouring jurisdictions;
- Manila: Vehicle data provided by Professor Ric Sigua of University of the Philippines and a population figure from http://www.nscb.gov.ph/secstat/d_popn.asp;
- Seoul: Seoul Metropolitan Government statistics for Seoul City only. Note that car ownership for Seoul City is higher than the figure for the wider metropolitan area of 19.9 million people;
- Singapore: from the 2009 Yearbook of Statistics Singapore (Statistics Singapore);
- Taipei: calculations using 2007 statistics publications of the Department of Transportation, Taipei City Government;

- Tokyo: Data on Tokyo-to, Saitama, Chiba, and Kanagawa from Japan Yearbook of Statistics 2010. Car ownership in Tokyo-to alone was only 242 per 1,000).

Appendix 2: Sources of information on parking regulations

This appendix lists the sources of information on parking standards used in this paper.

Ahmedabad

General Development Control Regulations provided by ITDP India Ahmedabad office.

Bangkok

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

Beijing

Sources provided by Mr Zhao Hua and through 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 and on 17 January 1994, 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>).

Dhaka

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

Guangzhou

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

Hanoi

Sources obtained, 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).

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) via http://www.susdev.org.hk/en/pdf/Pnap013_eng.pdf.

Jakarta

Guidelines on the technical details of urban planning, released by the Office of Planning, DKI Jakarta, March 1995 (in Indonesian). 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)

Kuala Lumpur

Planning Guidelines and Directions for Calculating Car Parking Requirements, Kuala Lumpur City Hall document (in Malay);

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);

Development Control Guidelines: Transport and Traffic Management. Alteration (1) Petaling Jaya Local Plan B5-B5-10 to 20. Petaling Jaya City Council (in Malay).

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, Cecilia A, Lidasan, Hussein S and Regidor Jose Regin F (2003) Developing a parking supply model to explain residential condominium parking in Metro Manila, Philippines. Journal of the Eastern Asia Society for Transportation Studies 5, 1049-1064.

Seoul

Documents in Korean from Seoul City Government and Republic of Korea government websites selectively translated by Ms Yina Lee Song:
Seoul Metropolitan Government (2009 September) Parking Conditions and Improvement Suggestions: Understanding domestic and international parking policies. Seoul Metropolitan Government, Seoul;
Seoul parking installation and management ordinance 2009.07.30 4823 July 30, 2009 Ordinance No. 4823 Printer (revised) Chapter 4 annex parking lot.

Singapore

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

Taipei

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

Tokyo

Documents (in Japanese) on Tokyo parking regulations (and examples from elsewhere in Japan) (selectively translated by Mr Alvin Liu):
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/archinavitoool/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

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