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Urban Transport in Asia: Problems and prospects for high-density cities[1]

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Introduction

Recent decades have seen rapid change in the urban transport of many Asian cities. New transport opportunities have emerged but so have great challenges. Certain cities in the region have been hailed as success stories while in others transport problems are threatening environmental quality, safety, economic performance and even development goals.

This has been in the context of rapid urbanisation and accelerated economic change generally for cities in Asia (Drakakis-Smith, 1992; ESCAP, 1993; Forbes, 1996). The middle-income countries of Asia are in the midst of the so-called urban transition and the populous low-income regions of South Asia, China and Indochina are now also facing accelerating urbanisation (United Nations, 1993). The fact that Asia has lagged behind most other regions in urbanisation rates means that as a whole it still has a high potential for further large increases in urban populations. This is rapidly creating large numbers of significant cities in the region, each of them facing considerable challenges and growing pains, not least in the arena of urban transport.

This paper presents a spatial perspective on the main fundamental public policy choices faced by transport decision-makers in Asian cities. It also takes a long-term and comparative view of the issue. Many Asian cities, in common with others around the world, face a key dilemma, namely how to enhance “accessibility for all” in the face of spiralling traffic problems, deteriorating public transport service and a lack of investment funds. The results of a comparative analysis provide insights on several key public policy choices for low-income and middle-income cities, particularly those that are motorising quickly from previously low levels of vehicle ownership. For reasons that will be explained, the choices are often particularly stark in Asia. Scenarios for the future of transport systems in such cities and relevant policy implications are

[1] This paper is based primarily on research presented in “An International Comparative Perspective on Urban Transport and Urban Form in Pacific Asia: The Challenge of Rapid Motorisation in Dense Cities”, PhD Thesis by Paul A. Barter in the Institute for Sustainability and Technology Policy (ISTP), Murdoch University, 1999 (http://wwwistp.murdoch.edu.au/research/pbarter/pbarter.htm). The work was part of a major team effort at ISTP to collect urban transport data which has been published in Kenworthy and Laube et al. (1999). The cities included in that study were as follows. Wherever regional averages are shown in this paper, these are the cities that are being referred to.
Asia: Bangkok, Hong Kong, Jakarta, Kuala Lumpur, Manila, Seoul, Singapore, Surabaya, Tokyo.
Australia: Adelaide, Brisbane, Canberra, Melbourne, Perth, Sydney
Canada: Calgary, Edmonton, Montreal, Ottawa, Toronto, Vancouver, Winnipeg
Europe: Amsterdam, Brussels, Copenhagen, Frankfurt, Hamburg, London, Munich, Paris, Stockholm, Vienna, Zurich
United States: Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Phoenix, Portland (Oregon), Sacramento, San Diego, San Francisco, Washington

discussed. Evidence is drawn from a wide range of cities but most especially from 9 cities in eastern Asia for which very detailed data have been compiled as part of a large international study (Barter, 1999; Kenworthy and Laube et al., 1999). Several contrasting urban transport models or "strategies" can be identified, each representing fundamentally distinct choices with profound long-term consequences.

Regional Urban Transport Trends and Comparisons

This first section of the paper will put current transport patterns and trends in Asia into a wider historical and international perspective in order to better understand the range of choices available.

Asian urban transport until the 1960s

To set the scene let us take a brief look at urban transport patterns in Asia in the 1940s, 50s and 60s. This is based on a more detailed historical review in Barter (1999). During this period, in most Asian cities outside Japan, the vast majority of residents were served by a mixture of bus and/or jitney-based[2] public transport. Non-motorised transport, including walking and increasingly bicycles and pedicabs in many cities, was dominant for short trips of up to 5 km or so. Buses and/or jitneys were the main mode only for longer trips but were very significant only in larger cities (of more than 500,000 people or so). Low-cost taxi-like modes (either motorised or non-motorised) tended to provide feeder services to bus and jitney routes. Only a very small elite group of high-income people owned private cars. Modest tram systems had existed in almost every large Asian city during the early decades of the century but by the 1960s they had been removed almost everywhere, in line with the international fashion (Rimmer, 1986). Suburban rail services were significant only in certain Indian cities, primarily Bombay, and in Japan. The 1960s saw the beginnings of an upsurge in vehicle numbers in many cities, but this had not yet created high motorisation levels by 1970.

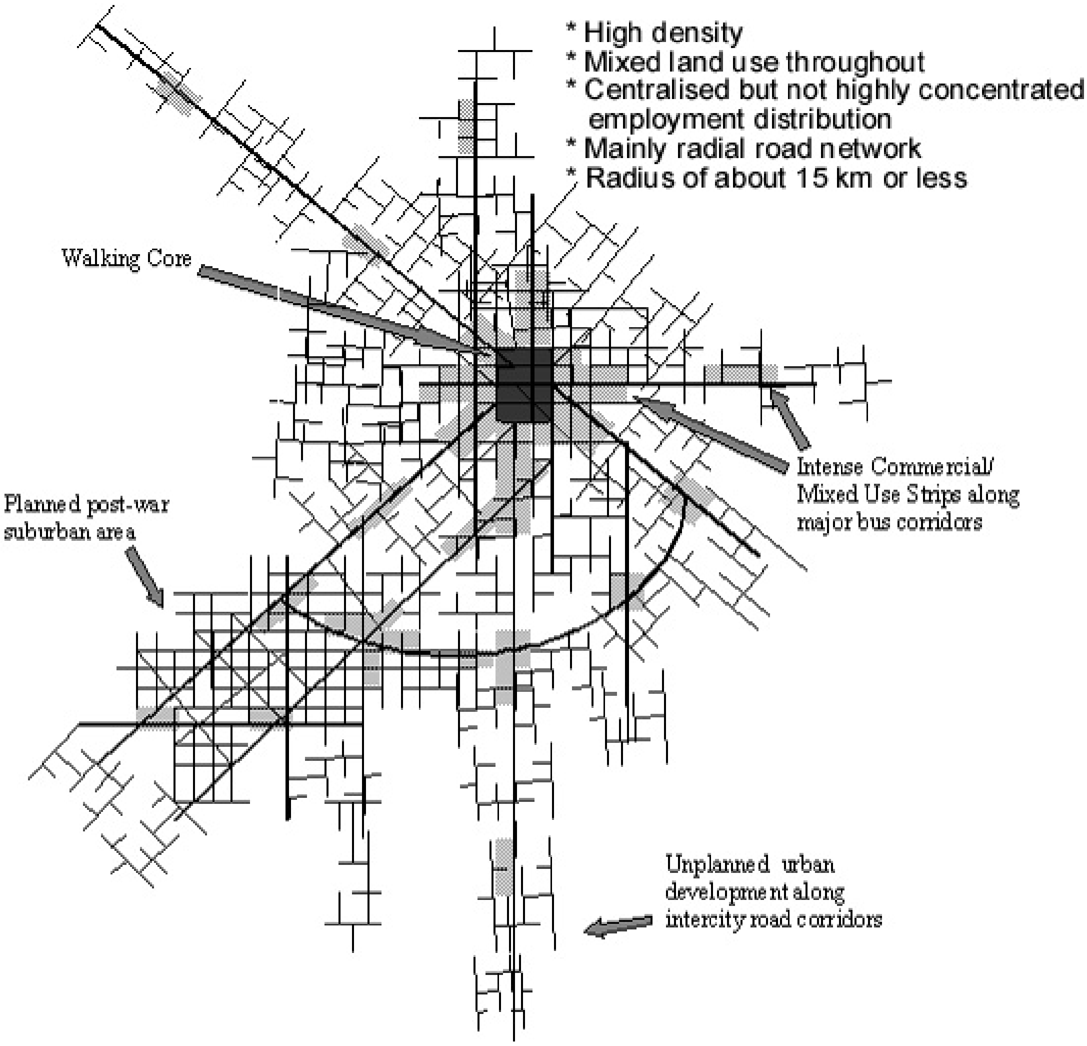
Large Japanese cities differed from most other Asian cities by developing strongly rail-based transport patterns (continuing a process that had begun before the war) with extensive tram systems (later replaced by subways) and suburban railways. As a result, Japanese urban land-use patterns were strongly influenced by railways, the dominant mode of transport (Cervero, 1998).

Asian urban land-use patterns

Most Asian cities were expanding quickly in the post-war decades and the urban land-use patterns that emerged in these developing cities reflected the post-war transport patterns that helped to shape them. Accordingly, by the 1960s key land use features of most developing Asian cities included: a) a centralised,

[2] The word "jitney" refers to public transport vehicles operated by small enterprises or owner-drivers using minibuses, minivans or similar vehicles on fixed or semi-fixed routes with little or no government regulation. Manila's jeepneys

but not highly concentrated, distribution of jobs; b) generally high urban densities; c) mixed land use in most areas; d) commercial activity in long strips along major roads; and e) a radius of at most 15 km or so. These "bus, jitney and NMT cities" tended to have urban densities well above 100 persons per hectare over their urbanised area[3], although large areas devoted to institutional land uses and elite housing could give a misleading impression of low density in parts of the cities. Overall, Asian urban densities were usually much higher than those found in European cities and many times higher than the densities in American or Australian cities. Central areas were not empty of population and often had as many residents as jobs. A schematic map of the main land-use features of these cities is shown in Figure 1.



are perhaps the most famous example but similar services can be found in many countries and also operated in many Western cities earlier in the 20th Century.

[3] Urban density is calculated by dividing the population of the metropolitan area by its urbanised area, where the urbanised area is the sum of the areas taken up by urban land-uses, including residential, industrial, offices, commercial, public utilities, hospitals, schools, cultural, sports grounds, wasteland (urban), transport facilities, and small parks and gardens.

Figure 1 Schematic map of bus, jitney and NMT-dominated Asian cities

Source: Barter, 1999.

There were variations on these patterns of course, depending on local topography, the size of each city and other factors. For example, Hong Kong developed exceptionally high densities as a result of a factors that included a constrained site, a high role for ferries (which can cater to very concentrated flows of people) and urban planning policy in the city.

Despite such variations, all large Asian cities outside Japan shared a number of characteristics that made them vulnerable to serious problems later as vehicle numbers began to rise quickly. Firstly, almost all of the developing Asian cities were highly dependent on bus or jitney-based public transport and lacked significant traffic-segregated public transport, such as rail, that had been relatively common in large Western cities and Japan. Secondly, most of the Asian cities had much higher urban densities than had been the case in most Western cities at the equivalent stage in their motorisation. These factors made developing Asian cities more vulnerable to the impacts of growing traffic than most Western cities had been earlier when cars began to intrude in large numbers.

Many Asian cities retain a rather high density character today, with some variations from city to city and country to country (Table 1). Only Japanese and Malaysian cities have middle-densities in the same range as European cities. Some of the highest urban densities in the world are to be found in Korea, Vietnam, China and South Asia.

Table 1 Urban density in Asian and selected other cities, ca. 1990

	Urban Density (persons per ha)	**Population** (millions)	**Year of Data**	**Source of Data**
Cairo (Egypt)	~400	~10	~1988	United Nations (1990)
Mumbai (*Bombay*) (India)	321	14.4	~1991	WS Atkins at al. (1994)
Hong Kong (SAR, China)	301	5.5	1990	Kenworthy and Laube et al, 1999
Hanoi (Vietnam)	256	1.1	~1992	Padeco Co. Ltd. (1993)
Shanghai (China)	251	6.2	1990	Hu and Kenworthy (1997)
Seoul (Korea)	245	16.7	1990	Barter, 1999
Pusan (Korea)	245	3.8	1990/91	Seoul Metropolitan Government (1992)
Taipei (Taiwan, China)	230	5.9	1995	Data compiled by the author
Manila (Philippines)	198	7.9	1990	Barter, 1999
Taegu (Korea)	190	2.2	1990/91	Seoul Metropolitan Government (1992)
Surabaya (Indonesia)	177	2.5	1990	Barter, 1999
Chennai (*Madras*) (India)	172	5.8	1991	Pura Abdullah (1996)
Jakarta (Indonesia)	171	8.2	1990	Barter, 1999
Medan (Indonesia)	164	1.8	1988	Nippon Koei Co. Ltd (1990)
Guangzhou (China)	157	2.9	1990	Hu and Kenworthy (1997)
Mexico City (Mexico)	150	~17	1988	Bauer (1991)
Bangkok (Thailand)	149	7.5	1990	Poboon (1997)
Beijing (China)	141	5.6	1990	Hu Gang and Kenworthy (1997)
Kwangju (Korea)	133	1.1	1990/91	Seoul Metropolitan Government (1992)
Santiago (Chile)	100	~5	~1990	Rivasplata (1996)
Taejon (Korea)	91	1.0	1990/91	Seoul Metropolitan Government (1992)
Singapore	87	2.7	1990	Kenworthy and Laube et al, 1999
Vienna (Austria)	68	1.5	1990	Kenworthy and Laube et al, 1999
Tokyo (Japan)	71	31.8	1990	Kenworthy and Laube et al, 1999
Klang Valley/KL (Malaysia)	59	3.1	1990	Barter, 1999
Zurich (Switzerland)	47	1.2	1990	Kenworthy and Laube et al, 1999
Paris (France)	46	10.6	1990	Kenworthy and Laube et al, 1999
London (UK)	42	6.7	1991	Kenworthy and Laube et al, 1999
Ipoh (Malaysia)	38	0.4	1985	Majlis Perbandaran Ipoh (1986)
Toronto (Canada)	26	4.2	1990	Kenworthy and Laube et al, 1999
New York (USA)	19	16.0	1990	Kenworthy and Laube et al, 1999
Sydney (Australia)	17	3.5	1991	Kenworthy and Laube et al, 1999
Washington, DC (USA)	14	3.6	1990	Kenworthy and Laube et al, 1999

Asian cities tend to be densely settled largely because they mostly had low mobility until recently and therefore needed to remain compact in order to maintain accessibility through non-motorised modes and low-cost public transport. However, as we will see in the next section, rapid changes in transport over the last decade or two have begun to create a traumatic and dangerous imbalance between new higher levels of mobility, especially private mobility, and many aspects of the pre-existing urban fabric and transport infrastructure.

Asian urban transport trends since the 1960s

Motorisation

The timing of when the trickle of new vehicles into the cities turned into a flood has varied from country to country in the region. Table 2 shows some data on this. For example, a brief upsurge in motorisation occurred in the late 1960s in Hong Kong and Singapore, although these cities then took strong steps to slow their rates of motorisation during the 1970s and 1980s. Vehicle ownership in Malaysia, Thailand and Taiwan surged quickly upwards from the late 1970s onwards. Both cars and motorcycles grew quickly in numbers and Malaysia, Thailand and Taiwan were among the first places in the region (or the world) to reach extremely high levels of motorcycle ownership (well above 100 motorcycles per 1000 persons) in their cities. Korea began a spurt of rapidly increasing car ownership from the mid-1980s as a result of rising incomes and the relaxation of strict restraint on private car ownership that had previously kept car numbers to extremely low levels. The 1980s and early 1990s also saw rapid rises in both car and motorcycle ownership in Indonesia. Car ownership rose more gradually in the economically troubled Philippines until the early 1990s when car numbers shot up sharply. Vietnamese cities have seen an amazingly rapid boom in the number of motorcycles since the early 1990s (see Ho Chi Minh City in 1996 in Table 3). In the late 1990s Indian cities too have experienced rapid rises in both car and motorcycle numbers following economic reforms and Chinese cities may be following soon.

Table 2 Growth in car and motorcycle ownership in Asian cities with other regional averages from an international sample of cities, 1960 - 1993

	Car Ownership (cars per 1000 persons)					Motorcycle Ownership (motorcycles per 1000 persons)				
	1960	**1970**[a]	**1980**	**1990**	**1993**	**1960**	**1970**	**1980**	**1990**	**1993**
Hong Kong	11	27	42	43	46	1	4	6	4	4
Surabaya	-	14	20	40	47	-	35	91	147	175
Manila	-	38	55	66	79	-	6	4	6	8
Jakarta	-	22	38	75	92	-	32	66	98	113
Singapore	39	69	64	101	110	12	51	49	45	42
Seoul City[b]	-	6	16	83	123	-	-	6	18	-
Klang Valley[e]	46[c]	72	86	170	206	-	50	65	180	201
Bangkok	14	54	71	199	220	6	20	35	124	179
Tokyo[d]	16	105	156	225	236	16	9	14	36	-
European	122	243	332	392	-	-	-	-	-	-
Canadian	274	348	447	524	-	-	-	-	-	-
Australian[e]	223	321	443	491	-	-	-	-	-	-
United States	376	460	547	608	-	-	-	-	-	-

Sources: Barter, 1999 and Kenworthy and Laube et al., 1999.
Notes:
a. KL's 1970 figures are for 1972, Surabaya's 1970 figures are for 1971 and Jakarta's are for 1972.
b. The data in this table for Seoul are for Seoul City only.
c. Kuala Lumpur's 1960 car ownership data is for 1963.
d. Tokyo's figures are for Tokyo-to only.
e. The Klang Valley is the metropolitan area of Kuala Lumpur.

Table 3 shows the levels of vehicle ownership in a number of other Asian cities by about 1990. It confirms that high rates of motorcycle ownership are common in Asia, especially in Southeast and South Asia. Motorcycles are already significant in Indian and in Vietnamese cities, despite the low income levels of those countries. It should also be noted that in most Asian cities motorisation continued to occur rapidly during the

1990s, with a pause or a slowing only since 1997 in those countries impacted by the regional economic crisis.

Table 3 Motorisation in other Asian cities, ca. 1990

City	Cars per 1000 persons	Motor-cycles per 1000 persons	Total vehicles per 1000 persons	Year of data	1990 National GNP per capita (US $)
Taipei City (Taiwan)	157	219	403	1990	7,761*
Taegu (Korea)	60	35	132	1990	5,400
Taejon (Korea)	52	32	117	1990	5,400
Pusan (Korea)	44	16	91	1990	5,400
Kwangju (Korea)	42	23	95	1990	5,400
Penang (Malaysia)	165	367	566	1991	2,320
Semarang (Indonesia)	42	147	215	1992	570
Medan (Indonesia)	38	134	?	1989	570
Delhi (India)	32	81	127	1993	350
Mumbai (*Bombay)* (India)	21	18	49	1990	350
Bangalore (India)	17	67	94	1986/87	350
Chennai (*Madras*) (India)	17	52	76	1990	350
Lucknow (India)	14	104	129	1990/91	350
Varanasi (India)	10	106	150	1991	350
Hanoi (Vietnam)	?	116	161	1992	? ~250
Ho Chi Minh (Vietnam)	8	291	?	1996	? ~250
Dhaka (Bangladesh)	13	8	33	1992	210

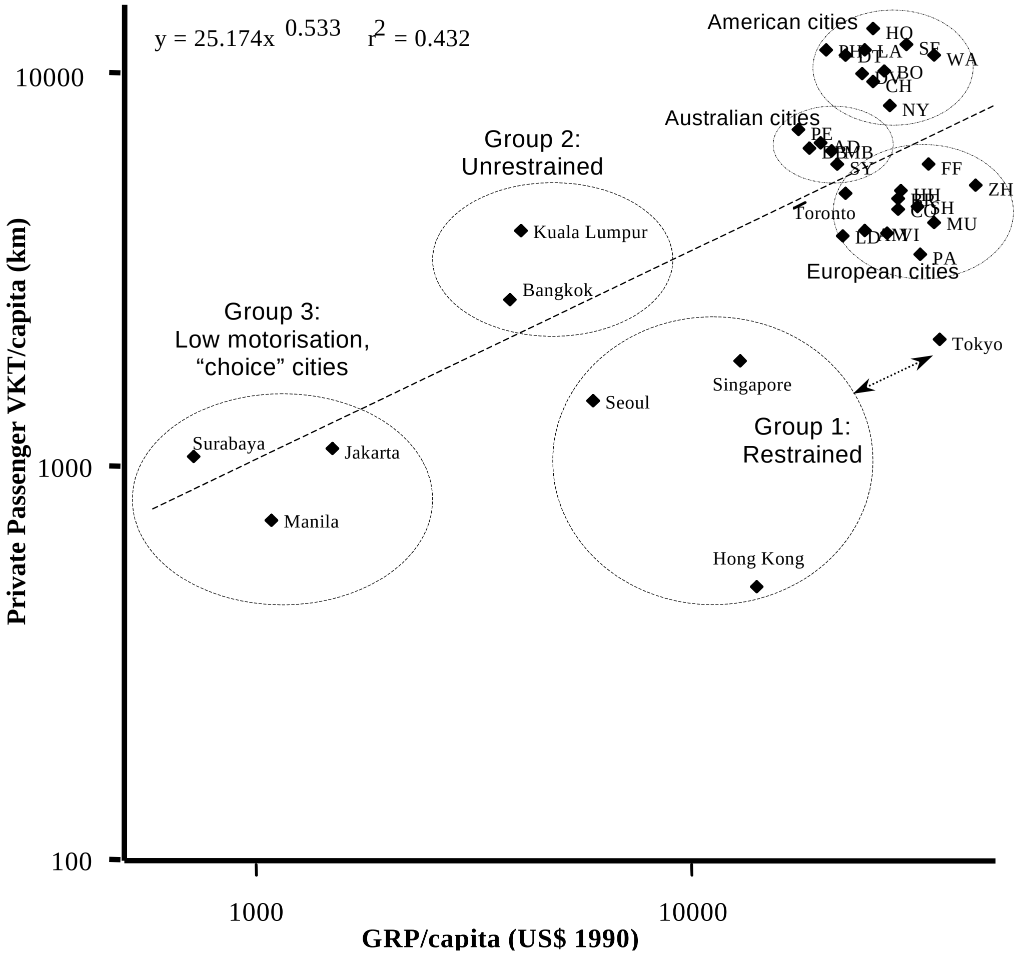
Notes: 1990 National GNP per capita data are from the World Bank (1992) except for Taiwan's which is from O'Connor (1994).
Sources for motorisation data: **Pusan**, **Taegu**, **Kwangju**, **Taejon**: Korea Transport Institute (1993); **Penang**: Road Transport Dept., Malaysia; **Chiang Mai**: Padeco Co. Ltd. (1993); **Medan**: Nippon Koei Co. Ltd (1990); **Semarang**: China Engineering Consultants (1995a); **Ho Chi Minh City**: MVA Consultants (1997); **Hanoi**: Padeco Co. Ltd. (1993); **Mumbai**, **Delhi**, **Chennai**, **Bangalore**, **Lucknow**: UNCHS (1994); **Varanasi**: Elangovan (1992); **Dhaka**: PPK Consultants (1993); **Mexico City**: Bauer (1991); **Taipei City**: Taipei City Government (1998).

Motorisation and income

It is often assumed that income levels can fully explain the variations in the levels of motorisation around the region. Indeed, purchasing power is certainly an important factor. However, other factors must also be important. Figure 2 shows for a sample of Asian cities that the relationship between income levels (indicated by Gross Regional Product per capita) and the ownership and use of private motor vehicles is not as simple as might have been expected. For example, Tokyo, Singapore, Seoul and especially Hong Kong had lower levels of private vehicle use than might be expected given their incomes. On the other hand, Kuala Lumpur and, to a slightly lesser extent, Bangkok, had vehicle usage levels that were surprisingly high given their relatively modest incomes in 1990. Jakarta, Surabaya and Manila all had low private vehicle use, which is understandable given their lower-middle income levels. It is also noteworthy that European cities tended to have lower private vehicle usage than would be expected according to their incomes and the American and Australian cities had higher private vehicle use than their incomes would lead one to predict.

Figure 2 points to the influence on vehicle use of other factors in addition to that of income. These other influences on vehicle ownership and usage besides income may include: fiscal measures that make vehicle ownership or usage expensive; the influence of urban land-use characteristics; levels of road infrastructure; levels of public transport service and infrastructure; and various other policies under the broad category of transport demand management (TDM) (Newman and Kenworthy, 1995; Tanaboriboon, 1992).

Figure 2 Private passenger vehicle use per capita versus GRP per capita in an international sample of cities, 1990



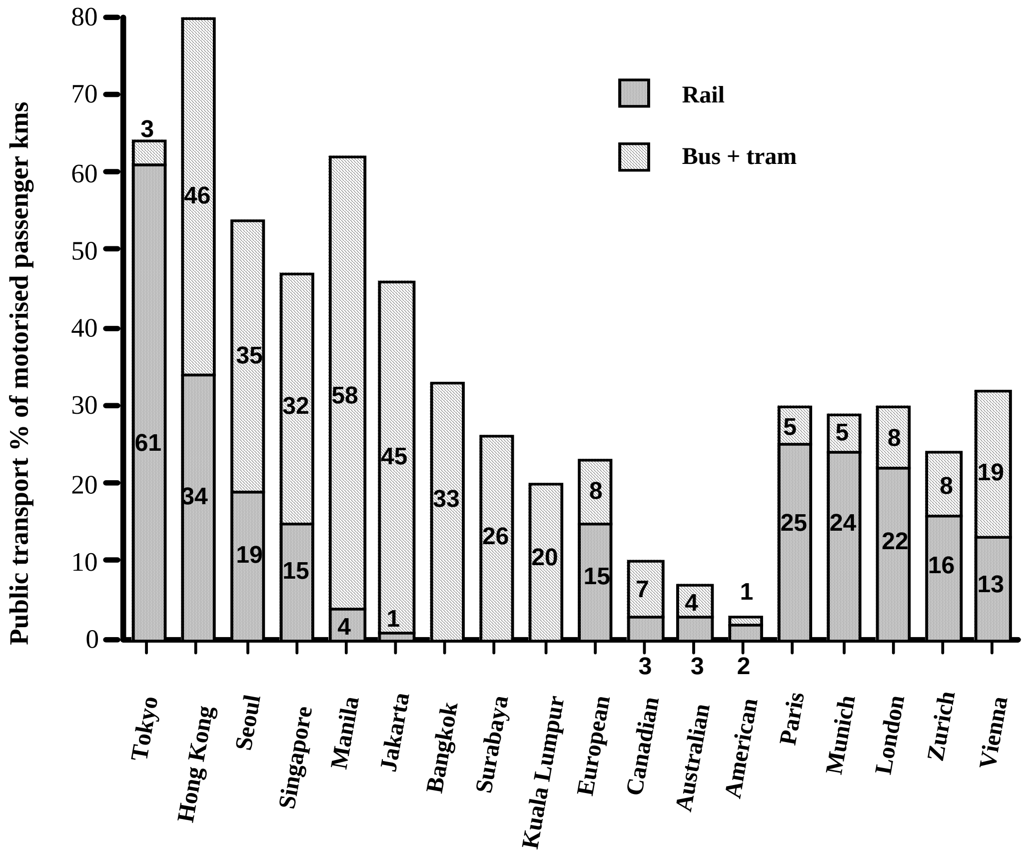
Source: Barter, 1999
Note: Both axes are on logarithmic scales. Goods traffic is not included here.

Public transport

Prior to the arrival of mass car ownership a high proportion of urban travel was on public transport in all large cities of the industrialised world. This might lead us to expect public transport to be playing a very large role in all Asian cities that still have relatively low levels of motorisation. When we examine the available data we find that very high levels of public transport use have indeed been achieved in some Asian cities but perhaps surprisingly not in all of them.

Figure 3 shows the relative importance of public transport (whether by rail systems or by road-based public transport) in some Asian cities. Figure 3 also shows that there is often a high level of dependence on road-based public transport in Asia. This highlights the vulnerability of public transport in these cities, and therefore their whole transport systems, to the impact of traffic congestion. It also highlights the vital importance of policy measures to provide on-road priority to buses in Asian cities and to develop segregated public transport systems. It should also be noted that the importance of rail in Seoul, Hong Kong and Singapore is relatively recent and buses remain very important in each of these cities despite the existence of urban rail. Singapore's mass transit rail system was only opened in 1987. Seoul's first subway line opened in 1974 and most suburban rail development has also been since that time. Hong Kong's mass transit rail system opened in 1979.

Figure 3 Public transport usage (rail and buses/jitneys/trams) as a percentage of total motorised travel in Asian and selected European cities in an international sample of cities, 1990



Source: Barter, 1999 and data from Kenworthy and Laube et al., 1999.
Note: Bus figures here include jitneys, such as Manila's jeepneys or Jakarta's *Mikrolet*.

Table 4 shows data on public transport in a number of other Asian cities. Public transport plays a very large role in a number of cities, including several Indian and Korean cities. However, public transport use is surprisingly low in several others, with Semarang, Denpasar and Ho Chi Minh City being the main examples in Table 4. Interestingly, these cities also have rather high rates of motorcycle ownership. In fact, in the low-income and middle-income countries of Asia, low public transport use seems usually to go together with a high popularity for motorcycles. Other examples include Kuala Lumpur, Surabaya, Taipei, Penang, Medan and, to some extent, Bangkok. It appears that the popularity of motorcycles may be partly a response to poor public transport. Then high motorcycle ownership subsequently creates further problems for public transport by competing for the same low-income and middle-income passengers.

Public transport usage is also surprisingly low in most Chinese cities, where bicycles are extremely important (as was the case in Vietnamese cities and Taipei before their motorcycle influx). Public transport is really significant only in the largest of the Chinese cities, Shanghai and Beijing, where public transport ridership exceeded 400 trips per person per year. In most other Chinese cities, and even in the large cities of Tianjin, Shengyang and Guangzhou, there were fewer than 200 public transport trips per capita per year in 1990 (Hu and Kenworthy, 1997).

Table 4 Public transport in other relevant international cities, ca. 1980 to 1990

	Public transport % of all trips	Public transport % of Motorised Trips	Rail % of public transport trips
Cities with a strong role for public transport			
Chennai (*Madras*) (India) 1984	55	91	17
Bangalore (India) 1988	?	73	1
Delhi (India) ~1988	36	71	4
Mumbai (*Bombay*) (India) 1986	?	67	50
Taegu (Korea) 1990	?	55	0
Pusan (Korea) 1990	?	54	15
Cities with a low or moderate role for public transport overall but a strong role relative to other motorised modes			
Shanghai (China) 1990	33	89	?
Dhaka (Bangladesh) 1992	13	69	negligible
Lucknow (India) 1990	16	54	0
Keihanshin* (Japan) 1980	23	53	80
Cities with a relatively low role for public transport - both overall and relative to motorised modes			
Semarang (Indonesia) ca.1990	?	39	0
Taipei (Taiwan, China) 1992	?	33	0.4
Denpasar (Indonesia) ca.1990	?	16	0
Ho Chi Minh City, 1996	?	3	0

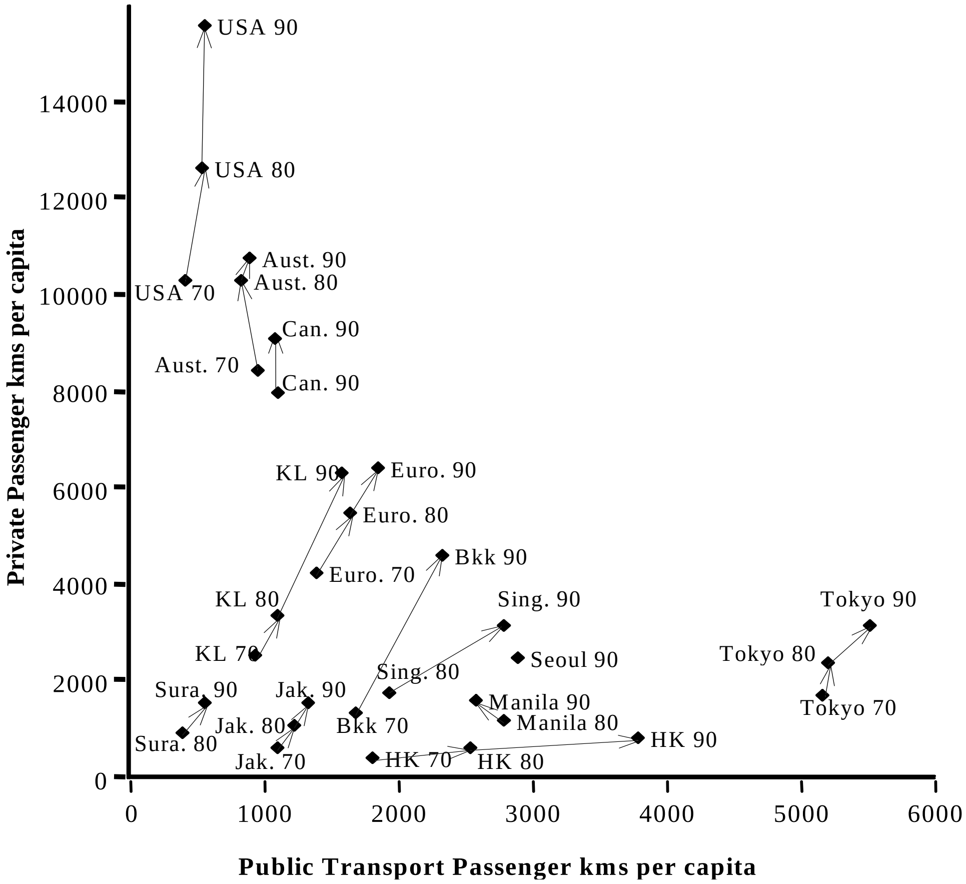
Notes: *Keihanshin is the name of the metropolitan region that includes Osaka, Kyoto and Kobe.

Sources: **Keihanshin** 1980: (City Bureau and Building Research Institute, 1990; Nagasawa, 1992); **Pusan** 1990, **Taegu** 1990: (Korea Transport Institute, 1993: 99); **Shanghai** 1990: (Chen, ca. 1993); **Semarang**: (China Engineering Consultants, 1995a); **Denpasar**: (China Engineering Consultants, 1995b); **Delhi**: (Gupta, Singh, and Jain, 1996) citing Patankar, 1989; **Mumbai** 1986: (UNCHS, 1994); **Delhi**, **Chennai** 1984, **Bangalore** 1988, **Lucknow** 1990: (UNCHS, 1994); **Dhaka** 1992: (PPK Consultants, 1993); **Ho Chi Minh City** 1996 (MVA Consultants, 1997); **Taipei** 1992 (Institute of Transportation, 1992).

Motorised travel trends and evolution

In order to get a clearer understanding of passenger transport trends in Asian cities it is useful to present data on private travel and public transport travel together on one graph. Figure 4 below shows how motorised passenger travel has been changing in some Asian cities and in cities of some high-income regions of the world. The trends in different regions and cities vary very widely. Notice the positions on the graph of Asian cities such as Surabaya, Jakarta, Kuala Lumpur, Bangkok and Hong Kong in 1970 or 1980. These confirm that most Asian cities had low levels of motorised travel until recently, whether by private vehicles or public transport. It seems certain that other low-income cities around Asia also currently have low motorised mobility levels and would appear in the lower-left corner of this graph along with Surabaya and Jakarta.

Figure 4 Trends in motorised travel (private versus public) in Asian cities and regional averages from an international sample of cities, 1970 to 1990



Sources: Barter, 1999 and including data from Kenworthy and Laube et al., 1999.

Strong contrasts can be seen among the Asian cities in the time trends in Figure 4. Kuala Lumpur, Bangkok, Surabaya and Jakarta have seen greater rises in private travel than in public transport travel. In contrast, Singapore’s public transport use almost kept pace with increasing private transport. In Hong Kong, almost all of the increased passenger travel since 1970 was in public transport. Manila and Tokyo already had very high levels of public transport use by 1980 but have seen faster growth in private transport since then. The Indonesian cities can be seen to have unusually low absolute levels of motorised travel compared with the other cities shown.

The United States, Australian and Canadian cities already had very high private and low public travel in 1970. On average, this pattern has increased further, with private transport increasing much faster than public transport use in these regions, especially in the United States. European cities on average have seen moderate increases in both private and public transport use.

Non-motorised transport

Data on non-motorised trips must be read with great caution because of the often inconsistent methods for dealing with such trips in surveys. Just one example is that many surveys exclude very short trips, which therefore tend to especially underestimate the number of walking trips. Nevertheless, Table 5 provides some data on walking and use of non-motorised vehicles in a number of Asian cities and a few others for which such data were available in the literature. There is great diversity, especially in the levels of bicycle and pedicab usage.

Table 5 shows the great importance of walking in many low-income cities, for example in Dhaka where motorised transport accounts for only a small minority of trips. The significant role of bicycles in Chinese cities and in some Indian cities is well known. Vietnamese cities also had a very high role for bicycles in the 1970s and 1980s, although no specific mode split data were available (Luu Duc Hai, 1995). Taipei, which is now motorcycle-dominated, had a high level of bicycle use in the 1960s (McNeill, ca. 1977). Kuala Lumpur, Jakarta, Surabaya, and Bangkok have seen drastic drops in the use of non-motorised vehicles since their height in the post-war decades.

Even in wealthy Tokyo the great importance of non-motorised trips, including bicycle trips, is extremely noteworthy, considering that this is an enormous urban area of more than 30 million very affluent people. Japanese cities and a number of European countries demonstrate that high incomes do not necessarily exclude the possibility of a large role for bicycles and for walking. By contrast, American and Australian cities have low levels of walking and bicycle use, with an average of less than 5% of work trips by non-motorised transport (Kenworthy and Laube et al., 1999).

Table 5 Non-motorised transport in Asian cities and other relevant cities, ca. 1990

	Percent of all trips				Sources
	Walk	**Bicycle**	**Pedicab**	**NMT Total**	
Tianjin (China) 1990	11	75	?	86	Liu, Shen and Ren (1993: 2)
Guangzhou (China) 1984	46	37	?	83	Liu, et al.
Dhaka (Bangladesh) 1992	60	1	19	80	PPK Consultants (1993)
Lucknow (India) 1990	25	29	15	69	UNCHS (1994)
Beijing (China) 1986	14	54	?	68	Liu, et al. (1993: 2)
Delhi (India) ~1987	49	9	?	58	Gupta, et al. (1996: 67)
Jakarta (Indonesia) 1985	40	2.4	4.6	47	Barter, 1999
Amsterdam (Netherlands) ~1990	~23	~24	0	~47	Pharoah and Apel (1995: 254)
Tokyo (Japan) 1990	27	15	0	42	Barter, 1999
Madras (India) 1984	28	11	1	40	UNCHS (1994)
Munich (Germany) ~1990	~24	~13	0	~37	Pharoah and Apel (1995: 254)
London (UK) ~1990	~34	~2	0	~36	Pharoah and Apel (1995: 254)
Sao Paulo (Brazil)	<~36	tiny	~0	36	Poole, et al. (1994: 57)
Surabaya (Indonesia) 1995	19.6	10.5	4.8	35	Barter, 1999
Manila (Philippines) 1996	20	tiny	~1-2?	30 in 1980	Barter, 1999
Stockholm (Sweden) ~1990	~24	~6	0	~30	Pharoah and Apel (1995: 254)
Zurich (Switzerland) ~1990	~25	~4	0	~29	Pharoah and Apel (1995: 254)
K. Lumpur (Malaysia) 1985	~26	~2	0	28	Barter, 1999
Singapore 1990	25	<1	tiny	25	Barter, 1999
Seoul (Korea) 1990	?	<2	0	?	Barter, 1999
Hong Kong 1990	?	tiny	0	?	Barter, 1999
Bangkok (Thailand) 1990	~15	tiny	tiny	15	Poboon, 1997

Challenges and Opportunities

The first section of this paper has placed the urban transport trends of Asian cities into historical and international context. It also introduced some of the major urban land-use characteristics commonly found in Asian cities. This next section now examines the implications of the existing transport and land-use characteristics for the future. What challenges and opportunities do Asian cities face in trying to improve their transport systems and in trying to provide adequate access for all of their residents and for the economically vital movement of goods? The focus here is mainly on spatial issues that are extremely pressing but which have been neglected in the literature on urban transport in Asia (Barter, 1999).

Spatial challenges for Asian urban transport

Spatial issues and their transport implications are central to an understanding of the transport and land use choices that are open to Asian cities. High urban densities can be both positive and negative in their transport implications depending upon policy settings and choices. High densities mean that urban road capacity per person is inherently limited and that very high traffic intensities can emerge quickly, creating high levels of traffic impacts.

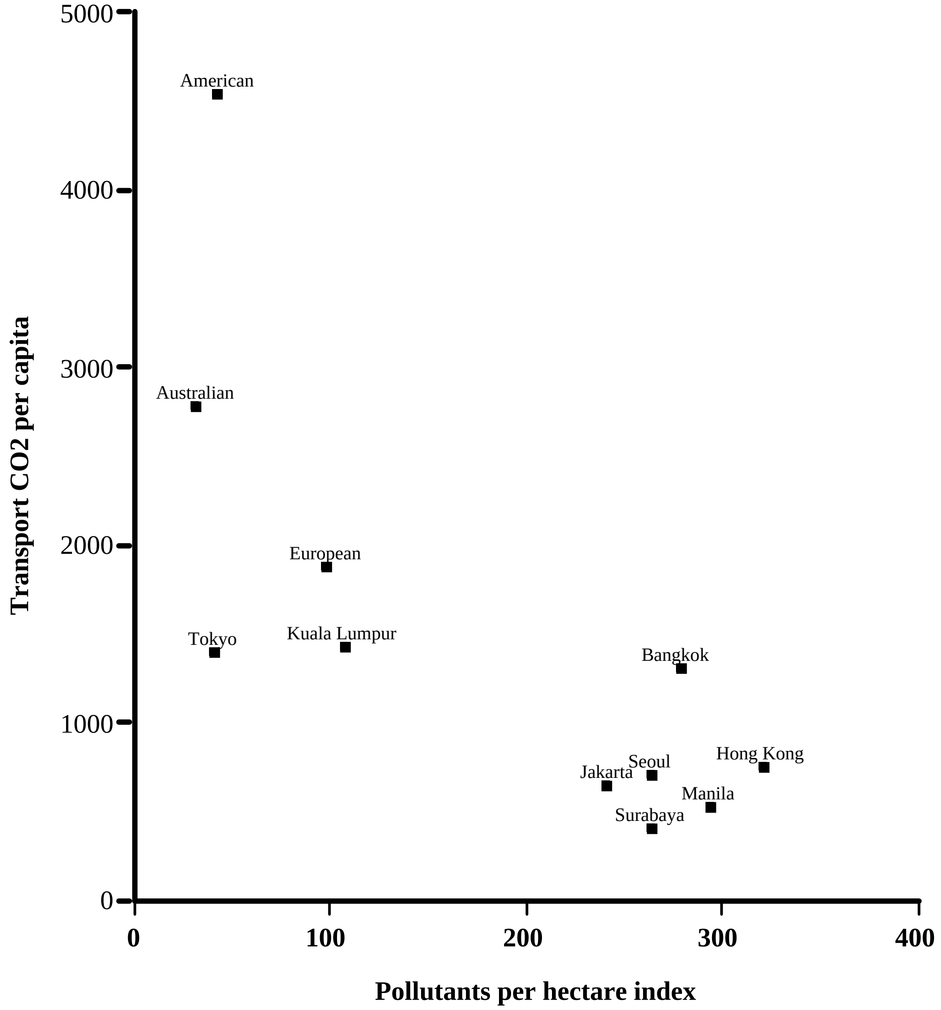
Local impacts versus global impacts

The major negative local impacts of urban transport include air pollution, noise pollution, water pollution, the severance of communities by roads or railways, transport accidents and congestion. Urban transport also contributes significantly to a number of the important human impacts on the global environment. Prominent among these is the build-up of greenhouse gases, in particular carbon dioxide (CO_2), in the atmosphere. This is a by-product of the burning of fossil fuels, primarily oil in the case of transport.

The variations from city to city and region to region of local negative impacts of transport are in stark contrast to the variations in global impacts. This is shown in Figure 5 where an index of per hectare local air pollution emissions[4] from transport is used as an indicator of the severity of local impacts of transport and per capita CO_2 emissions from transport are used to indicate global impacts. It turns out that local impacts per hectare of urban transport are already very high in many Asian cities, despite relatively low levels of vehicle use per capita and therefore rather low contributions per capita to the global problem of CO_2 emissions. Asian cities, such as Bangkok, Manila or Hong Kong, may be “traffic-saturated” but not “automobile-dependent”.

[4] Data on emissions of four of pollutants (CO, SO_2, NO_x, and VHC) have been combined to calculate a simple index of local pollutant emissions (Barter, 1999).

Figure 5 Global impacts versus local impacts of transport: CO2 emissions per capita from transport versus local air pollutants from transport per hectare for Asian cities and regional averages in an international sample of cities, 1990



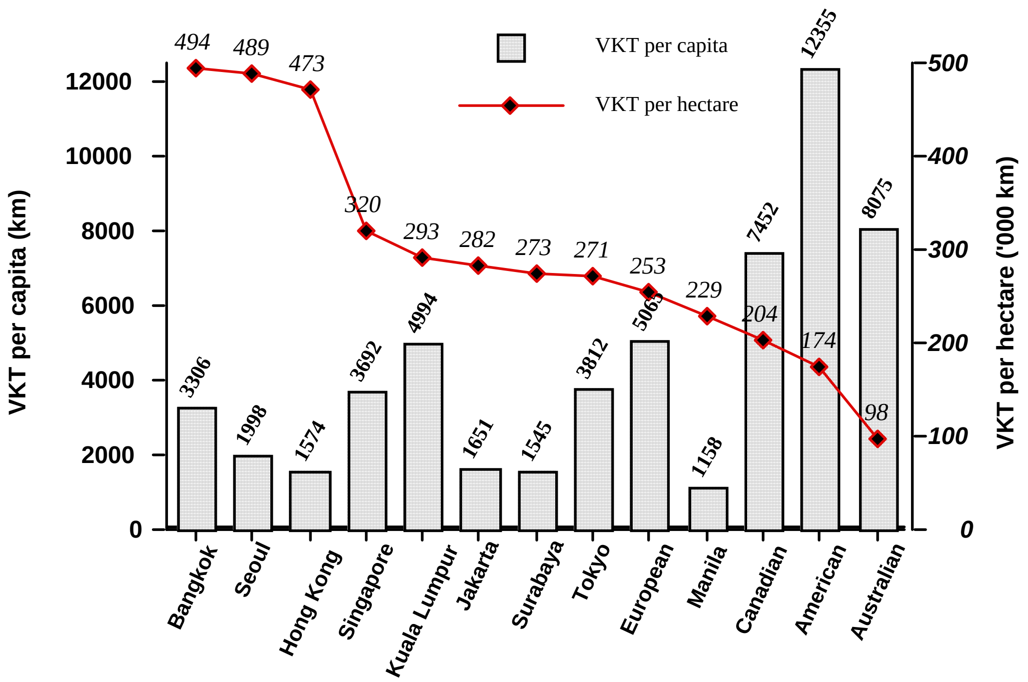
It must be acknowledged that high emissions per hectare do not always translate into a major air pollution problem, since this also depends on other factors, such as climate, prevailing wind patterns, the layout of the city, topography, etc. Nevertheless, these data do show that dense cities face an inherent danger of direct, severe local emissions impacts from traffic.

Traffic per hectare or traffic intensity

The findings above on local air pollution per hectare relate to the fact that a number of these cities have high levels of traffic per hectare (as measure by vehicle kilometres travelled or VKT per hectare), despite low levels of vehicle travel per person (Figure 6). Low quality fuels and the polluting vehicle fleets found in many low-income or middle-income cities are only partly to blame. A high level of traffic per hectare is the more fundamental reason and is at the centre of the spatial challenge for transport in dense Asian cities.

Notice in Figure 6 that the two highest density cities in this group, Hong Kong and Seoul, with almost the lowest vehicle kilometres per capita in the whole sample of cities, had almost the highest levels of traffic per hectare. The American cities had relatively low vehicle use per hectare, despite their very high rates of vehicle use per person. This is related to their low urban densities, which also explains the fact that the Australian cities have the lowest traffic intensities of all of the cities in the sample, since their densities are similar to US cities, but their VKT per capita figures are lower.

Figure 6 Traffic per hectare compared with traffic per person in an international sample of cities, 1990



Note: These vehicle kilometres of travel (VKT) data include on-road public transport vehicle kilometres.

Road expansion is no panacea

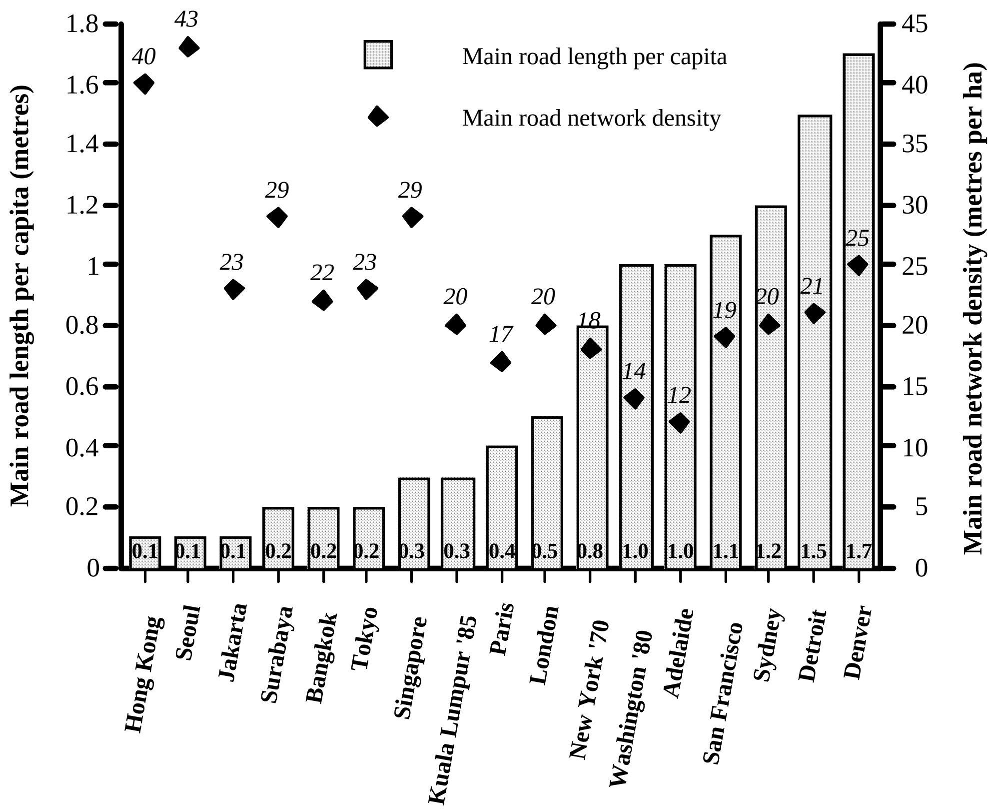
Traffic congestion is another obvious impact from transport. It is felt by those in private vehicles and even more so by the goods transport industry and by bus or jitney passengers and operators. Some commentators argue that too much attention is focused on solving congestion at the expense of other transport costs and problems that may be more significant (Litman, 1995; McNeill, ca. 1977). Perhaps congestion is best viewed as a symptom of deeper problems rather than as the primary problem to be tackled directly. In any case, there is considerable evidence (some of it anecdotal) that congestion is a particularly serious problem in Asian cities, especially those middle-income cities that have been experiencing rapid motorisation. Bangkok's traffic nightmare is now legendary with speeds having reached extraordinarily low levels in the early 1990s (Poboon, 1997).

Some authors attribute this problem primarily to low levels of road infrastructure in Asian cities (Bodell, 1995; Midgley, 1994; Tanaboriboon, 1993). This diagnosis and the strong popular focus on congestion as a problem tends to encourage road expansion to be seen as the main solution. However, the issue is not so simple.

It is true that many Asian cities do indeed have low levels of road length per person, and main road length per person, relative to cities in Europe, Australia or North America (Figure 7). However, it is too simplistic to blame traffic problems only on a lack of road space. The problem is in fact more fundamentally a spatial one, related to the high densities of development of most of the Asian cities and to the rapidity of motorisation, which have meant that both the road network and the land use patterns of most Asian cities remain highly unsuited to mass use of private cars.

In fact, high-density urban form is the central underlying reason for the low road provision per person in dense Asian cities. Road space is inherently a scarce commodity in dense cities. In fact, logically ANY measure of road capacity <u>per person</u> will necessarily be low in a dense city unless road capacity <u>per hectare</u> can be made unusually high. Figure 7 illustrates these points by showing the main road length per person against the main road length per hectare in a range of cities. Asian cities do NOT have unusually low road network densities (or road length per unit of urbanised area). If anything, the higher density Asian cities tended to have slightly higher arterial road densities than others (the Asian cities' average was 29 metres per hectare, while for the non-Asian cities in Figure 7, the average was 18 metres per hectare). However, high urban densities mean that these dense road networks amount to rather low levels of road length per person. In fact, a city of 150 persons per hectare (common in Asia) would have to provide 10 times more road capacity per hectare than a city of 15 persons per hectare (like many American cities) in order to achieve the same road capacity provision per person.

Figure 7 Main roads network density compared to main length per person in Asian cities and a number of other cities in an international sample, ca. 1990



Sources: Barter, 1999 and Kenworthy and Laube et al., 1999.

Notes: a. Tokyo's arterial road data are for Tokyo-to, not the larger Tokyo Metropolitan Transportation Area (TMTA).

b. It is difficult to consistently draw the line between "main" and "local" roads with available data. The street types that have been included in the definition of main roads in each case are:
Hong Kong (all major roads as defined in traffic census);
Seoul (includes avenues >~40m width, streets 25~35 m, roads 12~20 m, excludes "paths" <~10 m);
Jakarta ("arterials" included. "local" roads excluded);
Bangkok ("expressways" and "main roads", excludes "local" streets);
Surabaya (all "arterials" and "collectors");
Tokyo (all categories except local "*shi*" and "*gun*" roads);
Singapore (includes "expressways", "major arterials", and "collectors", excludes "local" streets);
Kuala Lumpur ("expressways, primary distributors, district distributors, local distributors");
London ("classified roads");
Paris (all roads except ordinary departmental roads);
Sydney (includes "main roads", excludes "local" streets);
Adelaide (includes "arterial roads", excludes "local" streets);
New York (includes "freeways and arterial", excludes "local");
Washington (excludes only "collectors and local streets");
San Francisco (excludes "city streets");
Detroit (excludes "local roads");
Denver (includes "freeways, expressways" and "arterials").

Perhaps Asian cities could substantially expand road capacity through extraordinary measures such as smart highways, and multilevel or underground roads and parking stations (indeed many are trying to do so). However, the fact that some Asian cities already have very high traffic intensities suggests that this might be a disastrous strategy. Further expansion of road capacity will of course allow increased traffic volumes and hence increased traffic intensity (unless such cities rapidly reduce their density). Very dense cities, perhaps more so than any others, do not have the choice of building enough roads to satisfy demand. Simple calculations reveal that this would destroy the fabric of the city long before the demand for private travel could be satisfied (Zahavi, 1976). In fact, a case can be made that even in lower density cities, the burden of attempting to cater to the full demand for roads is overwhelming (Goodwin, 1991). Furthermore, major road-building programs can directly undermine the alternatives to private motorised transport as well as indirectly starving them of investment.

Spatial opportunities for better urban transport in Asia

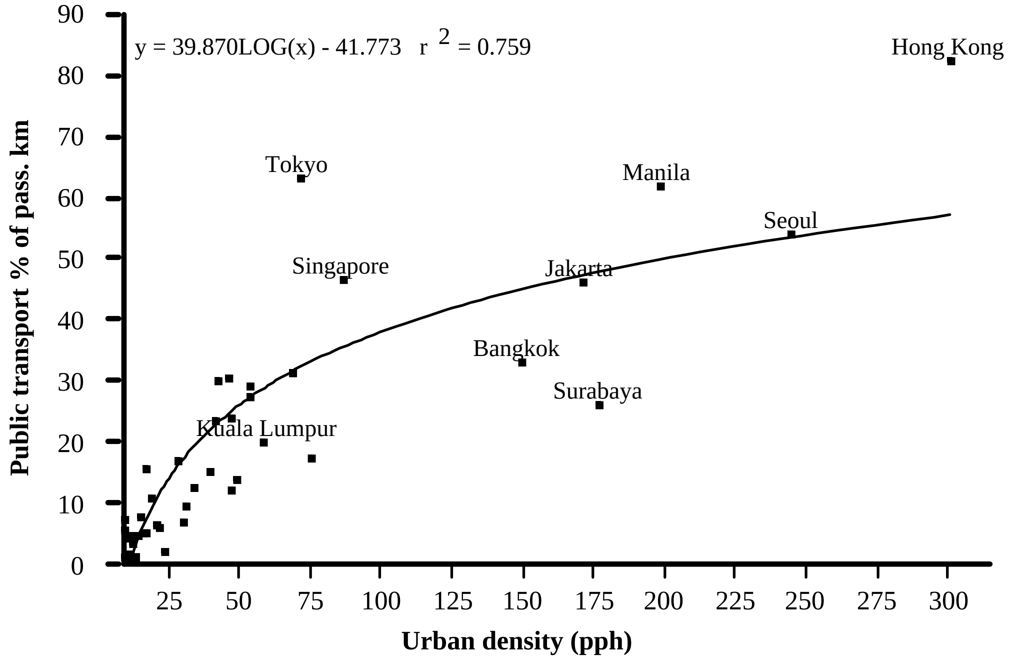
This section turns to some of the opportunities presented by the dense land use characteristics that are common in Asian cities.

Public transport

It is well known that high urban densities (of population, jobs and services) provide an opportunity for high service levels of well-used and potentially profitable public transport and for a significant role for non-motorised modes of transport (see for example Pushkarev and Zupan, 1977). The case of very dense and wealthy Hong Kong, with 82 percent of all motorised passenger kilometres by public transport and with 570 passenger boardings of public transport per person per year, best exemplifies the opportunity that high urban density presents to public transport.

Figure 8 illustrates that a very high role for public transport is possible in high density cities, even in those with high incomes. However, the examples of Bangkok and Surabaya and the wide scatter of points on the graph suggest that high density does not necessarily guarantee success for public transport and that other factors, such as service quality and the competitiveness of public transport speeds with private transport, must also be important.

Figure 8 Public transport percent of total motorised passenger kilometres versus urban density in an international sample of cities, 1990



A number of mechanisms explain why there is at least the potential for high levels of public transport in dense cities. In high density environments there will be large numbers of potential customers within the catchment of most public transport services. Another mechanism is that dense areas can be effectively served by space-efficient but high-capacity public modes (Bruun and Schiller, 1995). Third, high density makes it easier to provide highly accessible public transport. For a given level of service kilometres per person, service kilometres per hectare (and hence ease of access to public transport) will be higher in a higher density city. The tendency for high density cities to also have mixed land use encourages demand for public transport to be well spread throughout the day, as many trip purposes will be served within a small area. Finally, high density, mixed land uses generate sufficient demand to justify high-frequency public transport service, which further strengthens the convenience of public transport for passengers, especially by making transfers between services easy. An integrated network of high frequency services can unleash the benefits for passengers of the network effect to make all parts of the urban area accessible to all and allowing public transport to serve random trip destinations and actually compete with the convenience of private vehicles (Laube, 1995; Mees, 2000).

Non-motorised accessibility

Another opportunity presented by the high urban densities found in many Asian cities is the possibility that many trips can be short and therefore easily made on foot or by non-motorised vehicles. Mixed land uses, that are often associated with high densities, also encourage short trips and non-motorised transport by allowing a diversity of destinations to be available within a short distance.

The potential should be high, in theory, for non-motorised transport to play a very large role in dense Asian cities. Even in large Asian cities with rather high levels of motorisation, such as Bangkok, high proportions of trips are still within non-motorised range. In Bangkok in 1989, according to a JICA study, about 51% of motorised trips were less than 6 kilometres. This implies that if non-motorised trips are included, then approximately 60 percent of all trips in Bangkok were less than 6 kilometres in length (Poboon, C., August 1996, pers. comm.). However, high density again does not guarantee that non-motorised transport will play an important role. For example, Bangkok seems to have remarkably little walking or cycling to work despite its high density. The levels of non-motorised transport in high and very high-density Asian cities are often no higher than levels found in many middle-density European or Japanese cities (Table 5). The hostile street environments for pedestrians or cyclists in many Asian cities can negate the potential provided by the land-use patterns

.

It would appear from this very brief investigation of opportunities that many Asian cities are not fully exploiting the potential that their high urban densities present to encourage flourishing public transport and non-motorised transport. This is particularly apparent with respect to non-motorised transport. Nevertheless, there is no doubt that the land-use characteristics of the Asian cities mean that they have a high inherent potential for these modes of transport to do well. Policy settings that work with this opportunity are likely to reap rapid and significant rewards for dense cities. This is primarily because the local negative impacts and the spatial demands of public transport and non-motorised transport are much lower (per kilometre travelled) than those of private cars or motorcycles (Bruun and Schiller, 1995; TEST, 1991).

Choices and Visions for Better Urban Transport

This final main section of this paper now turns to an investigation of the principal transport choices that are available to Asian cities by looking in some detail at the alternative development paths that have been followed by a number of cities and which might provide lessons for others.

Walking cities, transit cities, bus/jitney cities, auto cities and motorcycle cities

It is possible to apply transport-based descriptive labels to different types of city. These labels can be used as a short-hand to describe in general terms both the transport systems and the land-use patterns that typically go with them, making it easier to describe the evolution of transport and land-use systems. This is possible because historically distinctive urban land-use patterns have tended to arise in association with each new important and dominant transport mode. For example, all cities prior to about 1850, relied primarily on walking, with small contributions from animal drawn vehicles and water transport in some cities. This city type has been called “the walking city” or the “pre-public transport city”, or the “foot city” (Hall, 1983; Newman and Hogan, 1987; Shaeffer and Sclar, 1975). A walking city cannot be anything but compact and is generally unable to extend more than about 5 kilometres in diameter (meaning that all destinations can be reached within about a half-hour walk).

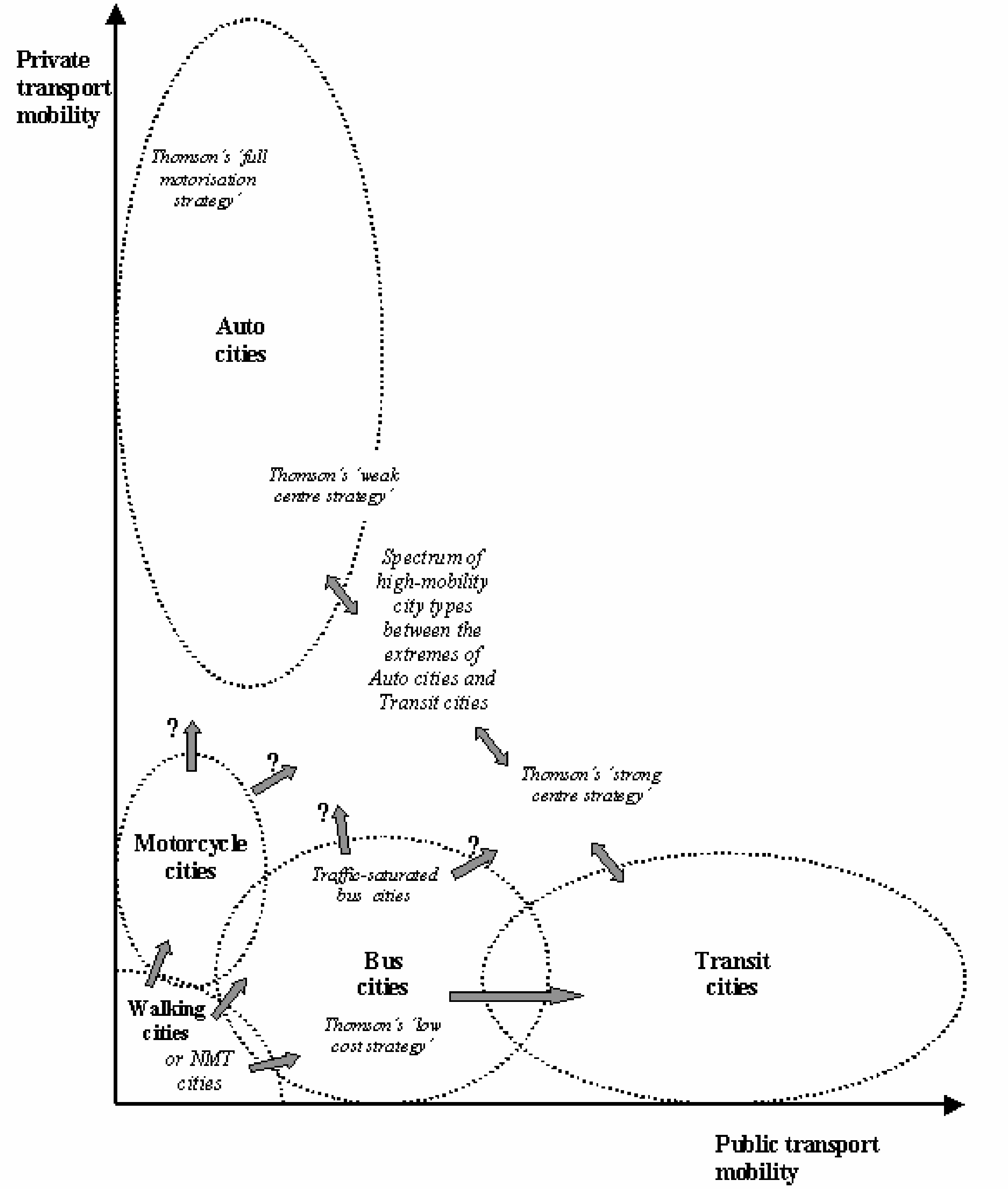
The importance of bicycles, trams and urban rail between 1860 and 1920 allowed “public transport cities” (or “transit cities”) to emerge, at least in high-income countries. These generally spread 10 to 20 kilometres along rail and tram corridors and could have lower densities than walking cities (of between 50 and 100 persons per hectare) (Newman and Hogan, 1987). Transit cities tended to have important, concentrated central business districts (CBDs), which emerged as a result of the accessibility pattern created by the mainly radial public transport. The “bus, jitney and NMT city” (or bus/jitney city) shown in Figure 1 could be viewed as a variation on this transit city type. The bus/jitney city is also very similar to the “low cost” urban transport and land-use strategy described by Thomson (1977).

Finally, in many wealthy Western cities, diesel buses, mass car-ownership and widespread road building after the Second World War facilitated the extreme dispersal of development up to 50 kilometres from the centre and with densities of only 10 to 20 persons per hectare. The car became the mode of transport that shaped new urban development and allowed the emergence of a new city type, called the “automobile city” by Newman and Hogan. One perspective on modern cities is to see then as hybrids, having elements of two or more of the “pure” types.

A further speculative city type is proposed here, namely the “motorcycle city”. Motorcycle cities seem to be a new phenomenon and thus were not observed by Thomson or by Newman and Hogan. An increasing number of Asian cities that previously depended upon non-motorised transport, are apparently now moving directly to motorcycle-oriented transport, without any intervening period with a significant role for collective public transport. Examples include Denpasar, Chiang Mai, and Ho Chi Minh City. It is not yet clear whether motorcycle domination will persist for long in any particular city. Furthermore, if it does persist, it is also not clear what land-use characteristics will emerge in such cities. For the moment, they can perhaps best be understood as being part of a more general low-cost city type that takes in both bus/jitney cities and motorcycle-oriented cities. Over time, a truly motorcycle-oriented city could probably have a more dispersed pattern of activities than a bus city. On the other hand, a motorcycle-oriented city can probably cope with higher densities than are possible for a car-oriented city due to the more modest space demands of motorcycles (especially for parking space).

Figure 9 shows a schematic plot of how various city types can be interpreted in terms of a graph showing travel by both private and public transport (of the kind in Figure 4). It represents this author’s assessment of where the various city types would approximately lie on such a graph of private versus public travel.

Figure 9 City types on a plot of private versus public motorised travel per person



Source: Barter, 1999.

Land-use considerations or spatial constraints cannot be ignored when we consider what will happen as the transport systems in a city change. For example, it has been demonstrated in this paper that serious problems arise if significant numbers of cars quickly enter dense cities that were previously dominated by non-motorised vehicles, buses or motorcycles.

Alternative paths of Asian urban transport development

A schematic diagram, Figure 10, illustrates the main potential alternative paths of evolution between the different Asian city types and some of the key choices that play a role in influencing these paths. Many of the urban transport trends described earlier in this paper can be interpreted in terms of the paths in Figure 10. The conclusions that are summarised in Figure 10 are based on a detailed review of events and detailed policies in nine Asian cities over recent decades (Barter, 1999). It concluded that an important turning point arrives when a bus/jitney city is in the early stages of an upsurge in vehicle numbers and the extent to which private cars are either welcomed or discouraged at that time appears to have an important long term impact.

Option 1: Restraint of cars and promotion of public transport

Hong Kong, Seoul and Singapore seem to have followed the path portrayed on the right-hand side of the model in Figure 10, from bus/jitney cities towards “modern transit cities”. In each case, this evolutionary path involved early policies that discouraged the ownership and use of private vehicles. Hong Kong, Singapore and Seoul have long had policies restraining private vehicle ownership and/or use, and have fostered high quality public transport. Expressway networks in each of these cities are relatively modest relative to population (Barter, 1999). In South Korea, restraint of car use and ownership was achieved through high gasoline prices, a high yearly car ownership tax, and low availability of credit for private consumption (World Bank 1986; Kim 1991). Car ownership stayed very low in Seoul until the mid-1980s[5]. In Hong Kong and Singapore, restraint on private car ownership began in the early 1970s in response to upsurges in traffic. Usage restraints soon followed, such as increased petrol prices, area licensing (in Singapore), and parking restrictions. Decision-makers recognised that they could ill-afford the spatial demands of many cars. In both Hong Kong and Singapore, restraint measures have been strengthened several times since they began (Pendakur, Menon et al. 1989; Phang 1993; Hau 1995; Ang 1996). These policies dramatically slowed motorisation in the two city-states, despite tremendous increases in incomes. It is important to note that in Seoul, Hong Kong and Singapore restraint on cars began early in the motorisation process. All began restraint before car ownership reached 70 cars per 1000 people. This may have been one factor in making the restraint policies more politically palatable.

The slowness of their motorisation helped these cities to retain high ridership on buses and then eventually to invest in mass transit. Restraint of private transport in Hong Kong, Seoul and Singapore has been helpful by discouraging middle class customers from deserting buses, thereby maintaining the customer base and reducing the impact of traffic congestion on buses. Until relatively recently, Seoul, Hong Kong and Singapore had bus-dominated public transport, but all have now built very significant mass transit systems

[5] At that time the cost of driving in Seoul suddenly decreased just as incomes continued to increase. By 1990/91, the real price of gasoline in Korea was less than half of its levels in the period, 1975 to 1985 (World Bank 1995). However, a congestion crisis in Seoul is forcing it to renew efforts to restrain traffic, to enhance bus priority and to expand urban rail (Lim 1993; Chae, Kim et al. 1994).

It is important to point out that Seoul, Singapore and Hong Kong traffic restraint began BEFORE mass transit was built[6]. The actual building of mass transit systems came rather late in Singapore, Hong Kong and Seoul, and was not the initial impetus behind their “transit-oriented” paths. In fact, it seems that traffic restraint policies in these cities had the effect of ‘buying time’ that allowed them to later be able to afford world-class public transport systems, the viability of which was not threatened too soon by rising private vehicle ownership. Public transport in these cities was able to retain the middle class as customers and cater to their rising aspirations for mobility by improving services gradually and eventually with urban rail systems. Private vehicle ownership remained below 150 vehicles per 1000 persons by the time mass transit systems could be completed in these cities. The metro systems in Singapore, Hong Kong and Seoul as well as their overall public transport systems have among the highest cost recovery rates in the world (Allport 1994; Kenworthy, Laube et al. 1999).

Option 2: Unrestrained motorisation

By contrast, Bangkok and Kuala Lumpur, among others including Taipei and recently also Jakarta and Manila, have not yet restrained private vehicle ownership or usage and to a greater or lesser extent have become “traffic saturated”. Most of these cities (with the exception of Kuala Lumpur) have not yet fundamentally altered their urban form or transport network characteristics sufficiently to cope with cars. They have thus become “traffic-saturated bus cities” as shown in the centre of the diagram in Figure 10. The emphasis of urban transport planning in both Kuala Lumpur and Bangkok has long been on efforts to increase the flow of traffic (Spencer 1989; Jamilah Mohamed 1992; Poboon 1997). Vehicle ownership restraint has been rejected in both places and proposals for traffic limitation measures for congested central areas were seriously considered then dropped by both in the 1980s (Spencer 1989; Tanaboriboon 1992). Public transport and non-motorised transport have been neglected (Barter 1996). Since the 1970s the Kuala Lumpur metropolitan area has been pursuing probably the most ambitious program of expressway construction in Asia and has achieved by far the highest figure for length of expressway per million people among the Asian cities in the sample (Barter, 1999).

In Kuala Lumpur, Bangkok, Taipei, Jakarta and Manila public transport was very slow to improve and remains much slower than private transport (Barter, 1999). Rapid motorisation made the improvement of public transport particularly difficult. As congestion crises emerged in the 1990s in each of these cities, public transport failed to offer a viable alternative to the cars and motorcycles of the emerging middle-class (even if the cars could only move at a crawl). Significant urban rail investments have generally occurred recently only after motorisation reached rather high levels and large road investments have continued in competition with the new urban rail. There was no bus priority in Kuala Lumpur until 1997, contributing to the decline of patronage as buses came to be a “mode of last resort”. Bangkok had some success with giving

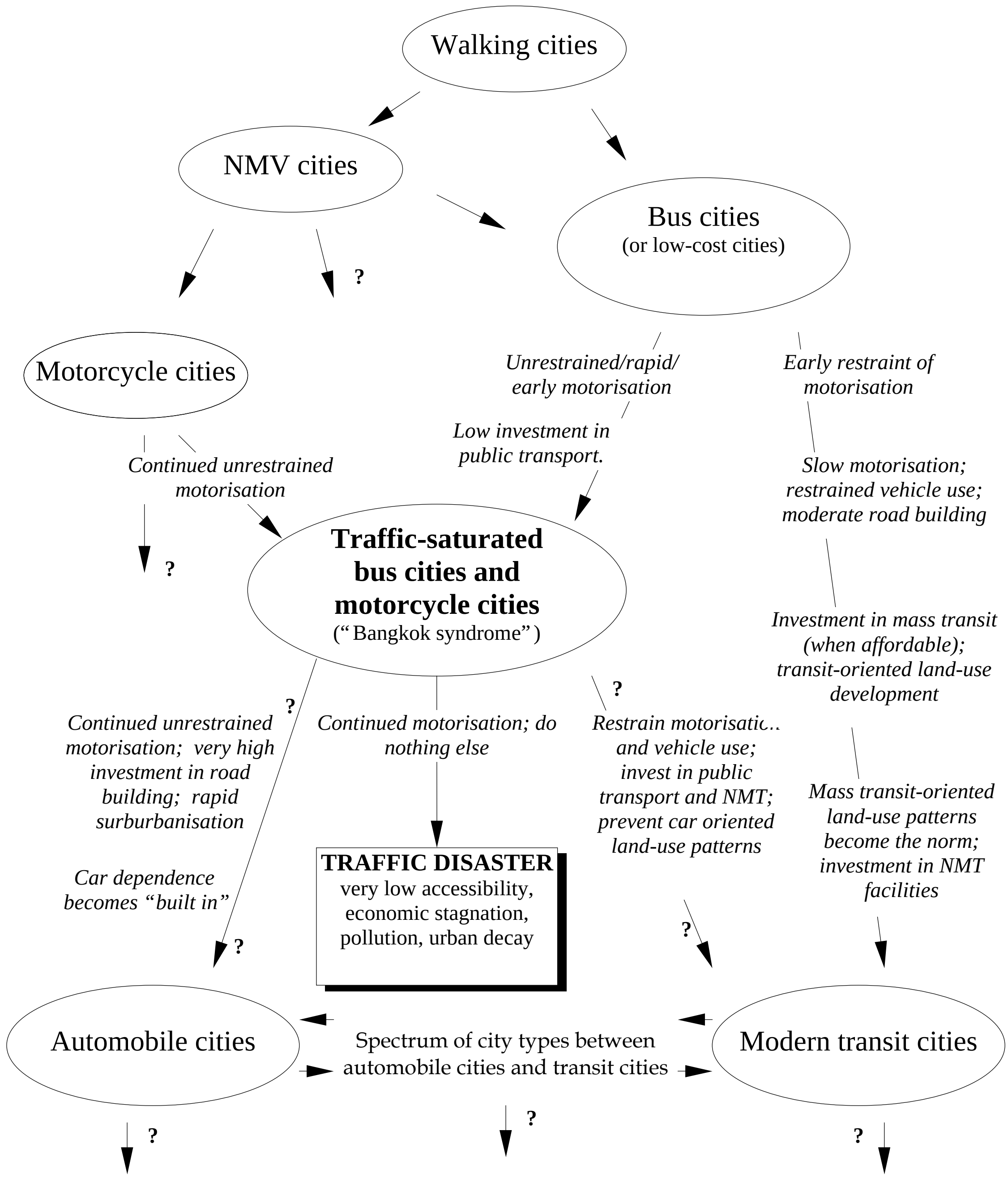
[6] Seoul’s first subway line opened in 1974 but the system remained small until 1979. Hong Kong’s MTR opened in 1979. Singapore’s MRT did not open until 1987, whereas traffic restraint started in the early 1970s.

buses priority but did not persevere. A network of bus lanes in Bangkok was successful in the early 1980s (Marler 1982) but by 1990, just as congestion was making the lanes more and more crucial to maintaining the viability of the bus service, the network had become largely ineffective due to lack of enforcement[7] (Tanaboriboon 1992).

Urban traffic restraint and the enhancement of public transport are intimately linked. Allport (1994) argues that much of the importance of mass transit investment is in making traffic restraint politically palatable. A major reason for Kuala Lumpur and Bangkok's rejection of traffic restraint in the 1980s was the argument that public transport must improve first (Spencer and Madhaven 1989). Similar arguments have been used in Jakarta (Forbes 1990). However, the argument that mass transit must precede restraint is not really supported by the evidence from Seoul, Hong Kong and Singapore where restraint began much earlier than urban rail investment (although the circumstances in those cities may be difficult to reproduce elsewhere). In the absence of traffic restraint, motorisation may quickly reach high levels as incomes rise, before improved public transport can be put in place. This is especially likely if cheap motorcycles find a ready market as they do in many Asian cities. In Bangkok, Kuala Lumpur and Taipei, private vehicle ownership, including motorcycles, passed 400 per 1000 people soon after 1990, before any significant mass transit was opened.

[7] Except for the few contra-flow lanes, which are self-enforcing. No-one wants to run head-on into a bus.

Figure 10 Simple generic model of urban transport and land-use evolution in developing cities



Note: This scheme is intended to describe the paths taken or potentially to be taken by cities that are in the so-called developing world or which were in the "developing world" until the 1960s or so.

Traffic restraint and equity

Importance has been attached here to the potential of restraint policies aimed at slowing motorisation and at discouraging rapid increases in private vehicle use. Wherever transport demand management (TDM)[8] policies are proposed they always generate considerable debate. In particular, mistaken equity arguments are often heard over TDM. It may seem on the surface that policies that increase the price of private car usage

[8] Transport Demand Management (TDM) includes such policies as car parking limits or taxes, parking "cash-outs", road pricing, fuel pricing, congestion pricing, distance-based insurance and many other related tactics. TDM can increase occupancy of vehicles and shift travel to public transport, to off-peak times or to less congested routes.

are unfair. In fact, the opposite is true (Litman, 1996). Among the reasons for this are that car users, especially those who use their vehicles the most, are generally in the highest income groups. This is especially so in low-income cities where cars are owned only by the rich. The earlier in the motorisation process that traffic restraint policies begin, the more equitable they are. Conversely, in low-income cities, policies that subsidise private car use (eg gasoline subsidies) are extremely inequitable, since they help rich people much more than the poor. The economic burden of TDM-related charges, such as road pricing, fuel taxes or parking surcharges, depends greatly on the availability of alternatives, especially good public transport and a safe environment for cycling and walking. These alternatives will wither away unless there is a financial incentive for middle-income travellers to use them, at least occasionally. In cities with successful public transport, such as Zurich, Seoul or Hong Kong, it is used by upper-income, middle-income people and the poor alike. The equity impacts of TDM-related charges also depend very much on how the revenues are used so it is important that any such revenue be used to benefit lower-income households, either by improving travel alternatives or in some other direct way.

Scenarios

The simple generic model of Figure 10 also includes possible future paths for Asian cities. Which of these paths is chosen will depend upon the outcomes of debates (whether public or among decision makers) in each city. It is hoped that the framework developed in this study can help to inform such debates. The conditions that led Bangkok to face such extreme transport-related problems are widespread among large cities in the developing world. Any such city with high urban densities and a bus-oriented, non-motorised or motorcycle-oriented transport system and a high rate of economic growth must consider the “Bangkok syndrome” to be an imminent danger unless the growth of private vehicle ownership and usage can be slowed down.

In the dense, traffic-saturated bus cities, continuing on the current path of allowing unrestrained motorisation is an extremely problematic choice. Nevertheless, it is a choice that some cities may make. The result of such a choice is depicted on the generic model as “Traffic Disaster”. This scenario is likely to be associated with chronic pollution, urban decay and possibly even economic stagnation for the city. Small motorcycles may continue to proliferate in such cities as the only mode that remains viable. Activities and land-use patterns would most likely continue to disperse and gradually make the option of turning to the transit-oriented strategy more and more difficult. For dense, middle-income, traffic-saturated bus cities with modest financial resources, road investments are unlikely to be sufficient to allow the cities to spread out rapidly enough to relieve the pressures of pollution, congestion and traffic impacts generally. Such cities can apparently continue to function, but an unpleasant scenario emerges. Traffic will tend to dominate every public space, the city will expand outwards at upper-middle or high densities but with centres of activity widely scattered, traffic speeds will be low and conditions for walking or cycling will be unpleasant. Public transport will become increasingly unattractive due to low speeds and poor service levels. This kind of city will have moderate levels of mobility but a very low level of accessibility. Unfortunately, this description can already be applied to Bangkok today.

Despite this gloomy scenario, there is still hope. Traffic-saturated bus/jitney cities, such as Bangkok, have not yet substantially reoriented their urban fabric towards the needs of private cars, and it is considered that a transit-city path still remains an option for the future. However, such a path will only be possible if the choice is taken to embark vigorously on new policies that restrain and slow further motorisation and vehicle use, and which increase investment in, and priority for, public transport and non-motorised transport. Curitiba in Brazil is one such city that has managed to turn away from a disastrous path of traffic growth with vigorous public policy and a determined low-cost approach (Cervero, 1995). Lower-income cities, many of which are apparently following paths similar to Bangkok's, can turn away from the path towards "traffic disaster" by adopting vigorous policies aimed at switching to a transit-oriented path. The chances of success in improving public transport in lower-income cities would be greatly improved by traffic restraint.

For some cities with relatively higher incomes, moderate densities and smaller population sizes, it may be possible to make high investments into roads and low-density suburban development and hence to allow a car dependent city to emerge (possibly accompanied by some investment in public transport aimed at maintaining access to older central areas). The signs are that Kuala Lumpur's metropolitan region, the Klang Valley, is following just such a path with its continued very high rate of motorisation growth and with huge investments in urban expressways (Barter, 1999). It is a high-cost strategy that depends on continued very high investment in transport infrastructure. It is a path that ultimately leads to a city with many of the same accessibility and environmental problems of "automobile dependence" that are seen in Australian and American cities today.

It is more difficult to speculate on future possibilities for cities in which non-motorised vehicles or motorcycles are currently predominant. The prospect of an influx of cars into such cities, which now have very limited public transport, is a relatively new phenomenon. There is an urgent need to examine the question of which choices can best contribute to sustainable, equitable and efficient urban transport development in such cities in the future, especially as incomes rise further and bring car ownership within the reach of even a small part of the populations of these cities. Like the large bus/jitney cities that have been a focus of this paper, non-motorised vehicle cities and motorcycle cities tend to be dense or very dense. Therefore, these cities face severe spatial constraints to the widespread use of four-wheeled private vehicles. In many cities of this type, public transport plays a small role and will be difficult to improve quickly.

Conclusions

A key argument in this paper has been that rising incomes do not necessarily mean that a traffic-dominated urban transport future is inevitable. Urban decision-makers need to be aware that there are effective public policy levers that can have a major influence on transport trends and that they will have most success if policy is made with a keen awareness of the high density urban land-use patterns that exist in most Asian cities. The high urban densities of cities in Asia are best served by high levels of public transport, walking and cycling. The same density factor means that it is physically difficult to accommodate many private motor vehicles. It is not possible to provide the same level of road provision in dense cities as in lower density cities. Bangkok illustrates that a 'traffic disaster' can arise very quickly as motorisation increases in a dense city. The high densities of most Asian cities provide transport planning with both challenges and opportunities. There are challenges because such cities are vulnerable to traffic saturation, but there are opportunities because land-use patterns in Asian cities are potentially highly suited to the non-automobile modes of transport. Policy settings aimed at exploiting this opportunity are likely to reap rapid and significant benefits

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