PUBLIC TRANSPORT OPTIONS FOR EAST ASIAN MEGA-CITIES

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Abstract

This paper provides insights of the current state of public transport in East Asian Mega-cities, their characteristics that make them different with other public transport systems in other parts of the world. A combination of high percentage of public transport use, existence of para-transit, poor service quality to respond with high level of motorizations are some of the features of urban public transport in East Asian developing cities. Data from Tokyo, Shanghai, Seoul, Taipei, Ho Chi Minh City, Manila, Jakarta, and Bangkok are analyzed to develop a thorough understanding on the specific features of public transport in the East Asian Mega-cities. Several reform policies and strategies are proposed, including promoting public transport technology to shift the competition from costs to quality, fare integration, suitable financing options, and an appropriate implementation timing, as well as developing a public transport hierarchy to suit the increasing demand for urban mobility.

Keywords: *East Asia, urban area, public transport, reform strategy.*

INTRODUCTION

In order to assess the urban transport situation and explore appropriate policies in East Asian mega-cities, it is important first to examine the specific features of these mega-cities. East Asian mega-cities, in general, possess several distinct socio-economic features, but in the following paragraphs only key features which may have direct implications for urban transport policies are discussed.

Among the world's different regions, East Asian region is well known for its rapid and sustained economic growth. Table 1 shows the long-term GDP per capita trend measured in international dollars (based on the purchasing power parity) and annual economic growth rate averaged over 1985-2004. To increase the GDP per capita from about $1,200 level to $5,000 level, US took 86 years but Japan, Taiwan, Korea, and Thailand took only 57, 21, 19, and 29 years respectively, squeezing the required time significantly. Similar is the pattern also for the $5,000 to 10,000 segments. The higher economic growth of most East Asian countries in recent decades is clearly reflected by the average annual growth rate figures shown in Table 1.

The trend of high economic growth is accompanied by the concomitant trend of rapid urbanization. Over the period of 25 years from 1980 to 2004, East Asian region recorded an average annual urban population growth rate of 4.03% against the world average of 2.4% (World Bank, 2006). The urban growth is however more concentrated in the capital cities resulting in rapid emergence of primate megacities in the region. In 1950, there were only 3 (tree) cities from East Asia in the list of 20 largest cities in the world; by 2005, there are 7 (seven) cities in the list, namely, Tokyo, Shanghai, Jakarta, Osaka-Kobe,

Beijing, Metro Manila, and Seoul. And there are many candidate cities to be included in the list in near future, such as Bangkok. The megacities development, on one hand, is posing a challenge of managing large-scale urbanization not experienced before by these countries and, on the other hand, is further widening inter-regional disparity-an important policy issue in most East Asian countries.

Table 1 Historical Trend of Economic Growth

Countries	Long-Term GDP Trend[a] (PPP, International 1990$)			Average Growth Rate (1985-2004)[b]
	GDP/capita (Calendar Year)			
US	1,257	5,079	10,116	33%
	(1820)	(1906)	(1951)	
UK	1,250	5,288	10,049	2.7%
	(1700)	(1915)	(1967)	
Japan	1,297	5,129	10,040	2.4%
	(1906)	(1963)	(1971)	
Taiwan	1,270	5,020	10,522	
	(1956)	(1977)	(1991)	
Korea	1,252	5,007	10,238	6.8%
	(1964)	(1983)	(1993)	
Thailand	1,205	5,290	6,383	6.1%
	(1963)	(1992)	(2001)	
Indonesia	1,235	3,256		5.2%
	(1971)	(2001)		
Phillipines	1,254	2,412		2.6%
	(1953)	(2001)		

a: data source, Maddison (2003)
b: data source, World Bank (2006)

Equally significant aspect for urban transport policy is the high-density mono-centric urban structure most of these megacities are evolved with. Table 2 shows size of metropolitan income, area and population along with the size and population density of metropolitan core. The high-density metropolitan cores are evolved as strong centers attracting larger share of important urban functions such as business districts, government offices and shopping centers, and thereby results in a distinct mono-centric urban form. There is however some variation in the homocentric pattern. For example, in Tokyo and Metro Manila, there are multiple sub-centers within the metropolitan core while Seoul, Bangkok, and Shanghai exhibit truly mono-centric form. The urban form, in fact, evolves over a long period of time and transport infrastructure is an important element that influences the structure of the urban form. In that sense, it appears that the urban transport system in most East Asian megacities is partly responsible for mono-centric concentration at the metropolitan core.

Unlike other cities in the US, Europe, and Australia (with some exceptions of some European cities such as Zurich), in East Asian cities, public transport has been the most predominant mode of urban travel. The extremely high rate of urbanization and the early stage of economic development in the Asian Cities make it difficult to use road infrastructure-based approach to accommodate mobility in the cities. Figure 1 below demonstrates that the already high percentage of public transport use in the case study cities requires different approaches and perspectives on how we should plan and design

urban transport in East Asian cities. Even London, with an extensive public transport network consisting of bus and MRT system, has a public transport share of less than 30%. This figure is similar with the city of Bangkok which has much less public transport network coverage.

Table 2 Metropolitan Income, Area and Population Density in the Metropolitan Core

	Income per capita US $	Metropolitan		High Density Metropolitan Core		
		Area km^2	Population mil.	Area km^2	Population mil.	Density person/ha
Tokyo	40,658	6,450	30.1	621	8.1	131
Seoul	10,305	11,748	21.4	605	10.2	168
Taipei	15,214	2,324	6.3	134	2.6	197
Shanghai	6,566	6340	17.8	660	11.4	172
Bangkok	6,316	7,761	10.7	225	2.2	96
Jakarta	930	7,315	23.4	656	8.7	133
M. Manila	2,217	3,670	16.3	637	10.1	158
HCMC[1]	1,270	2,095	6.2	494	5.2	105

1. HCMC: Ho Chi Minh City

Data source: STREAM Study Compilation

Even when some of the East Asian cities are losing its share of public transport such as in the case of Bangkok and Seoul, some other cities maintain relatively similar share of public transport for 30 years. Even in the case of Taipei, the share of public transport has dramatic increase from 30% to more than 40% in the last 10 years, and the Taipei government has even pushed the target to have 60% of public transport share in 8 years time without increasing its tariff. It is therefore important for us to know what are the ingredients of success and failures of public transport in East Asian Mega-cities and what lessons to be learned from the historical data.

Nowhere in other parts of the world that we witnessed many types of public transport operating in urban areas like in East Asian cities. The presence of Three Wheeler public taxis in Bangkok and Jakarta, Jeepney in Manila, Motor taxi in Ho Chi Minh City and Jakarta provided a unique characteristic of the region. The operation and management system also varied from a corporatization of public transport operation to an individual ownership-hire system in the case of Metromini in Jakarta and Jeepney in Manila. The variability of the system has been predominantly in response with the extremely high increase in motorcycle although in some East Asian Cities, the use of motor cycle in the city center is completely banned for the reason of safety (Shanghai). On the other hand, some other cities such as Manila, where 10 years ago the use of motorcycle has not regarded as an option, is experiencing an increase and is seen as a “threat” to Jeepney as they provide a flexible and door-to-door mode of travel.

The wide variety of para-transit system in the earlier academic discourse (in 1970 – 1980) was often cited as an ingenious East Asian solution for urban mobility as they provide a reliable, door-to-door and affordable public transport system. However, as the city grows beyond 10 million inhabitants, those systems can no longer meet the demand for high capacity commuting movement. Its financial regime makes it worse to maintain adequate service level, creating a spiraling-down effect of public transport financial viability and market share.

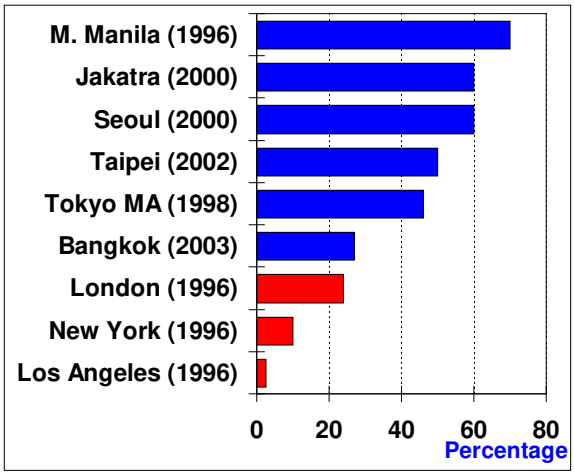

Figure 1 Percentage of Public Transport use in Selected Cities

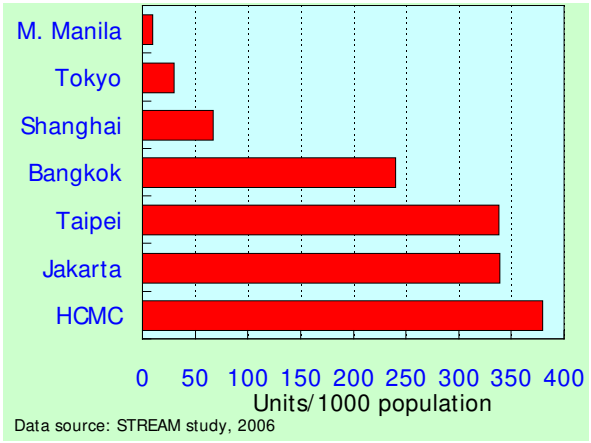

Figure 2 Motorcycle Ownership in 2004

Urban travelers in East Asian Megacities are seeking a rational choice of travel. The revival of public transport system in Seoul, Taipei, and Jakarta has demonstrated that people do behave rationally when confronted with the choice of travel. The earlier case of Singapore (although the case may not be transferable to other cities due to its characteristics of a city-state condition) showed that choice of travel should be provided in order to gradually changed people choice of travel. The change from costs competition to quality competition to maintain the high percentage of public transport use in East Asian Megacities will be the central question on the provision of urban public transport system. The main issue is therefore to prevent the shift from public transport to private transport, not how to shift private transport user to public transport.

STRATEGIC ISSUES

Bus and Para-Transit Reform

The current bus and para-transit operation will remain the feature of public transport system in East Asian Megacities. The industry appearance has been the subject of

early public transport market opening in the 70's-80's following bus deregulation in Europe (especially in the UK) that allows private operators to receive concessions to provide service-for-fee public transport system. Many developing East Asian cities however, failed to establish a quality standard and impose a stringent enforcement of the concession agreement. Many cities like Manila and Jakarta experience a license-for-life principle, without a mechanism for reviewing the compliance of public transport operation. This has in turn, created an operational efficiency and sacrificing the service quality in the urban mobility, making buses and para-transit inferior toward private vehicles. The polarization of urban income level has also contributed to the segmentation of bus and para-transit customer in the cities, the phenomenon that did not happen clearly in the developed cities.

Learning from East Asian cases, several key elements of reform can be identified as follows:

1. Fleet modernization; Modernizing bus and para-transit fleet have been the subject of many city governments' policy both via direct government budget (Jakarta), government-owned company (Shanghai), PPP Scheme (Seoul), or a full private financing with the government regulation (Taipei, Bangkok). In Ho Chi Minh City, fleet modernization includes the introduction of a new double-decker bus to increase the capacity.
2. Fare collection through IC cards; Public transport integration has been promoted using a ticket integration and revenue system automation. Taipei has introduced a contactless IC Card in 2002 whereas Tokyo has developed a system earlier. Many other cities have followed to use similar system in order to boost the scale-economies of the system.
3. Bus lane; Jakarta has been the front runner in developing Asian megacities to promote BRT (after the failure of bus lane system in 90s'). It is now emerged as a new approach to increase road-based public transport safety and capacity. Almost all of the case study cities have now introduced or considering introducing a specific bus-lane (Bangkok, Seoul, Manila, Taipei, and Ho Chi Minh). Many cities introduce the system because of its low-cost feature and high-capacity if designed properly and the city structure supports high density corridors.
4. Route co-ordination, Information system, and Co-ordination with MRT
5. Fare discount for transfer.

East Asian Megacities have also a breeding ground for public transport reform models. It ranges from a gradual-reform model (Taipei) to the direct interventionist model (Seoul). Other cities fall in between the two. The followings will highlight the differences between the two models.

1. Taipei Model (Gradual-Reform Model); The city of Taipei has developed a gradual change in the public transport sector by allowing a step-by-step introduction in various public transport modes. The current MRT system is introduced 3o years after its approval and after the public transport hierarchy is established. As a result, after an extreme decline from 63.3% (1980) to 26.8% (1990), the share of public transport gradually return to 40.8% in 2005. Now the city of Taipei has set a target of 60% in 8 years period by introducing complimentary BRT system in the city center.
2. Seoul Model (Interventionist Model); The downturn of public transport share in the city of Seoul has been responded by a massive government support in term of providing public transport supply for its inhabitants. A PPP scheme in the public

transport management and operation is put in place with a direct subsidy from the government. At the moment, the costs of mass rapid transit operation remain below its operating revenue (0.55 – 0.74).

Table 3 Comparison of Taipei and Seoul Models

Taipei	Seoul
Reform through gradual process	Reform through major intervention
Ownership and operation largely by private sector; regulation by public sector	Public-private partnership in management and operation, significant role of public sector
No direct subsidy (indirect cross-subsidy from MRT for fare discount)	Significant financial burden on public sector (direct subsidy)

Is the subsidy justifiable? This question remains the debates within academic and political circles. While many politicians believe that subsidy for MRT and rail-based public transport is necessary, subsidy for buses and para-transits is rarely applied in East Asian Megacities. Many of the current bus and para-transit operations are fully privatized without any government support. Theoretically, and subsidy for public transport can only justifiable when the economic gain coming from current user and shifted user of private vehicle can off-set the amount of subsidy provided by the government. To what extent the city government can maintain the level of subsidy is a current debate with BRT system in Jakarta as it represents a road-based public transport operating in a rail-based environment.

It is also important to note that some cities have attempted deregulation to utilize market force for positive impacts such as fare deregulation in Metro Manila and Jakarta (AC/non-economy buses), entry deregulation for Van transport (Manila, Bangkok) and taxi deregulation in Bangkok. The city of Jakarta has also pursued a taxi deregulation but yield limited success to a wide disparity of the service quality offered by various taxi companies. Those reforms have been successful in improving the efficiency of the company, pushing the price down and creating a competitive environment for private sector to invest in the public transport sector. With the market entry, licensing and fare deregulation operating efficiently in some cities, they can allocate and focus the subsidy to a targeted market (students, senior citizens), creating incentives for transfers, discount for return journeys and time-based travel.

Urban Railways

What was the expectation of cities when they decided to built rail-based urban transport system? They are expected to:

1. Serve as high-capacity and high quality public transport mode
2. Back-bone of inter-modal (Rail, bus, para-transit) system
3. Absorb potential modal shift from bus to private modes
4. Influence land-use pattern (high density and transit oriented)

This paper argues since from the very beginning of the study that MRT and urban rail issues has been related with the policy and implementation timing. Many MRT systems in the developed cities were built in the early of 20th century (Paris, 1900; New York 1904, Tokyo, 1927 and Moscow, 1935) or even in the late 19th century (London, 1863). Other cities like Mexico built their MRT system in 1969, Beijing in 1969 and Hong

Kong in 1979. The policy timing is critical because the city governments are aware that MRT construction is financially a difficult choice and when it is delayed it could have a less impact on shaping the urban form and may need stronger measures to ensure good ridership and thus operating ratio. If the implementation is delayed in the longer period, it may increase a burden for public subsidy. In the city of Taipei, even the MRT was introduced in 1996, the plan has gone back 30 years before. The following table shows the current ridership of East Asian MRT and the consequence of its policy timings that can be drawn from the case studies.

Table 4 East Asian MRT and Their Ridership

City	Opening Year	Length, 2006 (km)	Passengers, 2004 (thousand)	Remarks
Seoul	1974	287	6,500	Rapid expansion, rethinking for alternative modes, BRT
Metro Manila	1984	46	750	No expansion due to financial constraint, low capacity
Shanghai	1995	120	1,300	Rapid expansion, 400 km by 2010 (using leasing fee)
Taipei	1996	67	957	Rapid expansion, 118 by 2010
Bangkok	1999	44	580	Uncertain expansion plan

The right timing means that it is the appropriate time to construct MRT system considering the income level, population, car ownership rate and demand density, as well as the policy to shape the city structure using transport intervention. One of the well-identified evidence of the MRT system is the ability of MRT system to develop polycentric urban form and public transport corridors (Tokyo and Taipei). The Transit Oriented Development or TOD approach has been the subject of many researchers and offers an interesting solution for urban transport financing options.

At the moment, both Ho Chi Minh City and the city of Jakarta are initiating their implementation to construct MRT system. Jakarta plans to build 14.5 km MRT (one line) with the support from the Government of Japan and 27.8 km Monorail system executed as PPP project. Ho Chi Minh City plans to construct 107 km MRT (6 lines) and 35 km Tramway/Monorail system (3 lines).

Table 5 MRT Statistics in the East Asian Megacities

	Population (Greater MA)	Urbanized Density	GRP per capita $	Car Ownership	MRT-km
Taipei	60	220	15.70	242	67
Seoul	12	230	14.04	180	487
Ho Chi Minh City	6.1	355	2.22	10	0
Bangkok	10	138	5.66	227	43.5
Jabotabek	22	173	2.08	125	0
Manila	16.3	206	2.56	50	45.6
Shanghai	17.8	196	7.00	20	120

Note: GRP is in USD 000

Another issue related with the introduction of MRT in urban areas is the types of technology to be used. MRT investment is a very long term investment and the risk

associated with the technology is extremely high (dependency, state-of-the-art technology, operating capacity, system compatibility). From the case study cities, lessons that can be learnt from the technology choice are as follows:

1. capital cost, operational cost and future demand;
2. range of system technology to minimize the cost;
3. important to consider system integration and seamlessness; and
4. importance of early consideration for hierarchical urban rail system (along with service integration with other PT modes) with key elements of different railway services (High-speed, express, local etc), circular line around city core, direct operation between commuter lines and subway lines.

Recent debate on the BRT and MRT is taking a wrong path. Since both systems are public transport systems, they should not be seen as two competing systems. Many studies (for example GTZ, 2002) have identified the characteristics of the BRT and MRT system, but it would be misleading to conclude that BRT is low cost substitution for urban rail. This statement should be put in the context of urban size and physical structure, population distribution and the scale of commuting travel. The BRT and MRT system should be put they can best serve the urban mobility using public transport, as a main trunk line from medium cities (Ho Chi Minh city), a feeder line to urban rail service (Seoul, Taipei), as a transitional high capacity mode (Jakarta).

Financial Sustainability of Public Transport

Against the traditional beliefs that public transport requires subsidy for operation, some cities in the East Asian regions such as Tokyo and Taipei can have operating profit in comparison with their comparison cities like Los Angeles, Paris, Berlin, London, and New York (UITP, 2001). Even the city of Seoul which receives subsidy for its operation, the level of public subsidy is relatively lower than the comparison cities with less public transport fare. The reliability, service quality and profitability, all those keywords lead to the importance of maintaining higher ridership. The following table demonstrates that the high ridership in Tokyo and Taipei is the key element in promoting operationally feasible MRT system.

What is the optimal fare level? This question certainly deserves a delicate elaboration, but the irony of high ridership and loss making public transport operation such as Seoul and Metro Manila has taught us that determining the “good” fare level and understanding the fare elasticity are the key strategy for communicating the rational price for travel. The politicians and policy makers often trapped by their own cage for promoting a notion that a “good” fare is a “low” fare. The spiraling down effect of increasing subsidy and inability to maintain preferred service quality will be inevitable.

The comparison between MRT fare and taxi fare (see Table 7) is a powerful reflection on how the well-structured fare system (either through regulation or market incentive) for urban public transport options may guarantee higher operating ratio without loosing the number of passengers. In the commercially successful system such as Shanghai, Tokyo and Taipei, the fare setting strategy has also shifted from affordability to service quality. In the early stage, affordability is important, but the evidence suggests that users are willing to accept higher fare for better service. When this well-structure fare system is incorporated in a larger scheme of other modes such as bus and para-transit system as well as private vehicles, this would further create an environment where private sector could enter the market without the fear of loosing its investment.

Table 6 Operational Characteristics of Selected Subway System 2005

	Tokyo		Seoul[1]				
	Tokyo Metro	Toei	Seoul Metro	SMRT	Taipei	London	New York[2]
Route (km)	183.2	109	134.9	152.2	67	408	371
Passengers (mil/year)	2110	761	1440	819	361	971	1449
Pass/km/day (000 person)	32	19	29	15	15	7	11
Operation Revenue	357,312	121,774	772,200	426,600	9,204	1,402	2,908
Cost	277,203	114,335	1041,200	780,600	8,571	2,362	5,673
Revenue/cost	1.29	1.07	0.74	0.55	1.07	0.59	0.51
Fare (US$)	1.3~ 2.5	1.4~ 3.5	0.8~1.1		0.6~ 1.9	3.0~ 8.0	2.0 ~

1. data year 2003,2. revenue/cost includes also of bus
2. Data source: Seoul (Sung 2007), rest from homepage of respective agencies

Table 7 Fare Ratio Between Taxi and MRT/BRT

Cities	Taxi	MRT/BRT	Fare Ratio
Jakarta	0.42	0.37	1.14
Manila	0.75	0.26	2.92
Bangkok	1.10	0.44	2.50
Shanghai	1.45	0.40	3.63
Singapore	1.63	0.45	3.59
Hong Kong	1.92	0.51	3.74
Seoul	2.00	0.95	2.11
Taipei	2.12	0.61	3.50
New York	2.50	2.00	1.25
Frankfurt	2.70	2.25	1.20
Rome	3.15	1.36	2.31
London	4.37	3.03	1.44
Tokyo	5.78	1.40	4.13
Paris	7.02	1.91	3.68

The above table shows that the city of Jakarta for example has a relatively similar fare taxi/BRT ratio with cities experiencing high government subsidy for public transport, i.e. MRT operation. It would be no surprise that the city of Jakarta also requires an operational subsidy to maintain its operation. The subsidy trap will put the government in a constant inquiry from the public and in dilemma for an increasing demand or expanding public transport network. The pressure will be even bigger if no significant shift from private vehicle can off-set the subsidy or if the public transport system cannot encourage land use change toward polycentric form, public transport corridors or TOD. Already in Jakarta the cost of using bus system is expensive for the poor (similar with Metro Manila

and Ho Chi Minh City), but if we use an average income for a comparison, Jakarta's BRT is the most expensive system in East Asian Megacities.

The East Asian Megacities case studies showed that different income level responds differently when confronted with a certain fare structure, service quality and affordability. Appropriate market segmentation strategy need to be adopted for example by introducing high-quality mode (MRT, LRT, AC Bus, deregulated fare) and economic mode (non-AC bus, fare control, may be with subsidy). As the income level increases, the market size of the economy mode gradually shrinks and finally can be phased out (through market). Since the market still leaves some community groups un-served or underserved (students, elderly, disabled), the special subsidy can be provided without jeopardizing the commercial viability of the services.

POLICY SUGGESTIONS

There are obvious needs in the basic strategy in promoting public transport in East Asian Megacities. To begin with, public transport should not be treated as a means to provide basic transport services, but should instead be considered and planned as a high-quality and reliable transport service that can provide a comparable service toward private transport modes. The degree of shift could be gradual (as in the case of Taipei) or interventionist (like in Seoul), but the rate of success is perhaps higher if the degree of shift is be adjusted with stage of development and market trend)

Cities in East Asia have undergone a different path and taken different strategies and measures (see Table 8). Some of the measures were successful, but some others failed. In the last 30 years, many cities have started bus deregulation, initiating PPP and privatization schemes, some others have installed MRT and develop complimentary BRT system.

To further continue the public transport reform, some of the suggestions below should be considered by policy makers:

1. both demand side (promote demand for public transport) and supply side (improve access and service quality) need to emphasized to make public transport attractive for "choice riders";
2. importance of bus reform: but need to be identified right timing of implementation and mode of reform (gradual vis-a-vis one-time "bigbang");
3. financial cost of bus reform needs to be considered;
4. positive role of para-transit (door-to-door and flexibility) should be recognized; but market forces should be utilizes for reform (Ex. emergence of van transport in Manila and Bangkok);
5. urban rail is imperative but investment needs to be made at the right timing;
6. consideration development of hierarchical railway network should be made from early stage; without hierarchically coordinated urban rail network, public transport mode share can not be maintained, and as a result the public transport system faces the vicious cycle of low ridership and fiscal deficit turning the whole system as "white elephant";
7. public transport fare needs to be harmonized across different public transport modes ("low" fare may not be "good" fare always); and
8. possibility of improving service through both regulation and deregulation need to be considered keeping the emerging market condition and user's preference in view.

Table 8 Summary of Public Transport Measures in East Asian Megacities, 1960-2000.

	1960s	1970s	1980s	1990s	2000~
Tokyo	Tram stopped direct operatn	St. Plaza, new system	Pvtz of national rail	PPP, incentive for Pvt rail	Coordination; deregulation
Seoul	Buses by pvt operators; subway started (1974); subway expansion; Bus lanes, fare subsidy for subway;				Bus reform; Subway, LRT
Taipei	Public bus corporation; private bus companies			MRT started; Bus lanes	MRT expans, MRT-Bus coord.
Shanghai	Promoting Bus and taxi services			Subway started (1995); 400 km by 2010, Bus lanes	
Bangkok	Bus service by pvt (24) and public; Nationalized in 1975 under BMTA		Bus expanded, Bus lanes	MRT by PPP, Taxi dereg 92	Large MRT network plan
Jakarta	Ordinary bus service		Para-transit banned	Bus lane (X)* Rail improv.	BRT lines, MRT signed
M.Manila			Investment for LRT lines; fare Deregulation for AC bus		Bus route reform, BRT?
HCMC	Bus				Bus expands; MRT planned
(X): failed and abandoned					

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