Transport Policies and Patterns: A Comparison of Five Asian Cities

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Abstract
Transportation is a key driver of development in cities by providing safe, efficient and reliable transportation for people, goods and services. Public transportation plays a vital role in contributing to a city's standard of living by providing mobility; which stimulates efficient economic activities, promotes equitable social conditions, and creates sustainable people-oriented urban environments. It is therefore, an important subject of public policy and an effective tool for achieving sustainable development. In this paper, we examine the policies and transport outcomes of Tokyo, Hong Kong, Singapore, Shanghai and Seoul to find out how traffic is kept flowing in these dense and fast-paced cities.

Introduction
Over the last few decades, Asia has seen rapid population growth which exerts pressure on existing economic, social and environmental structures – including transportation and mobility. The Asian Development Bank has estimated that 80% of Asia’s new economic growth will be generated in its urban economies where most jobs and employment opportunities are located. Rapid motorisation contributes to much of the congestion and pollution experienced in Asian cities. In order to balance the need to improve liveability and address increasing mobility needs in cities, local governments must employ sustainable transport development strategies.

According to the UITP European Union Committee Green Paper on Urban Transport, successful local policy packages have to address the three pillars of sustainable transport defined as:
1. Land use planning and addressing the environmental impact of urban sprawl;
2. Restricting private car usage in urban areas; and
3. Developing high quality public transport

Public transportation has a vital role in providing mobility and access. It is the most cost-efficient and environmentally friendly mode of transporting large numbers of people. Thus, cities with sustainable transport systems are characterised by high public transport mode shares, transit-oriented development aimed at reducing travel demand, restricting car usage and facilitating the use of non-motorised modes.

Objective
This paper provides a comparative view of the travel
patterns and transport policies of five major Asian cities – Hong Kong, Tokyo, Singapore, Seoul and Shanghai (Table 1 and Figure 1) whose transport strategies are characterised by the promotion of public transport, the integration of land-use and transport planning and the use of travel demand management measures to reduce travel and optimise traffic flows. The cities represent capital market centres that play important roles as regional transport hubs and are known to have good transport infrastructure. They share similar issues of rapid growth in urban population, rising private vehicle ownership and congestion, which, combined with resource constraints creates a challenging environment for their urban transport systems.

The Cities

Hong Kong

Hong Kong’s Central Business District (CBD) originated in the Central District, situated on Hong Kong Island.

Table 1. 2011 City Comparison

<table>
<thead>
<tr>
<th>Cities</th>
<th>Singapore</th>
<th>Hong Kong</th>
<th>Central Tokyo</th>
<th>Seoul</th>
<th>Central Shanghai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area (km²)</td>
<td>714</td>
<td>1104</td>
<td>623</td>
<td>605</td>
<td>660</td>
</tr>
<tr>
<td>Population (in millions)</td>
<td>5.2</td>
<td>7.1</td>
<td>8.97</td>
<td>10.4</td>
<td>7.02</td>
</tr>
<tr>
<td>Population density (1000 people/km²)</td>
<td>7.26</td>
<td>6.54</td>
<td>14.4</td>
<td>17.3</td>
<td>18.2</td>
</tr>
<tr>
<td>Road density (km/km²)</td>
<td>4.78</td>
<td>1.89</td>
<td>19.04</td>
<td>13.46</td>
<td>4.88</td>
</tr>
<tr>
<td>No. of cars per 1000 people</td>
<td>100.4</td>
<td>61.5</td>
<td>183.1</td>
<td>244.1</td>
<td>41.3(1)</td>
</tr>
<tr>
<td>Rail density (km/million persons)</td>
<td>33.8</td>
<td>25.7</td>
<td>33.9</td>
<td>30.1</td>
<td>19.3(2)</td>
</tr>
<tr>
<td>Bus Fleet per million person</td>
<td>672</td>
<td>816</td>
<td>163</td>
<td>716</td>
<td>692(3)</td>
</tr>
<tr>
<td>Taxi fleet per million persons</td>
<td>5,218</td>
<td>2,145</td>
<td>5,574</td>
<td>2,168</td>
<td>2,149(4)</td>
</tr>
<tr>
<td>Rail ridership per day (million passengers)</td>
<td>2.4</td>
<td>4.73</td>
<td>8.7</td>
<td>7.1</td>
<td>5.76(5)</td>
</tr>
<tr>
<td>Bus ridership per day (million passengers)</td>
<td>3.4</td>
<td>3.79</td>
<td>0.56</td>
<td>4.6</td>
<td>7.7(6)</td>
</tr>
<tr>
<td>Average Fare per boarding (US$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRT/Subway/Metro</td>
<td>$ 0.68</td>
<td>$ 1.29</td>
<td>$ 1.01</td>
<td>$ 0.53</td>
<td>$ 0.45(7)</td>
</tr>
<tr>
<td>Public Bus</td>
<td>$ 0.50</td>
<td>$ 0.94</td>
<td>$ 1.24</td>
<td>$ 1.68</td>
<td>$ 0.39(8)</td>
</tr>
</tbody>
</table>

Kowloon with population densities of about 15,924 and 44,917 persons per km² respectively. The limited space and high population growth in these areas spur dense and compact development, and a highly integrated transportation network.

Hong Kong has a comprehensive public transport system comprising railways, franchised buses, public light buses, taxis, ferries, trams and non-franchised buses. These public transport services are operated by the private sector or public corporations without direct government subsidy. Its public operators are well known for their efficiency and self-finance (Figure 2).

In 2011, bus and rail contributed 89.5% of total motorised travel mode share, making it a city with one of the highest public transport usage (93.3%) in the world. From 2002 to 2011, there was a 9.9 percentage-point increase in the proportion of trips made by rail and an 8.2 percentage-point decrease in the proportion of trips made by bus. This is in line with Hong Kong’s policy of expanding its rail system as the backbone of the transport system with other modes such as buses playing a more supplementary role.

Tokyo
Unlike the other Asian cities, Tokyo is a major commuter city. According to the 2005 National Census, more than 2.5 million people (workers and students from mainly the three neighbouring prefectures of Saitama, Chiba, and Kanagawa) commute in and out of Tokyo daily. Tokyo’s public transportation network is composed of railways which connect Central Tokyo with the suburbs and subways which operate primarily in Central Tokyo, and includes other modes such as buses and streetcars.

Bus and rail account for 51% of total travel mode share in 2008. Between 1998 and 2008, rail mode share increased by 7 percentage-points. This can be attributed to the realisation of the 2000 Rail Expansion Master Plan for Tokyo Metropolitan Area which planned to increase the rail network by 233km by 2015. The share of trips made by bus has remained constant at about 3% while the share of private transport trips has seen a gradual decline over the years.

A significant proportion of trips are made on foot, averaging at about 23.5% of total trips. This may be attributed to the transit-oriented developments in Tokyo where each rail station area has convenient walk links to commercial, retail and entertainment centres (Figure 3).

Shanghai
Most of Shanghai’s urban development is concentrated in the Central Shanghai and Pudong district, which forms the local CBD area. Population density in the districts of Central Shanghai is significantly higher ranging between 18,000 and over 36,000 persons per km².
Shanghai has an extensive public transport system, largely based on metros, buses and taxis. In 2009, bus and rail comprised 25.8% of travel mode share. Between 2004 and 2009, there was a 3.7 percentage-point decrease and 4.4 percentage-point increase in the proportion of trips made by bus and rail respectively. The increase in rail usage can be attributed to the increase in rail density – Shanghai’s rail network size increased by about 234km from 121km in 2004 to 355km in 2009. Overall, public transport mode share (bus, rail and taxi) increased by 0.3 percentage-points to form 34.6% of all trips in 2009. Cycling and walking form the most predominant travel mode, accounting for 36.5% of all trips made in Central Shanghai (Figure 4).

**Figure 4. Shanghai. Source: www.pachd.com**

**Seoul**

Seoul comprises 25 districts and is served by a comprehensive subway network that interconnects every district of the city and the surrounding zones. Public transportation comprises taxi, bus and rail. Seoul’s rail network consists of nine metro lines and the national rail. The city bus network is based on a trunk and feeder system with dedicated rights of way on major corridors. Trunk lines connect the centres while feeder lines circulate around the centres.

**Figure 5. Street in Seoul**

In 2010, bus and rail accounted for 64.3% of all trips. Between 2006 and 2010, the share of bus and rail trips increased by 0.5 and 1.5 percentage-points respectively. Conversely, private transport mode share declined by 2.9 percentage-points within the same period. Overall, public transport mode share has increased by 2.9 percentage-points to form 71.5% of all trips in 2010. The improvement in public transport share of trips made may be attributed to the increase in rail density and bus reforms since 2004 (Figure 5).

**Singapore**

Public transport in Singapore consists of the Mass Rapid Transit (MRT) system, Light Rapid Transit (LRT) system, buses and taxis. Public buses serve almost every part of Singapore, making it the most extensive form of public transportation, while rail provides speed and efficiency, especially during peak hours. According to the interim results of the 2012 Household Interview Travel Survey, public transport constituted about 62% of all peak hour trips up from 59% in 2008. Between 2008 and 2011, the share of bus and rail trips experienced a 9 percentage-point increase whereas the share of private transport trips decreased by 6.3 percentage-points. Within the same period, the share of rail and bus trips increased by 7.3 and 1.7 percentage-points respectively. The increased use of rail may be attributed to the full opening of the Circle Line which connects all radial
routes leading to the city and reduces travelling time for commuters by allowing them to shorten trips between north-to-east and north-to-west and vice versa (Figure 6).

Transport Policies and Plans in Five Cities at a Glance

Public Transport Enhancement

Rail

Shanghai features the longest metro network in Asia at 425km. The plan is to develop a system comprising 22 lines and 877km of rail by 2020. Currently, 42% of the population in Central Shanghai is served by a metro station within a 600m radius. Shanghai aims to increase the proportion of bus, rail and taxi usage in the city centre from the current 47% to 50%; and for 90% of all public transport commutes within the city centre to be completed within one hour by 2015 (Xiao and Gu, 2012). In 2012, the Shanghai Daily reported that the Chinese government had recently approved 25 new subway projects worth US 127 billion (RMB 800 billion)(Lu, 2012).

In comparison, Singapore plans to double its current rapid transit network from 178km to about 360km by 2030, resulting in a network density of 54km/million populations. In total, about USD 48 billion was committed to increase the network to 280km by around 2020, and another three new lines and two line extensions will be ready between 2020 and 2030.

Seoul plans to extend its metro lines into the metropolitan area as more people move to the outlying suburban areas due to high housing prices within cities. As part of its Seoul Transportation Vision 2030, the city aims to expand its urban railroad network “with the aim of having subway stations located only ten minutes away from anywhere on foot” (Mayor Park Won Soon’s Hope Journal, 2013). Two lines are currently under construction (22.7km); another three lines connecting large-scale housing development districts to the core areas are also in the planning phase. The city is also constructing Light Rail Transit (LRT) lines to cover areas not served by the existing rail system. The Ui LRT line (11.4km), first of the nine LRT lines to be constructed is expected to open in 2014.
Hong Kong is currently undertaking five railway projects which are expected to be completed in succession between 2014 and 2020. The railway projects will improve connections within Hong Kong and strengthen transport links between the mainland and Hong Kong. The railway catchment area will also increase as more than 70% of the population in Hong Kong inhabit these areas (HK Railway Development Office, 2013).

Tokyo is currently reviewing its 2000 Expansion Rail Master Plan. The city is also promoting barrier-free access by retrofitting of barrier-free facilities into rail stations. As of 2009, more than 75% of stations in Tokyo have introduced barrier-free routes. It has also increased the number of direct-through commuter-rail entering-subway lines and provides rail travel information for smart-phone users to reduce service delays of urban rail due to passengers transferring between commuter rail and subways (Kato, 2012).

Bus
Apart from rail expansion plans, all five cities are also looking to improve their bus services. Bus route rationalisation is currently a priority under Hong Kong’s public transport policy. The Hong Kong government is looking into ways to strengthen the feeder capacity of buses and ensure provision of bus services at districts not served by railways. The objective is to minimise wastage by cancelling or reducing the frequency of under-utilised routes and redirecting them to routes with keen demand. In doing so, it has decided to adopt an “Area Approach” instead of the “individual route approach” in reviewing bus routes to enhance the bus network for districts as a whole.

In Singapore, the government is also playing a more active role to decisively improve bus services ahead of the roll-out new lines and capacity enhancements to existing lines in the next few years. Apart from taking on central bus route planning in 2009, the city in 2012 committed USD 888 million and partnered with public transport operators to add more buses, increasing the existing bus fleet by 20% so as to improve the reliability of bus services, increase bus frequency and address overcrowding.

Tokyo also plans to revive its bus industry. Buses account for about 3% of total travel mode share (including non-motorised modes) within Central Tokyo and mainly serve to complement the rail network or provide feeder services. In terms of improving bus service levels, efforts are being made to increase passenger convenience by improving speed and comfort, using intelligent transport systems to improve reliability and supply commuters with travel information. These approaches were also taken in Seoul in 2004 when it underwent a major public transportation reform.

Public Transport Reform
Seoul’s public transport reform in 2004 was aimed at making Seoul’s public transport system more transit-oriented and customer centric. Today, its policy focus has shifted towards “human-oriented transportation”. In achieving this, the city leverages on the use of intelligent transportation systems (ITS) so as to provide high quality transport infrastructure and improve services. The plan is to build a sustainable transportation system that centres on pedestrians. This entails providing safe, convenient transportation for the disabled, a pedestrian-oriented transportation environment, and low-cost, high efficiency operation systems.

In 2009, Shanghai’s bus operations were restructured before the highly anticipated World Expo Shanghai 2010. This included the relocation of bus stations, giving
bus lines so as to optimise their routing, converging and scheduling. Guidelines and policies were also set up for bus line operators to better manage their service, maintain and upgrade bus fleets and encourage investment in cleaner energy vehicles.

**Integrating Transport and Land-use Planning**

Integrating transport and land-use planning has long been a feature of city planning in Tokyo, Singapore and Hong Kong. In Hong Kong, city planning takes into account mobility planning which has resulted in a high proportion (about 75%) of office buildings and about 42% of housing units situated within 500 metres of a railway station. This encourages people to walk to train stations and take the trains to work, thereby reducing reliance on road-based transport.

Similarly, Singapore’s 1971 State and City Plan (SCP) first mapped out the integrated land use and transport plan for the city’s physical development. Major transportation corridors like the MRT and expressways were integrated into the land use plan. In addition, integrated transport hubs (ITHs) aim to improve commuters’ experience by making transfers between public transport modes more convenient. Singapore’s ITHs are air-conditioned joint bus interchanges and subway stations that are co-located with retail and commercial developments so that commuters can transfer in a comfortable and seamless manner, while enjoying the convenience of accessing retail and lifestyle services.

Tokyo is transit-oriented in terms of regional structure. Urban areas around railway stations are generally high density mixed-use area of retail, commercial and office uses; and pedestrian-oriented. Transit-Oriented Development (TOD) in Tokyo is characterised by private transit operators building high density suburbs along their transit lines to boost ridership; and in Tokyo, commuters from each station can access most daily services on foot.

**Travel Demand Management**

**Controlling Car Ownership**

Shanghai and Singapore place direct controls on growth in vehicle population while Seoul, Tokyo and Hong Kong rely on other vehicle restraint measures such as vehicular taxes, petrol taxes and parking policies to restrict ownership and usage.

In Singapore, the Vehicle Quota System (VQS) is used to limit the rapid growth in vehicle population to a more sustainable level. Under the VQS, a person who wishes to buy a new vehicle must first obtain a Certificate of Entitlement (COE). The COE quota is auctioned publicly so that those who want to own a vehicle can decide for themselves how much they are willing to pay for that right. The VQS applies to all private motor vehicles including cars, goods vehicles and motorcycles. It was first implemented in 1990 when rising affluence in the city showed that simply increasing ownership taxes was not effective in controlling vehicle population growth. The quota for vehicle growth is set at 0.5% per annum for Feb 2013 to Jan 2015.

Shanghai first implemented its license auction system
in 1994. Unlike Singapore, Shanghai’s auction system is limited to private cars only, where a fixed number of private car licenses are available for public action every month. To register for the license auction, prospective car buyers must put down a deposit of about USD 325 (RMB 2,000) for a disc loaded with software they can use to bid online. In 2012, between 8,000 and 9,500 licenses were put up for auction each month and the average bidding price was over USD 9,720 (RMB 60,560) which exceeds the cost of an entry-level car (Tian and Ho, 2013).

Parking Policy
Tokyo adopts a unique set of parking policies which have helped to restrain vehicle growth. The proof-of-parking rule requires car-buyers to first secure a night-time parking place before registering a car. The city adopts minimum parking requirements which are set very low and which exempt small buildings with limited on-street parking available (Barter, 2010). As parking is scarce and costly, (since parking rates are commercially priced) this makes it harder for people to meet the proof-of-parking-rule and own a car.

Fiscal Policy
Hong Kong has a steep, cumulative tiered vehicle registration tax structure based on the size and value of the car. Cars above six years have to undergo annual vehicle examinations for their licences to be renewed. Combined with limited parking spaces and high fuel costs, these polices discourage car ownership in the city.

Congestion Charging
Apart from increasing the capacity of the road network, Singapore also uses congestion charging to manage congestion along heavy corridors including traffic inflow to the central area. Based on a pay-as-you-use principle, motorists are charged when they use priced roads during peak hours. These Electronic Road Pricing (ERP) rates vary for different roads and time periods depending on local traffic conditions. This encourages motorists to change their mode of transport, travel route or time of travel.

Conclusion
The three broad policies of promoting public transportation, integrating land-use and transport planning, together with travel demand management, work in tandem to bring about a sustainable transportation system. Expanding public transportation networks creates better connectivity within cities and this increases the appeal and convenience of using public transportation as a primary travel mode. This improves the sustainability of a city’s transport system as public transit in particular, has a lower carbon footprint and is the most cost efficient means of transporting large numbers of people.

Integrating land-use and transport planning reduces travel demand by motorised modes and trip lengths locating residential and services in proximity so that
people need not travel far, especially by car. As seen in Tokyo, Hong Kong and Singapore, mixed-use development centring on public transit nodes enhance commuter experience and facilitate pedestrian-oriented development so that commuters can access retail, lifestyle and commercial services seamlessly.

Travel demand management policies such as congestion pricing in Singapore optimise traffic flow, while controls on car population growth in Shanghai optimises the use of existing road infrastructure as they regulate the rate of growth of vehicles at a more sustainable rate. In Hong Kong, the frequent vehicle examination requirements to renew licences helps to improve the energy efficiency and emission standards of motorised vehicles for more sustainable emission output attributable to transport. Hence as a whole, these broad policies work hand-in-hand to address the needs of people, businesses and the environment to achieve a more sustainable transportation system.

Acknowledgement
We would like to thank Ms Tan Annie, Senior Researcher, LTA Academy for her contribution.

Notes
1 (1)-(8) refer to the the Shanghai Metropolitan region which has a population of 23 million and land area of 6,341 km².
2 Average fare per boarding refers to total fare revenue divided by total ridership.
3 This is similar to Singapore’s approach where bus operators run services within their Areas of Responsibilities (AoRs).
4 Jimmy Leung, Director, Planning Department, The Government of the Hong Kong Special Administrative Region

References


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