

# **A Case Study on Urban Transportation Development and Management in Singapore**

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## **INTRODUCTION**

In many Asian metropolitan areas and large cities, transportation issues are major concerns among ordinary citizens and policy-makers alike. Road congestion is the most common issue, arising when traffic volumes exceed the free-flow design capacity of the facilities that channel traffic flows. Recognizing that excessive congestion imposes a cost on individuals, society, and the city as a whole, Singapore has introduced a number of far-reaching policies aimed at improving the traffic situation. Consequently, Singapore can be considered one of the few Asian cities to be successful in land transport management. Traffic in the city is moving much better than in most other Asian cities.

This paper reviews land transport policies and the various measures that Singapore has undertaken to alleviate urban traffic congestion. Its focus is on the actual implementation of policies and the lessons learned from Singapore's experiences. The paper's objective is to identify the implementation process and those policy elements that appear most replicable in other Asian cities, given the opportunities and constraints faced by each city as well as the particularities of their contexts.

## **THE SINGAPORE SITUATION**

Singapore is an island city-state of 640 km<sup>2</sup> and a population of 3 million (1996). Evolving from a small fishing village of 150 inhabitants to a British regional trading post in 1819, and since independence in 1965 into a major Asian metropolitan centre, Singapore has witnessed tremendous changes in the development of its economy. It is today one of four newly industrializing economies in Asia (the other three being Hong Kong, South Korea, and Taiwan). In the past three decades, its GNP per capita has grown at an average rate of approximately 7 per cent per year. With a vibrant economy, a small land area, and a large population, the demands on Singapore's roads have, inevitably, been excessive (especially during peak hours). This has resulted in worsening traffic congestion, particularly in the city centre.

Many of the roads built are now too narrow to accommodate the increasing volume of traffic and growth in car population. Indeed, with growing affluence, the car population has increased rapidly over the years (growing from 142,674 in 1974 to 303,864 in 1993). The ratio of cars to households has risen from 1:4 (i.e., 26 per 100 households) in 1980 to 1:3

(i.e., 31 per 100 households) in 1990.

Over time, however, a paradox has emerged, namely: despite the growth in numbers of cars on the road, the traffic situation (particularly in the city centre) has not deteriorated to the point of threatening the well-being of residents or degrading the environment. How did Singapore achieve this improved traffic situation? And what are the key policies and measures that improve road transportation and prevent traffic congestion?

## **THE SOLUTION: AN INTEGRATED APPROACH**

There are numerous measures that can be taken to alleviate urban traffic congestion. At a conceptual level, it is possible to identify and classify these measures according to three broad categories. The first category comprises measures that address the supply side of transport facilities (i.e., they are basically directed at increasing urban transport capacity). Measures in the second category are aimed at managing the demand side, specifically, in terms of encouraging efficient use of existing transport facilities (e.g., road space in congested central areas). The third set of measures concerns the development of alternative urban structures conducive to the dispersal of economic activities and improved physical integration between employment, amenities, and housing.

Singapore has integrated all three types of measures within a single urban land transportation policy. Fundamentally, if cities are to function efficiently and provide an acceptable living and working environment, then urban planning and transportation planning/management must be coordinated and integrated within one strategic package. This fact has long been recognized in Singapore and was translated into a long-range, holistic, urban land-use and transportation master plan soon after independence.

In 1972, a long-range comprehensive concept plan was devised for the entire urban landscape, with the intention of integrating land-use with transportation. The plan accomplished this through provisions which promoted the development of a ring of new towns around the central area; the decentralization of manufacturing, retail, and other activities (e.g., schools) to the new towns; and the construction of a comprehensive island-wide road and rail network to serve the various areas.

From the beginning, transport planners involved in the plan's formulation had warned that, with Singapore's limited land area and high density of development, an uncontrolled growth in car ownership and usage would quickly lead to major urban transportation congestion. The experiences of other cities (e.g., London and Hong Kong) had shown that simply building more roads was insufficient to keep traffic free-flowing, as these roads would inevitably invite more traffic (eventually resulting in more congestion). These warnings were taken seriously and led the government to formulate an integrated urban land transportation policy with the following key strategies:

- i. integration of land use and transportation planning to minimize the need for travel;
- ii. development of a comprehensive road network, including capacity maximization;
- iii. management of the car population and the demand of road usage to alleviate traffic congestion; and
- iv. provision of quality public transport choices, including the development of mass rapid transit and light rail.

The objective of the above strategies is to ensure free-flowing traffic such that people, as well as goods, move efficiently and easily.

### **Key Strategies**

The first of the four strategies aims at integrating urban development with transport planning by closely relating the expansion of urban transport facilities with other measures for promoting desired patterns of land use. This involved, for example, a proposal for a proper mix of development, and concentrating high building densities around mass rapid transit stations so as to ensure maximum accessibility for commuters to key nodes of employment, housing, leisure, and other social activities.

Another effort includes a recent plan to decentralize commercial activities from the central area to four new regional centres in major suburban residential areas. Once completed, this urban hierarchy will help reduce the threat of congestion in the central area. It will also closely integrate urban development with the present, planned transport system, thereby bringing jobs closer to workers' homes. This will result in a less transport-intensive, less costly, and more efficient and congenial urban environment.

The second strategy has been translated into a road-building programme, which has seen total road lengths increase from 1761 km in 1965 (the year of independence) to 2173 km in 1975, and from 2645 km in 1985 to 2989 km in 1993. Some 11 per cent of the country's land is now taken up by roads (compared to 13 per cent for housing). The government has announced that it will spend S\$1.1 billion to further expand the road network by another 225 km over the next five years (1995-2000). In Singapore, the government plays an active role in supporting urban development and facilitating its implementation, particularly through ensuring that the much needed funds and technical support are available.

In view of Singapore's urban development, the government is also seriously studying the feasibility of the Singapore underground road system. Although costly to build and operate (capital cost is estimated at S\$4.8 billion and operating cost is about S\$80 million per year), the system promises the equivalent of 40 per cent more road capacity within the city centre. This is significant given Singapore's finite land area. Increasingly, efforts are made to harness technology as a means of maximizing network capacity, for instance, by upgrading and installing intelligent traffic management systems. An example is the Green Link Determining (GLIDE) intelligent traffic light system, which increases the capacity of junctions and facilitates smoother traffic flow through the creation of more green waves.

Such measures, however, are only effective in reducing congestion if demand remains at present levels. This suggests the need for developing a policy on car-use restraint - which brings us to the third strategy of limiting the role of the car. In this regard, Singapore has implemented road pricing measures that require car users to bear the cost of using road space. One example is the introduction of the Area Licensing Scheme in 1975 to reduce traffic congestion during peak hours in the city centre. Recently, when road pricing was implemented along a section of the East Coast Parkway (a major thoroughfare into the city centre), Singapore began a passage pricing scheme.

In addition, Singapore has taken aggressive steps towards limiting car ownership through a quota scheme implemented in 1990, thereby limiting the number of new cars allowed on the roads. These car ownership and use restraints do not work in isolation and have thus been supplemented with other measures such as the imposition of high vehicle registration fees,

stringent requirements for obtaining a driving license, high petrol costs, and the provision of an alternative (i.e., an efficient and comfortable public transport system).

Without a viable alternative, it is difficult to wean users off private car dependence. The strategy must therefore involve making public transport a more competitive transport mode. This takes the form of the development of a mass rapid transit system and an island-wide public bus network (with improved commuter travel times and greater comfort and convenience). The mass rapid transit system, (with its route of 83 km and forty-eight stations), together with public buses, currently serves 3 million users daily and constitutes some 51 per cent of all daily motorized trips.

In effect, not one of the strategies stands on its own. Rather, they are interrelated and serve the basic objective of ensuring that accessibility is improved, and that both people and goods can move about safely and efficiently. Of the four strategies, traffic restraint has had the greatest impact in terms of reducing the usage of private cars and regulating traffic. This strategy will therefore be examined in greater detail in the next section. Indeed, it is the cornerstone of the overall land transport policy, as it safeguards the gains achieved by the other three strategies. It is probably also the most effective strategy for regulating any sudden increases in car traffic density due to such unpredictable factors as greater travel between Singapore and Malaysia.<sup>1/</sup>

## **TRAFFIC RESTRAINT POLICY IN SINGAPORE**

The traffic restraint policy is aimed at controlling not only the usage but also the ownership of private cars. Various measures have been implemented, including congestion pricing (through the Area Licensing Scheme) which has attracted world attention and offers a model for other cities. Malaysia, in an effort to ease traffic congestion in its capital city, Kuala Lumpur, has recently announced its intention to introduce an Area Road Pricing Scheme modeled after the Singapore scheme (*The Straits Times*, 31 January 1997).

### **Institutional Framework**

The Ministry of Communications, through its departments and statutory boards, (in particular, the Land Transport Authority), has a direct mandate to implement an effective and functional traffic restraint scheme. It exercises a firm policy of restraining vehicle ownership and usage by means of fiscal disincentives, quotas, and congestion pricing. Consequently, car ownership costs are very high in Singapore.

The Land Transport Authority is responsible for the planning, development, implementation, and management of all public and private land transport infrastructure and policies in Singapore. Its mission is to provide a quality, integrated, and efficient land transport system that meets the needs and expectations of Singaporeans. Moreover, it supports the government's economic and environmental goals, and provides cost-effective services (particularly from the consumer's point of view). It seeks to achieve this through the integrated urban land transportation policy (discussed above) and specific measures (presented below).

### **The Measures**

**Fiscal disincentives:** From the outset, the government has applied fiscal disincentives to control vehicle ownership and usage. The fiscal instruments for ownership control were

instituted in the early 1970s. Such instruments include an import duty, which is levied by the government through its Customs and Excise Department (Ministry of Finance) on each vehicle brought into the country. Moreover, when the vehicle is registered, the Land Transport Authority collects a registration fee and an additional registration fee (ARF). In addition, as long as the vehicle is registered with the Land Transport Authority, the owner must pay an annual road tax.

Over the years, heavy financial restraints have been imposed, primarily on private car owners, due to the strong demand for such vehicles. Since 1975, import duty, ARFs, and road taxes have been raised periodically. The present level of these charges is indicated in table 1. These measures have been largely effective: from 1975 to 1989, the car population grew on average 4.4 per cent each year - a cumulative total of 80 per cent (from 141,875 to 258,537). In contrast, the car population in Taipei grew six-fold over the same period.

**TABLE 1. OWNERSHIP RESTRAINT MEASURES ON CARS**

	Small Cars (1000cc and below)	Medium-sized Cars (1001-1600cc)	Big Cars (1601-2000cc)	Luxury Cars (2001cc and above)
Import Duty	45 per cent of OMV			
Registration Fee	S\$1000			
ARF	150 per cent of OMV			
Annual Road Tax	S\$0.70 per cc	S\$0.90 per cc	S\$1.05 per cc	S\$1.25 per cc (2001-3000cc) S\$1.75 per cc (above 3000cc)

Note: OMV denotes Open Market Value, that is, the value which is assessed by the Customs and Excise Department based on cost, freight, insurance, commission, and all other costs, charges, and expenses incidental to the sale and delivery of the car in Singapore.

**Quota scheme:** One of the characteristics of Singapore's transport and traffic management system is the continual review of its set of daily measures which ensure that traffic moves smoothly along the roads. With economic growth and urban development, these transport measures have to be redefined within an enlarged context in order to remain realistic. To illustrate, as the Singapore economy continued to grow in the 1980s and this prosperity was quickly translated into an upward growth rate for cars, additional measures were introduced to make sure that the roads would not become more and more congested. By 1989, the growth rate of cars had reached 8.2 per cent, at which rate the car population would be expected to double to 570,000 within nine years.

In August 1989, a Parliamentary Select Committee was established to examine the need for measures to curb road usage, review existing government policies on such measures, and make recommendations. The committee held public hearings to listen to the views of the public and transport experts. Over the years, the government has moved towards more openness and transparency in the formulation of its plans and policies, and has actively encouraged more public participation and feedback in the planning process. Extensive local press coverage of land transportation issues and proposals was used to raise public awareness, and the public has been encouraged through forums and interviews to forward their comments on the various proposals. Equipped with this feedback, the committee submitted its report to

Parliament.

Amongst other things, it recommended a quota system as a long-term solution to the problem of rapid growth in the car population. The proposal was accepted by the Ministry of Communications, and on 1 May 1990 this quota system, (the first of its kind in the world), was implemented. This system required a certificate of entitlement (COE) to own a new car. The quota system has seven categories, depending on engine capacity and intended vehicle usage, namely:

- i. cars less than 1000cc (small cars),
- ii. cars 1001-1600cc (medium cars),
- iii. cars 1601-2000cc (big cars),
- iv. cars more than 2000cc (luxury cars),
- v. "open" category,
- vi. goods vehicles/buses, and
- vii. motor cycles.

The scheme applies to all vehicles except scheduled buses, school buses, and emergency vehicles such as ambulances and fire engines. The inclusion of almost all vehicles under the scheme discourages such distorted economic behaviour as the purchase of a minibus instead of a car to avoid the payment of the COE.

Those who intend to register a vehicle must first bid for a COE in a public tender. The COE premium in each tender is determined by the amount of the lowest successful bid; all successful bidders pay the same premium. The COE has a finite lifespan of ten years. Beyond the ten-year period, the owner must either de-register his vehicle or renew the COE for another ten years by paying the prevailing quota premium, calculated as the twelve-month average of the COE premium. Such a scheme ensures that no individual holds perpetual rights to the ownership of a vehicle.

Performance of the scheme is closely monitored. This is quite exemplary as it allows all the flexibility necessary to make adjustments and avoid failures or costly mistakes in the face of changes that can sometimes occur very quickly. In the Singapore case, the scheme had to be modified soon after implementation to safeguard against speculative action arising out of public feedback. When first introduced, the COEs were transferable and this soon led to widespread speculation. Within the first two months of the release of the first batch of COEs, 2,600 (20 per cent) changed hands in "buy and sell" transactions. During periods of rising prices, speculators could make sizable profits of up to S\$5000. Therefore, following public concern over such speculative action and the effects on those who require a car, the government made the certificate non-transferable as of October 1991 (with the exceptions of the "open" and "goods" vehicle categories). Such a move demonstrates an equitable method of gaining a large consensus for policy implementation and increasing confidence among users.

The Ministry of Communications annually announces a rate of growth for the vehicle population based on prevailing traffic conditions and road capacity. From May 1997 to April 1998, the quota allocation was as indicated in table 2 (below).

**TABLE 2. QUOTA ALLOCATION, MAY 1997 - APRIL 1998**

Categories	Additional COEs	Average monthly quota		Movement (up/down)
		May 1997 - April 1998	May 1996 - April 1997	
Small Cars (1000cc and below)	431	195	249	-21.7 %
Medium Cars (1001-1600cc and taxis)	1956	1116	1103	1.2 %
Big Cars (1601-2000cc)	617	336	272	23.5 %
Luxury Cars (2001cc and above)	226	127	99	28.3 %
Goods Vehicles, and Buses	1161	810	648	25 %
Motorcycles	1109	739	591	25 %
Open	0	412	431	-4.4 %
<b>Total</b>	<b>5500</b>	<b>3735</b>	<b>3393</b>	<b>10.1 %</b>

Based on its road building programme, the ministry has set a long-term target of approximately 3 per cent vehicular growth per year to keep congestion under control. Using the quota system, the Singapore Government has successfully reduced the growth rate of cars from 8.2 per cent in 1989 to 5.4 per cent in 1990 and 4.7 per cent in 1991. In 1992, the car growth rate declined anomalously to 0.8 per cent, as many old vehicles (ten years and older) were scrapped, and their owners decided not to renew their COEs upon expiration of the grace period in April 1992. Similarly, the growth rate of the entire vehicle population decreased from 5.8 per cent in 1989 to 4.2 per cent in 1990, and from 3.1 per cent in 1991 to -0.3 per cent in 1992.

There is no denying that such measures are strict, but as they are intended to control demand rather than need, every consideration is given not to inconvenience the genuine users. In May 1991, the government introduced the Weekend Car (WEC) Scheme and, accordingly, created a new category of COE to register a WEC. A WEC owner receives rebates on the net ARF (i.e., ARF less the PARF benefit of the car), and import duty and quota premium (up to a maximum of S\$15,000), and pays only 30 per cent of the normal road tax. In return, he must only use his WEC during off-peak hours. Urgent use during other hours is permitted provided the user displays a special day license that costs S\$20 per day. Each WEC owner is given five such day licenses when he pays his annual road tax. More recently, the government introduced car-sharing schemes at the community level in order to encourage residents to start car-pools and reduce road congestion. A number of cooperatives and workplaces have already come forward to organize this service. The first pilot car-sharing scheme was implemented in July 1996, and it will be interesting to see how the scheme eventually works out, and what its impact on the traffic situation will be.<sup>2/</sup>

In effect, the WEC scheme is a crude form of manual road pricing. WEC owners are charged less because they only use their cars during off-peak times (i.e., when there is little traffic congestion). With the proposed implementation of electronic road pricing, this objective may be achieved without the need of WEC. All WECs will then be treated like normal cars in a

common tax regime, created to include electronic road pricing charges. As early as 1983, the government began studying the use of electronic road pricing as a mode of road charging.

**Road pricing:** Charging for the use of roads is not a new idea. Many cities around the world have implemented this concept either manually or electronically (e.g., Oslo, San Francisco, Paris, and Cambridge). Many more cities (including London, Stockholm, Amsterdam, Rotterdam, Hong Kong, and Kuala Lumpur) have initiated detailed studies on road pricing or are in the process of doing so.

In July 1989, the Singapore government announced that it would implement electronic road pricing. However, though the relevant technology required for electronic road pricing had been developed, there was no ready, off-the-shelf, system that met Singapore's requirements of charging vehicles travelling in a multi-lane environment. As a result, the experiment had to be put on hold. Recently, however, The Land Transport Authority announced that an electronic road pricing system is scheduled to come into operation in 1997/98. In the meantime, a manual system using pre-purchase display tickets (annex 1) has been introduced on a section of the expressway leading into the city (East Coast Parkway) during the morning peak hours. Motorists using the affected section of the East Coast Parkway between the hours of 7:30 and 8:30 a.m. pay a fee of S\$1 per day (or S\$20 per month).

The East Coast Parkway experiment was declared a success as it had effectively reduced traffic by as much as 40 per cent along the road during peak morning hours. Moreover, it improved travelling speed. Speeds of 67 km per hour had been recorded during the scheme's operation. However, once road pricing ends (after 8:30 a.m.), speeds on the East Coast Parkway near the congested Fort Road section slow to 37 km per hour. Because of the success of the scheme, and increasing congestion on other expressways, the Land Transport Authority has decided to extend the road pricing scheme to the Pan Island Expressway and the Central Expressway.

As of 5 May 1997, there were four road pricing scheme locations in Singapore. Motorists have had to display a valid area license (according to the licensing scheme/road pricing scheme) to pass through any of the scheme gantries during the operational hours of 7:30 to 9:30 a.m. from Monday to Friday (excluding Saturdays, Sundays, and public holidays). With the extension of the road pricing scheme, the operational peak hours of the area licensing scheme have been revised accordingly. To facilitate motorists, licenses can be purchased from any post office, specially set up sales booths, designated petrol stations, as well as the Land Transport Authority office.

When fully implemented, the electronic road pricing will essentially be an automated version of the area licensing scheme, with flexibility to vary charges at different times and places according to traffic conditions. Such a system provides for more efficient control of congestion, and allows for the possibility of using electronic road pricing much more extensively as a traffic management tool.

**Area Licensing Scheme:** In June 1975, the Singapore government introduced an area licensing scheme for automobiles entering the city area. It was a usage measure to control traffic congestion in the Central Business District (CBD) during peak hours. The scheme was based on a "cordon" pricing system. The cordoned area, referred to as the "restricted zone," was demarcated by twenty-eight overhead gantry signs. During the restricted hours, private cars and taxis buy and display a special area license on their windscreen to enter the restricted zone.

The licenses are pre-purchased (on a daily- or monthly-rate basis) at sales outlets (e.g., specially set up ticket sale booths and selected petrol kiosks on major roads into the city). The licenses are dated and identified by shape (a rectangular shape is used for the daily license while the monthly license is distinguished by its circular form) and colour (a colour code for every month). See annex 2 for a sample license. The licenses are then displayed as visible stickers on the windshields. Visual verification is undertaken by police officers stationed at the gantry positions. In general, the level of compliance has been high. Violators are liable to fines issued through the mail.

The restricted zone has been adjusted several times over the years as the CBD expanded. Details of the scheme's operation (e.g., the hours, mode of operation, and charges) have also been adjusted in response to changing economic and traffic conditions. When the scheme was first initiated, cars and taxis could form pools (of at least four persons) to gain free entry. Since 1989, all vehicles (except ambulances, fire engines, police vehicles, and public buses), have been subject to charges when entering the restricted zone during certain hours of the day. Car and taxi pools are no longer exempt. Charging all vehicles is considered more equitable as all vehicles contribute to congestion in the area and should, therefore, be subject to the same restraints. Also, given this practice, a milder levy is sufficient. Accordingly, the daily peak hour charge has been lowered by 40 per cent from the original daily charge of S\$5 to the present S\$3 (or monthly charge from S\$100 to S\$60).

In 1989, the operational hours of the scheme were extended to include the peak evening hours (4:30 - 6:30 p.m.) in response to the rising car population in the central area. In January 1993, the operational hours of the scheme were further extended to include the hours from 7:30 a.m. to 6:30 p.m. on weekdays, and 7:30 a.m. to 3:00 p.m. on Saturdays (the operational hours were recently revised on 5 May 1997 to coincide with those of the road pricing scheme, i.e., morning peak hours from Monday to Saturday, 7:30 - 9:30 a.m., and evening peak hours from Monday to Friday, 4:30 - 7:00 p.m.). The area license for entry during the non-peak hours was priced lower at S\$2. The change in operational hours was brought about by worsening traffic conditions in the CBD, particularly in the period between morning and evening restricted hours. The objective of the "whole day" restriction was to spread out traffic flow more evenly throughout the day in order to utilize roads better and without congestion. With developments in technology, the scheme is now being upgraded to an electronic road pricing system. The effects of the scheme are therefore closely monitored and periodic adjustments are made to ensure the scheme's effectiveness. This work routine has been a major factor underpinning the scheme's success.

**Evaluation of the area licensing scheme:** As illustrated in table 3, the area licensing scheme has considerably reduced peak-hour traffic. Specifically, it has reduced such traffic by 45 per cent, effected a 20 per cent increase in traffic speeds, and a 25 per cent reduction in traffic accidents. Traffic growth during the peak hours has been kept well below the volume before area licensing scheme implementation.

**TABLE 3. TRAFFIC EFFECTS OF THE AREA LICENSING SCHEME**

Time (hours)	Traffic (March 1975)	Traffic (May 1976)	Traffic (May 1979)	Traffic (May 1983)
<b>Cars</b>				
07:00-07:30	5,384	5,675	5,723	6,413
07:30-10:15	42,790	10,754	13,181	15,473
10:15-10:45	n.a.	6,459	5,527	7,069
<b>All vehicles</b>				
07:00-07:30	9800	10,332	10,596	11,280
07:30-10:15	74,014	35,787	49,606	57,035
10:15-10:45	n.a.	13,441	15,179	16,490

Since implementation, despite a gradual climb in the number of vehicles entering the CBD, the traffic situation during restricted morning hours (7:30 - 10:15 a.m.) and evening hours (4:30 - 6:30 p.m.) remained satisfactory. A survey in 1989 revealed that the number of vehicles entering the restricted zone during the morning peak period (7:30 - 10:15) was 51,000, compared with over 74,000 in 1975 (before the scheme was implemented). This is significant considering Singapore's strong economic growth since 1975 (during which time there was a 68 per cent growth in vehicle population).

In the final analysis, the area licensing scheme offers several advantages. It has low capital investment costs and physical requirements, low operating costs, and is relatively simple to implement and enforce. The monthly operating cost is approximately S\$300,000. In terms of alleviating traffic congestion, the scheme has been effective in improving traffic conditions within the CBD during peak hours. In so doing, it has brought about certain changes in travel behaviour: some car owners have switched to public transport, others have changed their commuting time to pre-peak hours or have changed routes to avoid the city area. While business has been largely unaffected, the level of traffic congestion and air pollution has been substantially reduced.

From a financial standpoint, over the years vehicle restraint measures have become a significant source of government revenue - even though this was not the original intention. From 1985 to 1991, vehicle taxes collected by the Land Transport Authority have more than tripled. As a proportion of the government's total revenue, the collection of vehicle taxes has doubled from about 5 per cent in 1980 to about 10 per cent from 1988 onwards. As with all other sources of revenue, the money collected from vehicle restraint measures contributes to such public expenditures as infrastructure development, public projects, health and education subsidies, and defence.

Given the scheme's success in Singapore, we should be mindful of the technical features that have contributed to its success. These include the pre-payment of licenses, (which is necessary in order to avoid the congestion that would be created by collection at entry points), the quick and easy identification of vehicles by enforcement officers, the availability of an attractive public transport system, provision of alternative routes for diverted traffic, and appropriate hours of operation. Other than these technical details, there are certain other unique features of the Singapore scheme that have contributed to its success (and are therefore relevant when considering other cities).

First, the area licensing scheme is a part of a comprehensive transport policy that covers vehicle ownership and parking charges. In the fight against traffic congestion, it is important to keep in mind that no single measure can succeed on its own. An entire package of measures (as demonstrated by the Singapore experience) needs to be implemented. Therefore, road pricing should be viewed as an integral part of a package aimed at ensuring the optimal use of urban transport systems.

Second, considerable planning and preparation preceded the scheme's implementation, including the construction of by-pass routes, park-and-ride facilities, and the expansion of bus services. Third, Singapore is a small city-state, therefore there is virtually no traffic from outside the city-state. Moreover, Singapore's single-tier government administration has provided for an efficient system of management and enforcement. From the outset, the government has accepted the responsibility of alleviating the worsening urban transportation situation and has mobilized all necessary resources (financial, technical, manpower, administrative, and legal) to solve the problems.

The final result is that even though car ownership in Singapore has increased much faster than population growth, the movement of people and goods within the system continues efficiently. The combined effects of the various measures have kept Singapore's traffic well below levels observed in countries with similar levels of income. Compared to Bangkok, Manila, and Hong Kong, Singapore has the highest estimated average travel speed during peak times (table 4, below).

**TABLE 4. TRAVEL SPEED IN SELECTED ASIAN CITIES**

City	Estimated average travel speed during peak times (kmh)	Resident population	Length of urban road network (km)
Bangkok	8	6,162,000	2800
Manila	10	8,475,000	1938
Hong Kong	22	5,851,000	1559
Singapore	30	2,762,700	2924

Source: United Nations Economic and Social Commission for Asia and the Pacific

## **CONCLUSIONS**

We have, in the preceding sections, presented Singapore's urban transport policy and the various measures taken to ensure free-flowing traffic on our roads. Singapore has adopted an integrated approach in tackling traffic congestion, one that is premised not only on the traditional means of increasing transport capacity through a road-building programme, but also on innovative measures to manage the demand for road space (especially by encouraging more efficient usage of existing transport facilities within typically congested city areas). This has been achieved by planning and developing an alternative urban structure, wherein economic activities become dispersed and physical integration between employment, amenities, and housing is improved. Moreover, bold and radical car ownership and usage restraints, and the promotion of a comfortable and convenient public transport system as a viable alternative to the private car, have been integral to the approach.

Obviously, the Singapore success story is closely linked with favourable social, economic,

and urban conditions, which are not found in many less-developed countries. These include a stable institutional and regulatory framework, a rather small land area with a high ratio of land occupancy in urban areas, and high economic growth, making funds available for the transportation sector. There is only a single-tier administration, resulting in faster and easier decision making and implementation. Furthermore, the country's small size and island boundaries have helped to make implementation efficient and traffic flow controllable.

Notwithstanding this specificity, which has placed Singapore in a rather unique situation in the world, we believe that the way transport problems are being handled by the authorities here is a very good example of what can be done in other countries. Many of the policies are universally applicable - whether in Singapore or elsewhere. Examples include the Area Licensing Scheme, car-sharing schemes, control of the car population through higher taxes and other measures, establishment and promotion of a more efficient public transportation system, highly integrated land use, and transportation planning.

In addition, the Singapore authority was able to develop and implement an elaborate and integrated policy through a realistic and pragmatic approach that takes into account not only the prevailing economic and social conditions, but also the application of modern technologies. This approach is an essential quality of the Singapore experience which has special meaning for many other cities. Examples abound of situations where the temptation of a utopia is so strong that governments have sometimes tended to implement prestigious infrastructures (e.g., impressive highways between the airport and city-centre) that cannot truly bring an adequate response to real urban transportation problems. It is important indeed to insist on realism in any policy that is to be proposed and implemented.

The Singapore experience has also demonstrated the need to continually monitor and adjust policies and measures if they are to remain effective. This gives the authority an opportunity to react to evolutions that can sometimes occur very quickly, (such as a sudden increase in the density of car traffic), and provides a means by which various traffic management measures can gradually evolve towards more sophisticated systems when they are needed. Close monitoring of quality and prices within the transport sector is one sure way of protecting the interests of consumers and ensuring that the urban transport system meets the varied needs of its customers.

Perhaps the most significant aspect of the Singapore example is the way in which the government acts in the realm of urban transportation. In the Singapore case, the government has taken the lead in setting the direction and pace of development, and has thus facilitated the implementation of many bold measures. Amongst other things, it has succeeded in controlling both the population and use of private vehicles. It is easy to see how a supportive government can shoulder many of the responsibilities in the field of urban transport: the task of creating a physical environment within which public transport operations can provide the best services at a minimum cost; and the tasks of maintaining, improving, and managing the infrastructure, roads, and streets, as per their respective uses. All of which are essential to keeping the city moving.

## NOTES

- 1/ The vehicular traffic situation is unlikely to worsen with higher integration between Malaysia and Singapore, as they are basically two different countries. Control of vehicle entry/exit can be exercised at the causeway (the land link which serves to monitor the flow of traffic between the two countries). In the event that the density of car traffic increases sharply, some measures that can be introduced include a higher entry tax, a minimum quantum of petrol requirement, (there is currently a requirement that Singapore cars entering Malaysia have the fuel-tank at least three-quarters full of petrol: this measure was introduced to stop Singapore motorists from taking advantage of cheaper petrol on the other side of the causeway and thereby undo the restraints of higher petrol taxes), and controls on the entry of certain vehicles.
- 2/ Car-sharing projects exist in some European countries, (e.g., Germany), but Singapore will be among the first in the Asian region to try it. Prospective users of the scheme must be aged between twenty-one and sixty, and have a Class 3 driving license for at least eighteen months. In the first pilot scheme introduced in Toh Yi Estate, they must join the scheme by paying a one-time entrance fee of S\$100 and an annual membership fee of S\$100, plus a refundable deposit of S\$200. In addition, they need a bank account from which car-sharing charges can be deducted by GIRO every month. They are charged S\$9 per hour with 10 km free mileage, and each additional kilometre travelled costs S\$0.40. Cars must be booked for at least one hour, and every additional half-hour costs S\$4.50 and comes with 5 km free mileage. Users must book their car by telephone and collect the keys from a locked key-box on a void deck which can be opened by smart card. The car-keys have an attached data tag that records the time and mileage when inserted into the car's onboard computer. Already S\$1.5 million has been spent to start this project.

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