

White Paper

A WORLD CLASS LAND TRANSPORT SYSTEM

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Land Transport Authority
460 Alexandra Road
#39-00
PSA Building
Singapore 119963
Tel : 375-7100
Fax : 375-7734

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ABBREVIATIONS

ALS	-	Area Licensing Scheme
ANTTS	-	Automatic Network Travel Time System
ARF	-	Additional Registration Fee
CBD	-	Central Business District
COE	-	Certificate of Entitlement
CPI	-	Consumer Price Index
CTE	-	Central Expressway
DGP	-	Development Guide Plan
DT	-	Diesel Tax
ECP	-	East Coast Parkway
ENV	-	Ministry of the Environment
ERP	-	Electronic Road Pricing
GLIDE	-	Green Link Determining
GDP	-	Gross Domestic Product
GPC	-	Government Parliamentary Committee
GPS	-	Global Positioning System
GST	-	Goods and Services Tax
HDB	-	Housing Development Board
LRT	-	Light Rail Transit
LTA	-	Land Transport Authority
MND	-	Ministry of National Development
MRT	-	Mass Rapid Transit
MTRC	-	Mass Transit Railway Corporation (Hong Kong)
NEL	-	North-East Line
OMV	-	Open Market Value
OPC	-	Off-Peak Car
PAYB	-	Pay-As-You-Bid
PIE	-	Pan-Island Expressway
PQP	-	Prevailing Quota Premium
PTC	-	Public Transport Council
RPS	-	Road Pricing Scheme
SBS	-	Singapore Bus Services Pte Ltd
SLE	-	Seletar Expressway
SMRT	-	Singapore Mass Rapid Transit Pte Ltd
SURS	-	Singapore Underground Road System
TIBS	-	TransIsland Bus Services Pte Ltd
TP	-	Traffic Police
TPE	-	Tampines Expressway
URA	-	Urban Redevelopment Authority
VQS	-	Vehicle Quota System
WEC	-	Weekend Car

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EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

Introduction

The Government set up the Land Transport Authority (LTA) in September 1995 to spearhead improvements to our land transport system. The LTA's mission is to provide Singaporeans with a world class transport system. This White Paper sets out how the Authority intends to achieve its mission, its transport vision for Singapore, its operating philosophy, and the initiatives it will undertake in the short and long term.

A world class transport system will not come easy. But achieving it is not impossible if we get our basics right, dare to try out bold and imaginative solutions and have the political will to carry them out. It is important that we succeed because a high standard of transport enhances the quality of life, is good for economic growth and helps us maintain our competitive edge.

Our vision is a system that meets the needs and demands of a dynamic and growing city with a population that will increasingly expect high standards in service and infrastructure. Whatever the individual preferences of commuters and the various transport choices Singapore offers, the overall system must provide high quality service, is convenient, accessible, comfortable, safe, speedy, and affordable to the majority of Singaporeans. We must also continue to get good value for what we spend.

This means providing commuters with a wide spectrum of transport choices, while ensuring that they are effectively integrated. The range of services must be broad enough

with sufficient differentiation in service standards and cost to suit each individual's preference and pocket. The cost to users of these services will depend on the cost of providing the services.

The task before the LTA is hence a challenging one.

Fortunately, for Singapore, our basic policies and infrastructure are sound and have been tested over the years. Indeed in many areas we are at the forefront, being acknowledged widely for our achievements, for example, in managing traffic in the city using the world's first ever Area Licensing Scheme (ALS), in having a Mass Rapid Transit (MRT) system which has won international acclaim and in operating one of the few commercially viable bus services in the world.

But we can do much better. The formation of the LTA will allow us to better integrate the functions of planning, development, implementation and management of all transport infrastructure and policies. We are now well poised to tackle this important challenge.

A world class transport system

A world class transport system must provide commuters with highly efficient, comfortable and convenient rides in free-flowing traffic. Having a world class public transport system is a key component of this system. There is no running away from this; public transport is and will always be the major mode of transport.

The system we aim to provide will offer convenience, reliability, ease of use, comfort, affordability and competitive travel times. Improving public transport means not only improving bus or train travel. It means improving all the intermediate and end-point facilities that make for a complete door-to-door journey: linkways, service information and provision, even customer service, are vital components of a world class transport system.

To achieve this, we will need a major change of mindset among the operators and the providers of infrastructure. We must find ways to give incentives, so that operators will continually improve their services and be more responsive to the changing needs and demands of their customers. This way, services can be pegged at the highest sensible levels while providing good value for money.

The key is in providing a comprehensive range of public transport services, each being developed to the highest quality commensurate with the fares charged, and all well integrated to provide a seamless journey. The choices include:

- MRT to serve heavy transit corridors;
- Light Rail Transit (LRT) systems to serve as feeders to the MRT network;
- Buses to continue serving the less heavy corridors to complement MRT-LRT network;
- Premier bus services like BusPlus to provide higher grade of bus service; and
- Taxis to provide car-like services.

We will expand our rail network so that it is

as comprehensive in coverage as the London Tube or Paris Metro which started in 1863 and 1900 respectively. We must progressively build up our network so that access to one of these services is within walking distance and sized to match our city. Our target should be a high percentage of trips on quality public transport as in Zurich, where 75% of trips into the city centre are by public transport.

As for private transport, we will use road pricing to optimise road space and keep key roads and expressways free flowing. Once the cost of congestion becomes more transparent, motorists will be better able to make more informed transport decisions. Achieving our vision of a world class transport system will depend on our success in tackling the following key areas:

- Integrating transport and land use planning;
- Expanding the road network and maximising its capacity;
- Managing demand of road usage; and
- Providing quality public transport choices.

Initiatives to improve the transport system

It will take 10 to 15 years to attain our vision of a world class transport system. In the short and medium term, LTA will undertake various initiatives to improve our transport system.

Integrating land use, town and transport planning

LTA will integrate urban development with transport planning. Having a proper mix of



developments and the highest building densities concentrated at and around MRT stations will ensure maximum accessibility for commuters to key nodes of employment, housing, leisure and other social activities. Commuter facilities and building developments will be fully integrated.

We should target for more high rise developments near MRT stations. Where appropriate, LTA should develop sites on top of or adjacent to MRT stations when constructing new rail lines. LTA must demonstrate the feasibility and benefits of building developments over new and existing stations.

Developing a comprehensive road network

Our goal is to build a more comprehensive road network. The Government will spend \$1.1 bn to expand our road network by another 225 lane km over the next five years. The immediate improvements to speed up traffic flows include:

- The Seletar Expressway (SLE), Tampines Expressway (TPE) and Nicoll Highway extensions;
- The upgrading of Jalan Ahmad Ibrahim into an expressway and Telok Blangah Road into a semi-expressway; and
- The transformation of 7 major junctions into 2- to 4-tier interchanges.

LTA is seriously studying the feasibility of the Singapore Underground Road System (SURS). While SURS promises the equivalent of 40% more road capacity within the city centre, it is extremely costly to build and to operate.

Capital cost is estimated at \$4.8 bn and operating cost is about \$80 mn a year.

Harnessing technology to maximise network capacity

LTA will use technology to maximise the capacity of our roads by upgrading and installing intelligent traffic management systems. Many promising improvements may be realised over the next few years if computer, telecommunications and information technologies continue to advance rapidly and become more affordable:

Some of the initiatives LTA will undertake over the next 2 years are :

- Creating more green waves. LTA will extend the Green Link Determining (GLIDE) intelligent traffic light system to cover the whole island. This will increase the capacity of junctions and smoother traffic flow;
- Creating "virtual slip roads" by allowing motorists to turn left at selected traffic light junctions even though the red signal is on, similar to the American right-turn-on-red system; and
- Adopting traffic monitoring systems like the Automatic Network Travel Time System (ANTTS) and close circuit televisions to monitor traffic conditions in real-time. LTA will further develop these systems to provide navigational and traffic information to commuters through the radio, telephone hotlines or variable message signs.



Demand management

We need a judicious mix of ownership and usage measures. The Vehicle Quota System (VQS) has worked well. We need to retain the scheme even after we introduce more extensive usage measures like Electronic Road Pricing (ERP). With VQS, the car to population ratio will be 1:7 by year 2010, compared to 1: 10 now. However we will continue to refine VQS further in the light of experience, try new ideas and close off loopholes.

Usage measures like road pricing are also needed. If they are effective, we can release more Certificates of Entitlement (COEs) to enable more Singaporeans to own cars. ERP will start in 1997. It will automate the existing manual road pricing schemes, and can be progressively extended to other congested roads. ERP will allow us to shift from ownership towards usage-based charges.

We will also rationalise the road tax structure and apply a more uniform basis to it, taking into account social and equity considerations. The tax adjustments will be significant. For scheduled buses, they will fully offset the impact of ERP.

We will also give rebates to help motorists adjust to the ERP. ERP charges for taxis will be phased-in over several years.

Improving public transport

Providing an attractive public transport system is the cornerstone of our land transport strategy. We will make public transport a more competitive transport mode.

Bus operators must be more customer-oriented. LTA will work with the operators to make the following improvements in the next 2 years :

- Improving travel times through more bus priority schemes like priority at traffic light junctions and bus lanes;
- Introducing more choices like BusPlus services, air-conditioned express services, supplementary services and intra-town services;
- Improving commuter facilities by providing bus arrival times at bus stops, over the phone, Televue or Internet. Commuters can therefore plan the timing of their trips from home;
- Providing better bus services by refurbishing bus stops, providing more covered linkways and overhead pedestrian bridges and comprehensive display of service information; and
- Encouraging higher operational efficiency. With the Global Positioning System (GPS) technology which uses satellites to pinpoint the location of buses, bus operators will be able to significantly improve their scheduling and introduce mid-way services to relieve overcrowded spots.

We will expand our MRT network. We envisage a 160 km network including:

- The Woodlands line - 16 km- to open in February 1996;
- The North-East line (NEL) - 20 km;
- The Kallang line - 16 km;
- The Northshore line - 20 km.

The MRT network will serve heavy traffic corridors. LRTs will serve as feeders to the MRT network, mainly lighter corridors and in



areas where there is sufficient ridership. We are studying the feasibility of running LRTs in Orchard Road/Marina South and some housing estates.

Taxis play an important role in offering personalised service at the high end of public transport. As long as the cost of operating taxis is correctly priced relative to private cars, we should allow market forces to determine the supply and demand of taxis. This is the key to providing a service that meets the demand of commuters. Other measures to improve the service include :

- Periodic evaluation and publication of the performance of taxi operators and incentives for the best performing fleet operator;
- Differential pricing to address the acute shortage of taxis during peak periods;
- Flexibility for operators to offer a wider variety of services; and
- Using GPS technology to improve the radiophone service to better match demand and supply.

Supporting Measures

We should not discount the contributions of other transport-related measures. These would include better pedestrianisation, good cycle facilities at MRT and bus interchanges away from the city, and parking policies such as more park and ride schemes.

Road safety and air quality

LTA will continue to work with the Ministry of the Environment (ENV) and the Traffic Police (TP) to keep our roads safe and the air clean. This will be done through regular

reviews of vehicle standards, public education and enforcement programmes. In addition, we will pay more attention to noise alleviating measures.

Financing framework

Our financing framework must continue to be based on the concept of partnership. The Government provides for transport infrastructure, commuters pay for operating cost and operators operate efficiently under the scrutiny of the Public Transport Council (PTC).

Our vision of a world class transport system calls for a comprehensive rail network. However, such a system is very costly to build and also costly to operate. This White Paper sets out the framework which will serve as a social contract between the Government, the operators and commuters on how we want to grow our future rail network.

Our financing system must be based on 3 sound principles:

- Fares have to be realistic and revised periodically to adjust for justifiable cost increases;
- We must recover operating cost; and
- We need a sustainable policy on asset replacement.

First, fares have to be realistic and revised periodically. This is because manpower and other operating costs will rise with time, and the possible major gains in productivity improvement from the reorganisation of our public transport system have already been

reaped. Commuters will be assured of affordable fares, but they must be prepared to pay for inevitable cost increases and higher service levels. Fare increases will be scrutinised by PTC and approved only if they are fully justified. Future adjustments will be in small regular steps, rather than large irregular jumps.

Second, we must recover operating cost by charging correct fares. This is the condition which must apply to all projects if we want a robust network and avoid cross-subsidising loss-making operations.

Third, we need a sustainable policy on replacing operating assets like trains and signalling equipment. Each generation should pay for its own consumption of services and assets.

The current policy calls for Government to provide transport infrastructure, including the first set of operating assets; commuters to share financial responsibility through fares covering both operating cost and the cost of second set of operating assets; and operators to extract efficiency dividends within the fare structure and service standards approved by PTC.

This is a prudent but conservative policy. However, the current arrangement is financially burdensome and exerts upward pressure on fares. It also stifles the extension of the rail network.

We will revise the requirement for asset replacement: Government to continue funding infrastructure and the first set of

operating assets, and commuters to continue paying fares which cover operating costs including depreciation. However, the second set of operating assets will be financed by fare revenue covering only the historical cost of the first set of operating assets, while Government co-finances the balance.

The revision will help us to develop a comprehensive rail network to support our vision of a world class transport system. The rail operators will not have to worry about future rises in the cost of operating assets and can then focus on improving customer service and operational efficiency. The new formula will balance the responsibilities and interest of the 3 main stakeholders- commuters, operators and the Government.

LTA can now review all rail projects and implement those which are considered viable in terms of financing, ridership and realistic and affordable fares. Even with this change, some projects may still not be viable. For marginal projects, we can consider implementing them if commuters find the projects worthwhile to them, as evidenced by their willingness to cover operating costs.

This financing framework reflects the Government's commitment to providing Singaporeans with a quality rail network charging affordable fares. The Government will continue to invest in rail extensions that are justified. The North-South/East-West line and the Woodlands line already cost \$6.3 bn. The NEL will cost \$5 bn. LRT projects now under evaluation could cost another \$1 bn.



Conclusion

If we can achieve all that is set out in this White Paper, Singapore will have a transport system that will be as widely acknowledged as its port and airport as among the best in the world.

But LTA cannot do this alone. We will have to work with many other agencies which share the objective of improving the infrastructure and quality of life in Singapore. More importantly, we will need the co-operation, understanding and support of the people.

Singaporeans must understand the challenges ahead, and be prepared for the changes to come. We must start solving tomorrow's transport problems today.

Otherwise the problem will only grow and we would have condemned future generations to even greater difficulties. We must act quickly lest we end up besieged by the many painful dilemmas which face so many congested cities. We therefore seek both understanding and co-operation from the people as we embark on this exciting enterprise. Their feedback and suggestions will be most welcome.

Many of the improvements we have outlined will take several years to complete, and for the effort to bear fruit. This is the nature of the problem. Indeed the exercise is not one in which the problem can be tackled once and for all. It will have to be managed all the time, and the improvements made continually. But if we stay true to the philosophy and approach of this White Paper, we should be able to have the world class

transport system that Singaporeans deserve ■



INTRODUCTION



INTRODUCTION

Over the last 10 to 15 years, the demand for transport has been explosive. We have become a more mobile and physically dispersed society. The number of vehicular trips grew annually by 7%, from 2.7 million trips in 1981 to about 7 million trips a day now. We can expect 10 million trips per day by 2010. 23% of all trips are made during the short 2-hour period comprising morning and evening peaks. The increase is not surprising, given rising levels of income, educational attainment, changes in lifestyle and a host of other demographic and social developments.

The transport system for Singapore in the next century will have to meet not only the increased demand for transport, but also rising expectations for quality transport. In 1980, barely 5% of the primary one cohort entered local universities. By 1994, it was 20% and it is still rising. Eventually, 60% of each cohort will be tertiary-educated. These young professionals aspire to own cars. They will settle for nothing less than a public transport system offering service standards comparable to private transport. Our challenge is to provide enough high quality transport alternatives to satisfy them.

Over the last 10 years, we increased our road network by 27%. But the car population grew faster at 45%. We cannot continue building more and more roads to accommodate new cars, given our limited land area. Roads now constitute 12% of the island's area, about the same percentage as housing. At this rate, 16% of the island will be used for roads by 2010! It is clearly not tenable to continue to rely on road expansion to solve all our transport needs.

To address the above concerns, the Government set up the Land Transport Authority (LTA) in September 1995 to spearhead improvements to our land transport system. The LTA's mission is to provide Singaporeans with a world class transport system. This White Paper sets out how the Authority intends to achieve this, its transport vision for Singapore, its operating philosophy, and the initiatives it will undertake in the short and long term.

A world class transport system will not come easy. But achieving it is not impossible if we get our basics right, dare to try out bold and imaginative solutions and have the political will to carry them out.

It is important that we succeed because a high standard of transport enhances the quality of life, is good for economic growth and helps us maintain our competitive edge.

Transport is not an end in itself but is a necessary activity which supports many facets of economic and social life. It is a link upon which the efficiency and attractiveness of many of these activities depend on. There is little point, for example, in having the most efficient port in the world if the roads leading to it are congested.

Our vision is a system that meets the needs and demands of a dynamic and growing city with a population that will increasingly expect high standards in service and infrastructure. Whatever the individual preferences of commuters and the various transport choices Singapore offers, the overall system must provide high quality service, be convenient, accessible, comfortable, safe, speedy, and affordable to the majority of Singaporeans. We must also continue to get good value for what we spend.

This means providing commuters with a wide spectrum of transport choices, while ensuring that they are effectively integrated. The range of services must be broad enough with sufficient differentiation in service standards and cost to suit each individual's preference and pocket. The cost to users of these services will depend on the cost of providing the services. By correctly pricing the various modes of transport available, we would ensure that the appropriate resources are directed to benefit the maximum number of commuters. Commuters will then be better able to make the right choices on what transport mode best suits their needs. The task before the LTA is hence a challenging one.

Fortunately, for Singapore, our basic policies and infrastructure are sound and have been tested over the years. Indeed in many areas we are at the forefront, being acknowledged widely for our achievements, for example, in managing traffic in the city (the ALS was a world's first), in having an MRT system which has won international acclaim and in operating one of the few commercially viable


bus services in the world.

But we can do much better. The formation of the LTA will allow us to better integrate the functions of planning, development, implementation and management of all transport infrastructure and policies. We are now well poised to tackle this important challenge.

Everyone has a part to play. The Government will continue to provide good transport infrastructure, good traffic management systems and implement sound policies.

Public transport operators will need to be provided with incentives to continually improve their service and give good value for money. As for commuters, they will have to pay a fair share of the improved transport services. Unless there is a clear understanding of this philosophy, our efforts to create a world class transport system will not be effective.

Action is needed on many fronts. Chapter 2 elaborates on our vision of the future. However we will need 10 to 15 years to develop a world class transport system, hence the immediate initiatives over the next 2 to 5 years. Chapter 3 explains the need to



integrate land use with transport planning. Chapter 4 sketches the road expansion plans, and also how we can tap technology to improve the productivity of our network. Chapter 5 covers the demand measures which are necessary to keep our roads congestion-free. Chapter 6 describes the improvements to public transport which will be the cornerstone of our transport policy. Chapter 7 touches on supporting measures. Chapter 8 explains the need for a new financing framework to realise the vision. Chapter 9 concludes the report ■



**A
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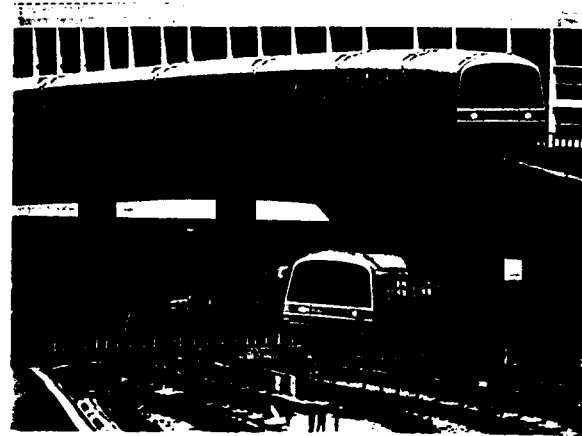
Public transport

Having a world class transport system means having a world class public transport system. There is no running away from this: public transport is and will always be the major mode of transport.

The system we aim to provide will offer convenience, reliability, ease of use, comfort, affordability and competitive travel times. Where a journey involves more than one mode of transport, the transfer must be fast, easy and comfortable. Only then can we promise a seamless journey. Improving public transport means not only improving bus or train travel. It means improving all the intermediate and end-point facilities that make up for a complete door-to-door journey: linkways, service information and provision, even customer service, are vital components of a world class transport system.

To achieve this, we will need a major change of mindset among the operators and the providers of infrastructure. We must find ways to give incentives, so operators will continually improve their services and be more responsive to the changing needs and demands of their customers. This way, service can be pegged at the highest sensible levels while providing good value for money.

The key is in providing a comprehensive range of public transport services, each being developed to the highest quality commensurate with the fares charged, and which are so well-integrated that for the commuter, it offers a seamless journey.



Comprehensive range of public transport services



These include:

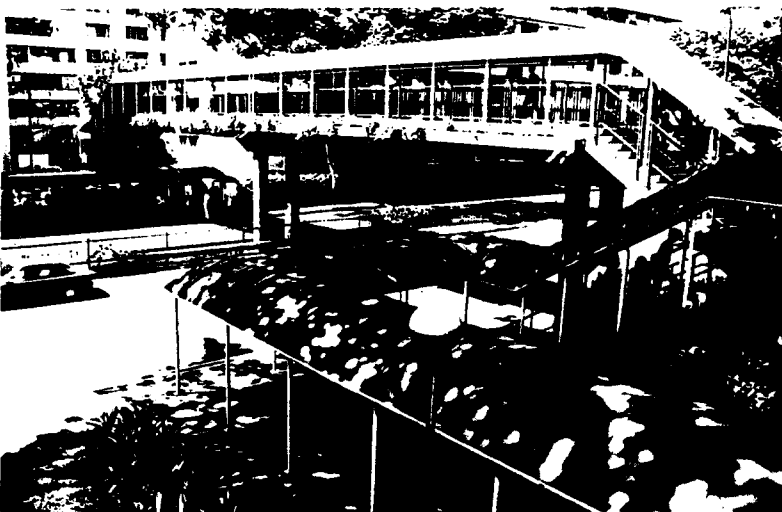
- MRT to serve heavy transit corridors;
- LRT systems to serve as feeders to the MRT network;
- Buses to continue serving the less heavy corridors to complement MRT-LRT network;
- Premier bus services like BusPlus to provide higher grade of bus service; and
- Taxis to provide car-like services.

We must progressively build up our network so that access to one of these services is within walking distance. To provide commuters with greater convenience, accessibility and comfort, urban developments must be fully integrated with transport facilities.

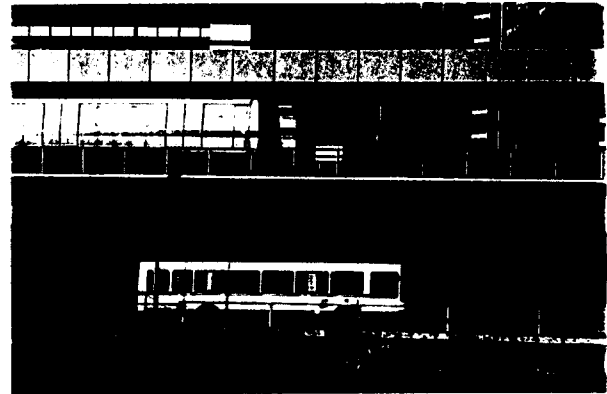
Commuter facilities like bus-stops, taxi stands, LRT/MRT stations along with other transport interchanges should be integrated with building developments. At the very least, we will link the different commuter facilities to the nearest buildings. Walking to transport facilities will be made more pleasant. Operators will provide the public with information on all travel modes, routes, timetables and fares and implement a fully integrated fare collection system.

A world class transport system must provide good value for money. Air-conditioned buses are relatively cheap, provide acceptable service along light corridors of travel, but are quite inadequate for heavy transport corridors.

Only rail transport can meet the transport needs of heavy demand corridors while



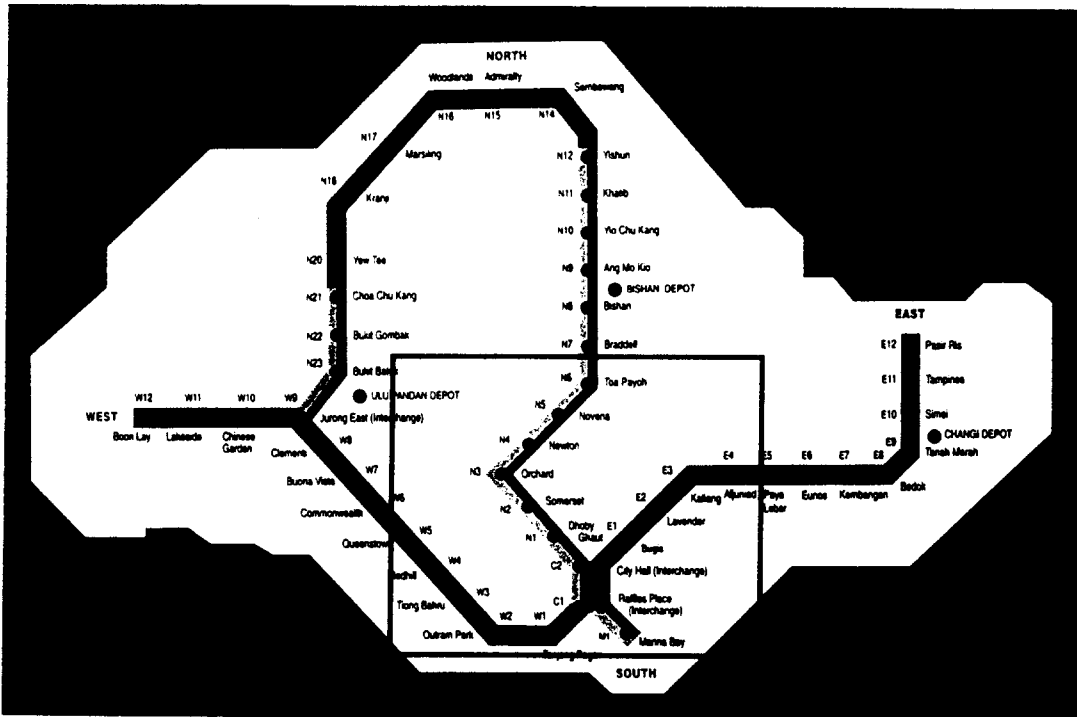
Linkway from HDB estate to bus-stop



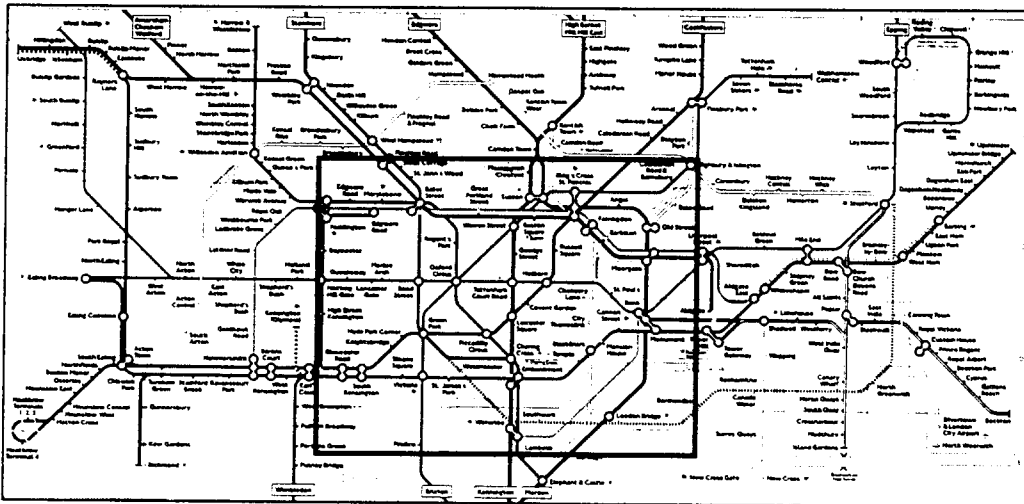
Integrating MRT and bus service for HDB estates

maintaining high travel speeds and predictability of arrival and departure times.

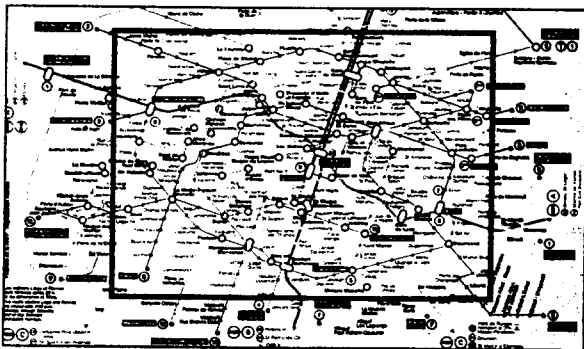
This explains why cities of high density are critically dependent on rapid transit systems with dedicated rights-of-way. They have opted for rail even though it is a more expensive option than bus. If the average Singaporean is to get around with the ease of a resident in London, Paris or Tokyo, we will need a rail network as comprehensive in coverage as the London Tube, the Paris Metro or the Tokyo Chikatetsu. These cities have built up their rail network so that commuters can easily get to stations which are typically spaced 400 to 500 metres apart. London started in 1863, Paris in 1900 and Tokyo in 1927. They have taken over a century to build up their networks. We only started MRT operations in 1987. We cannot grow a comprehensive network over the next few years. However we will build up the network incrementally, properly sized to match our city of the future. Over a decade or two, the results will be significant and clearly visible. Our target is to have as high a percentage of trips on a quality public transport system as in Zurich, where 75% of trips into the city centre are by public transport.



Singapore's MRT started in 1987



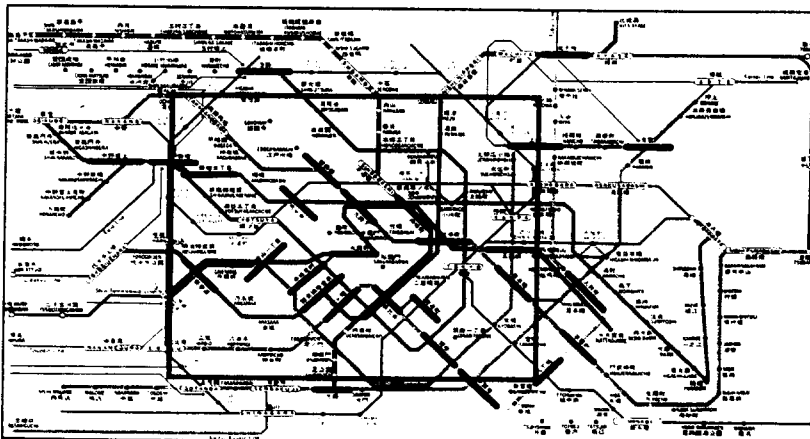
London's Tube started in 1863



Paris' Metro started in 1900

RAIL NETWORKS OF SINGAPORE/LONDON/ PARIS/TOKYO

□ Approximate area (10km x 8km)



Tokyo's Chikatetsu started in 1927



Private transport

Private cars provide the convenience and flexibility unmatched by most public transport systems. The attractiveness of car travel will increase further when we expand future road capacity by creating a more comprehensive network and by harnessing technology to make motoring a more enjoyable experience. However, the advantage of driving can be completely eroded if our roads are constantly plagued by massive congestion and parking is inadequate or inaccessible.

Congestion is costly in terms of time wasted, unnecessary fuel spent and pollution created. It also affects everyone equally, regardless of the purpose of the journey. The costs imposed on society are not always obvious; neither are they borne entirely by the motorists causing it.

Traffic jams result in the loss of productive hours, environmental pollution, wasted fuel and adverse health impacts. British economists have estimated that congestion on the M25 London motorway costs around £15 billion a year. In Singapore, the cost of time wasted due to congestion on the Pan-Island Expressway (PIE) and Central Expressway (CTE) has similarly been estimated to be about \$45 million a year.

It is thus critical to keep the major arterial roads and roads in key business districts relatively free-flowing. We are now approaching the stage where it is often not possible to expand road capacity without costly investments in the form of viaducts, spaghetti junctions and underground

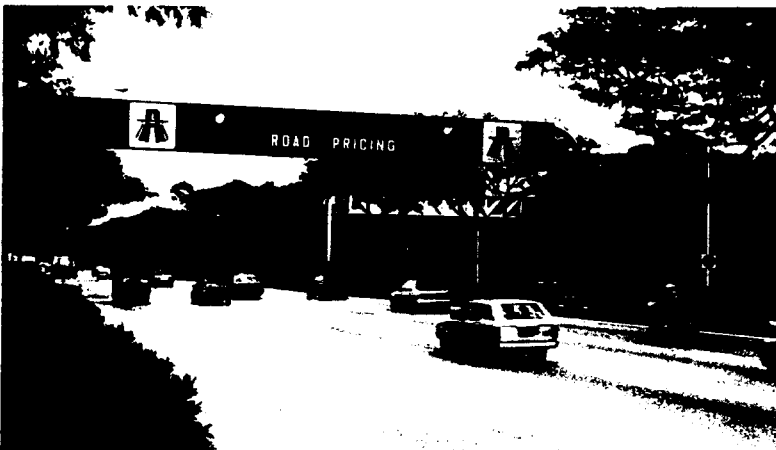




Congestion imposes a heavy cost on society

tunnels. The higher cost is not only in financial terms. Sometimes, it also means demolishing buildings which are important parts of our cultural heritage.

Road pricing will keep the key roads and expressways free-flowing. This is fair, as motorists who contribute to congestion must bear the cost of doing so. Moreover, the cost of congestion will be more transparent



Traffic on ECP during RPS hours



Traffic on ECP after RPS hours

to the motorist. This will allow road users to make more informed transport decisions.

Motorists can plan their trips based on the importance and cost of the journey, and the alternatives available. They will have the choice - to pay for a smooth and congestion-free ride - a privilege in a compact city like Singapore.

Key areas of improvements

Achieving our vision of a world class transport system will depend on our success in tackling the following key areas:

- Integrating transport and land use planning;
- Expanding the road network and maximising its capacity;
- Managing demand of road usage through ownership and usage measures; and
- Providing quality public transport choices.

It will take us 10 to 15 years to attain our vision. In the short and medium term, LTA will undertake a comprehensive set of initiatives to make tangible improvements to the transport system. These are addressed in the following chapters ■



INTEGRATING LAND USE, TOWN AND TRANSPORT PLANNING

INTEGRATING LAND USE, TOWN AND TRANSPORT PLANNING

Land use planning plays a key role in creating a sustainable transport network. Planning can influence the need for travel, even the mode of travel. The importance of an integrated land use and transport planning approach cannot be over-emphasised. Singapore has done well in this area so far.

For example, our town planners decentralised the population by building HDB towns away from the city centre, but connected them by an efficient system of roads, expressways and public transport.

Corridors for the existing MRT network were also planned for then. In this way, we avoided the serious problems of inner city congestion and urban sprawl that plague many cities, and at the same time made provisions for increasing demand for public transport in future. This approach was set out in the first strategic development plan, the 1971 Concept Plan.

In the 1991 Revised Concept Plan, transport considerations resulted in two key land use planning strategies :

- Decentralising commercial and other economic activities through the development of regional, sub-regional, fringe centres at MRT stations. This has resulted in better utilisation of the MRT network in both directions during peak hours; and
- Reducing the need for people to travel by locating employment centres like industrial estates, business parks and commercial centres near residential areas. Specifically, more homes would be built in the western

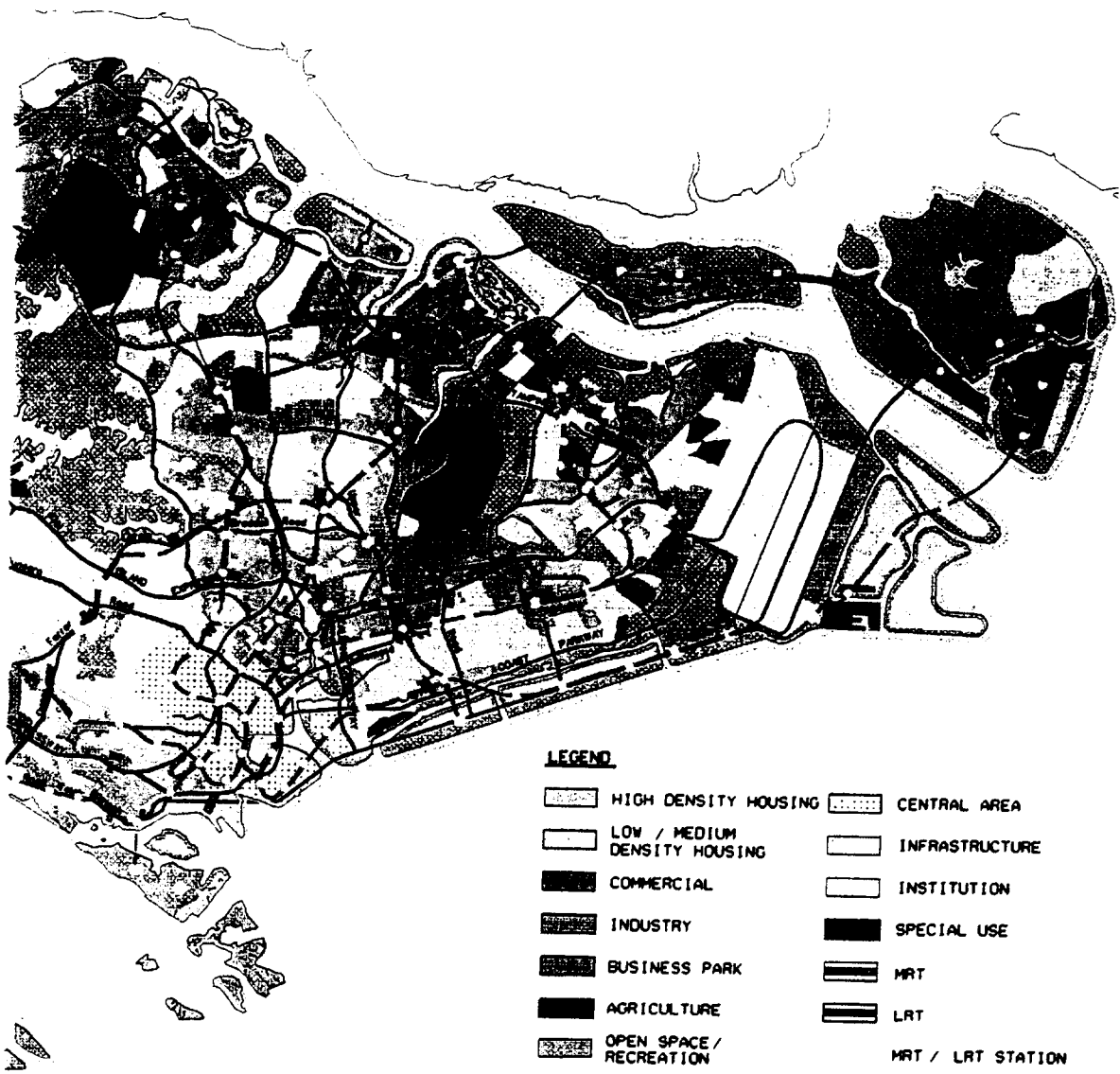
part of the island while more employment centres would be created in the eastern part of the island.

A key component of the Concept Plan is the Strategic Transport Plan. It tries to plan for a viable transport network that can meet the travel demand of a population of 4 million by the year 2030.



The key goal of land use planning is to get the layout and use correct. But this is not enough. Besides planning at the strategic level, at the micro-level, LTA must also work closely with the urban planners to integrate land use around MRT stations. This is an area which we will immediately improve on. Tangible improvements will be felt in 3-5 years' time.

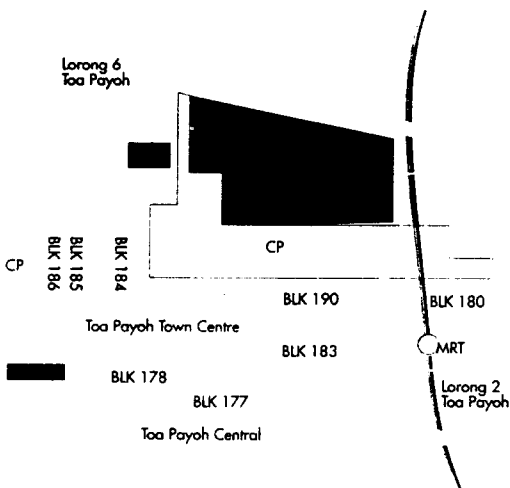
Ideally, we should concentrate the highest density developments around major transport nodes such as MRT stations, and disperse the less compact developments further away from these nodes. In developing the North-South and East-West MRT lines, we have not fully developed most of the MRT station sites. We should progressively release more of these sites for



development. The developments need not be exclusively for commercial use. In addition, we should plan for more high rise developments near MRT stations, properly landscaped and integrated with surrounding developments as part of our vision of building a city of excellence. The Bukit Merah Development Guide Plan (DGP) already allows for 30-storey residential developments. Similar planning provisions should also be made in other DGPs where appropriate.

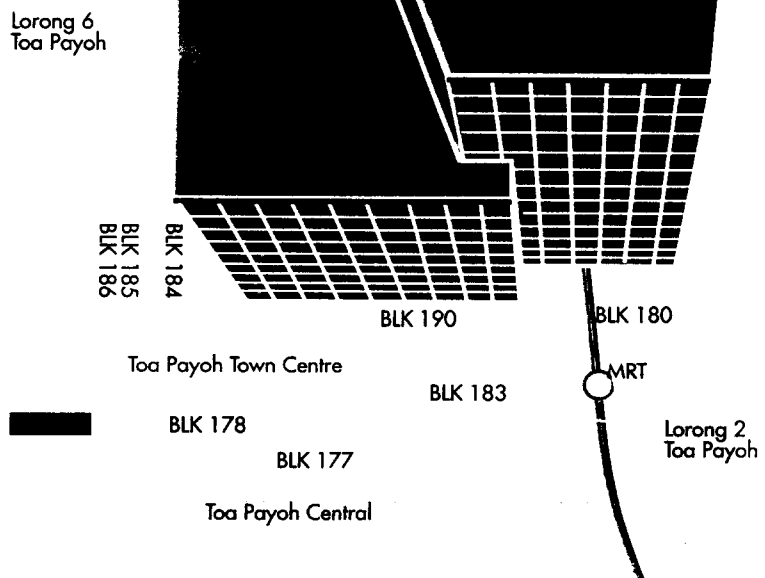
We should therefore aim for a proper mix of residential, industrial and even institutional developments, and the highest plot ratios at and around MRT stations.

This way, we can guarantee good accessibility to key centres providing employment, housing, leisure and other social activities. For example, the Housing Development Board (HDB) has started to plan the redevelopment of the Toa Payoh bus interchange into a commercial cum residential complex. The purpose is to improve accessibility to the bus interchange, the Toa Payoh MRT station, and residential and commercial developments nearby. The



Current layout

REDEVELOPMENT OF TOA PAYOH BUS INTERCHANGE



Proposed plan

Ministry of National Development (MND) is also planning to redevelop sites around other MRT stations.

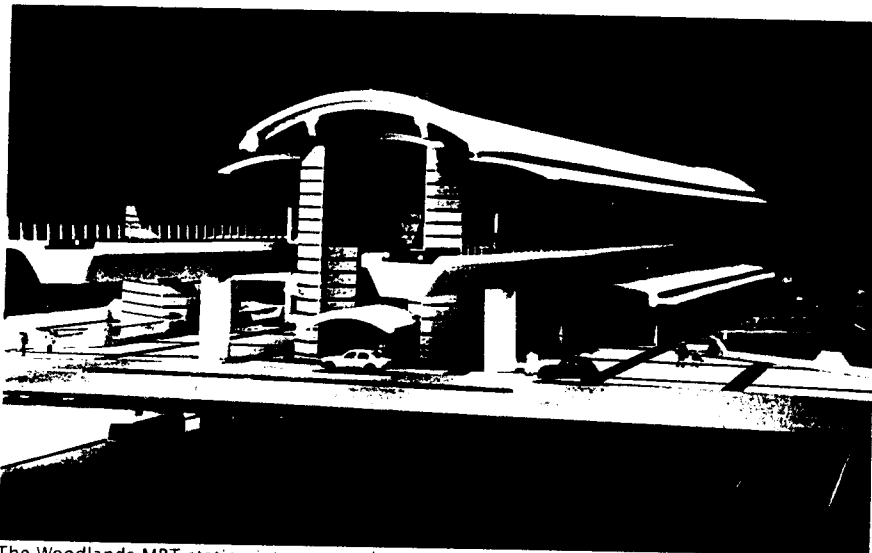
Intensifying developments around MRT stations alone is not sufficient to ensure good accessibility. Planners must fully integrate MRT stations with building developments and other transport modes. For example, at the new Woodlands MRT Station, other transport facilities like bus interchange and taxi and car drop-off points are well integrated with the station. Commuters can interchange easily, in comfort, even in inclement weather.

We must extend the fundamental principle of integration to HDB estates. For example, the configuration of LRTs should maximise accessibility for residents. In some instances it may be better for the LRT to hug the road reserve rather than sit astride the road divider. Such a configuration could greatly shorten the walk to the LRT station and provide residents and the local community with significant usable space under the viaducts. While some blocks nearer the LRT route would have more noise and less privacy, this must be balanced against the greater convenience and higher property values most residents will enjoy.

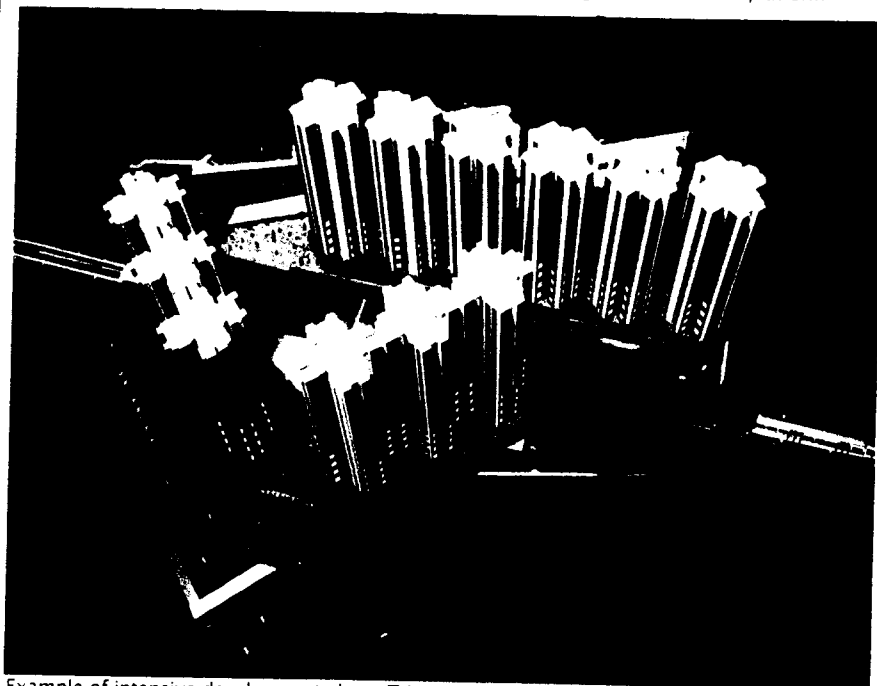
In Hong Kong, the mass transit operator — Mass Transit Railway Corporation (MTRC) — routinely develops sites on top of and around MTR stations. Their thrust is not maximisation of development potential per se, but proper balancing and integration of commuters' interests with development considerations. We should adapt the many

good points of the Hong Kong model for local application.

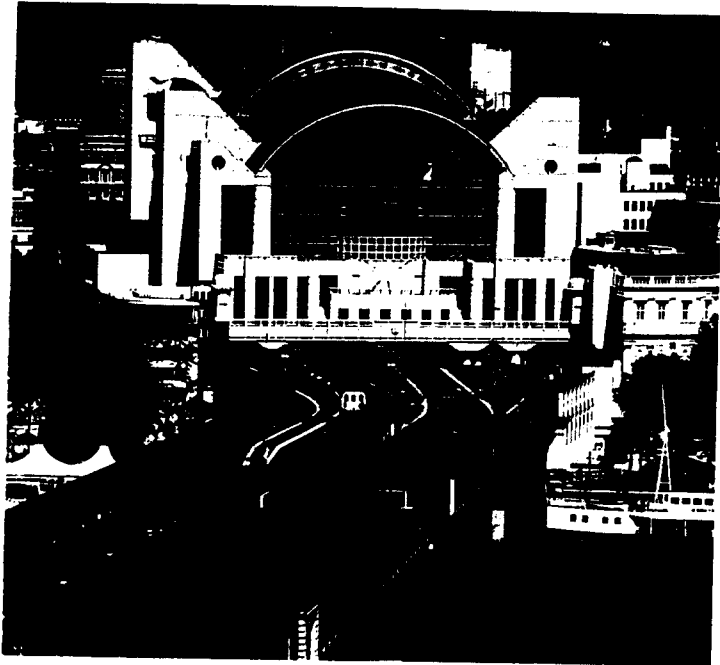
Where appropriate, LTA should develop sites on top of or adjacent to MRT stations when



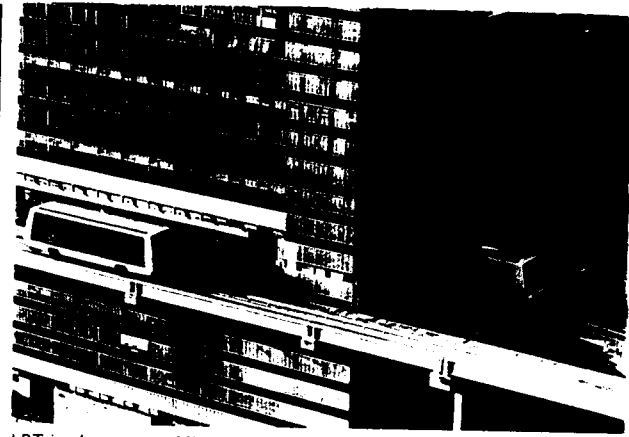
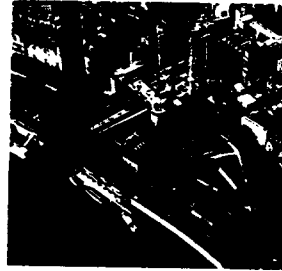
The Woodlands MRT station integrates other transport features like bus interchange at basement; taxi stand and car drop off point at grade and MRT at platform



Example of intensive development above Tsing Yi MTR station in Hong Kong



Building development above Charing Cross Train Station in London

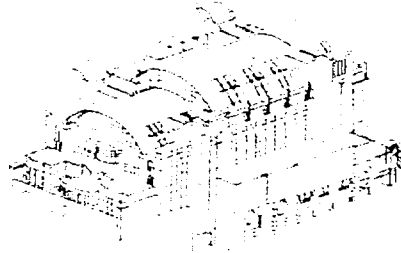


LRT in downtown Miami

constructing new rail lines. This will allow direct integration of developments upfront and avoid the costly structural investments needed if we delay developments until after the completion of the rail lines. LTA should demonstrate the feasibility and benefits of building developments over existing underground stations which have not been integrated with any developments.

For a start, LTA will develop a few sites whenever we extend the MRT network and the airspace above some rail tracks such as the Bishan MRT station. The other sites can progressively be developed by other agencies, or jointly with the private sector. This approach will allow our city to grow and benefit from a wide spectrum of ideas and a variety of designs ■

AIR RIGHTS BUILDING



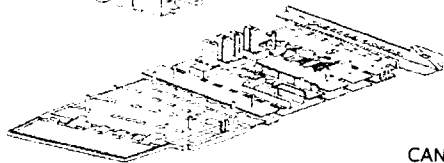
STATION CEILING



STATION PLATFORMS

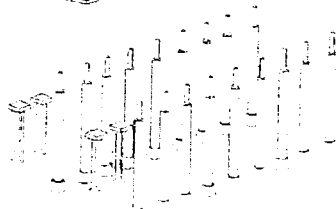


VAULTS ACCOMMODATION



CANOPY BUILDING

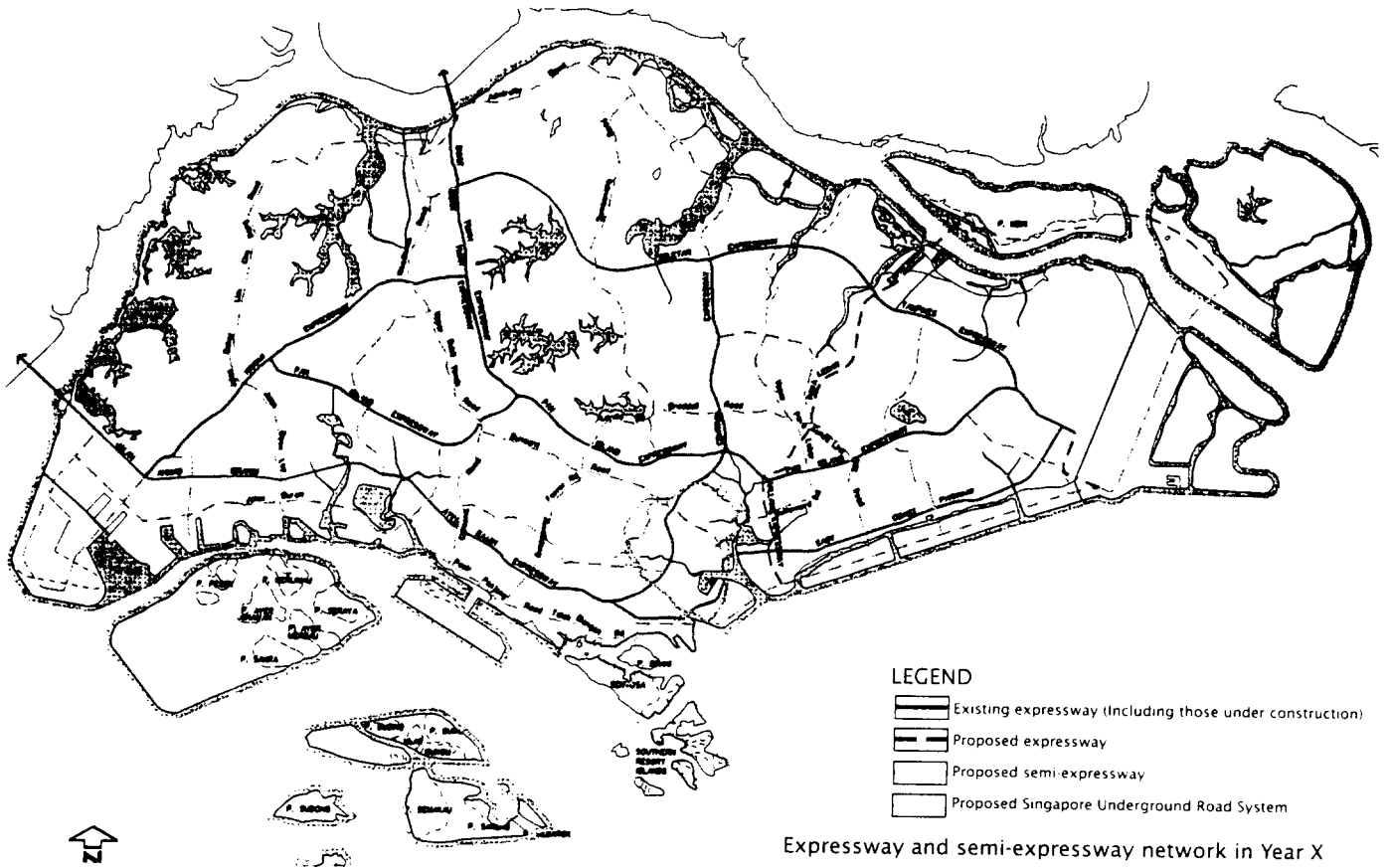
FOUNDATIONS





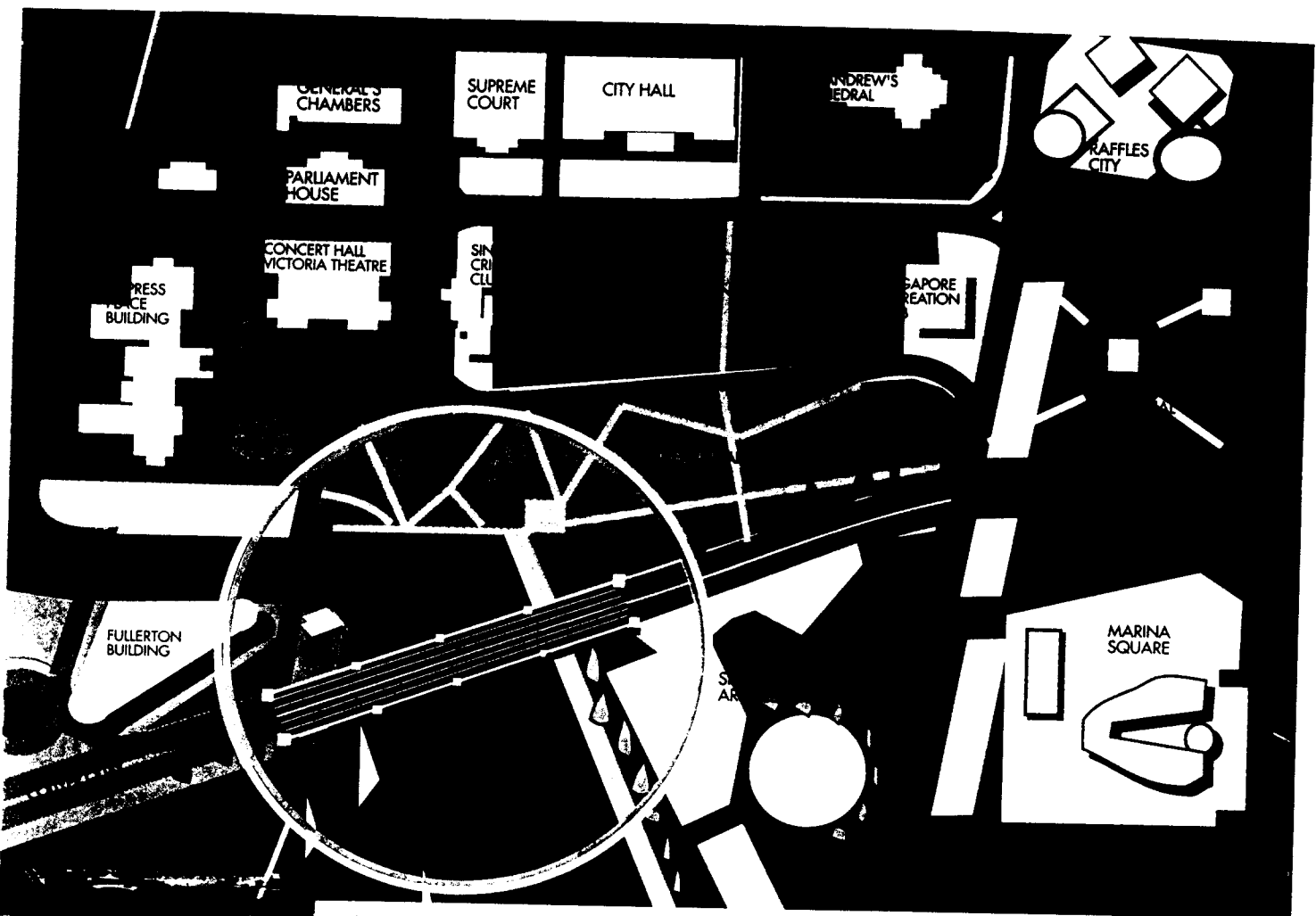
DEVELOPING A COMPREHENSIVE ROAD NETWORK

DEVELOPING A COMPREHENSIVE ROAD NETWORK



Our road network must be as comprehensive as possible to sustain economic activities and to provide better connectivity for all Singaporeans. Good connectivity will benefit not only private transport, but also public transport such as buses and taxis. LTA will continue to build transport infrastructure and ahead of demand where it makes sense to do so. But there will be difficult trade-offs ahead. More land for transport infrastructure usually means less land for other uses.

Our goal is to build a more comprehensive road network. This will offer motorists a wider choice of routes and help spread out and speed up traffic flows. Over the next 5 years, Government will spend \$1.1 billion to expand our road network by another 225 lane-km. This is a massive road expansion programme. It will include new expressways, expansion of major arterial



The Nicoll Highway extension to Collyer Quay

roads and upgrading of key junctions. The immediate road expansions to improve traffic flow are as follows:

- SLE and the TPE will facilitate travel between the northern and eastern regions;
- Nicoll Highway will be extended to provide a direct connection from Bras Basah Road to Collyer Quay;
- Jalan Ahmad Ibrahim will be upgraded to a high capacity expressway to serve the industrial developments in Jurong and Tuas

- and the second link to Malaysia; and
- Telok Blangah Road will be upgraded to a semi-expressway to provide a new high capacity east-west corridor between Jurong and the city.

To help speed up traffic flow while minimising land use, LTA will convert selected junctions into 2 to 4 tier interchanges. We will significantly relieve local congestion at the following junctions by:

Upgrading to 4 -tier interchange (Including provision for MRT tunnel)

- Upper Serangoon Road/Braddell Road

Upgrading to 3-tier interchange

- Adam Road/Farrer Road
- Holland Road/Farrer Road

Upgrading to 2-tier interchange. (With provision for 3-tier interchange in future)

- Benoi Circus
- Upper Serangoon Road/Upper Paya Lebar Road

Upgrading to 2-tier interchange

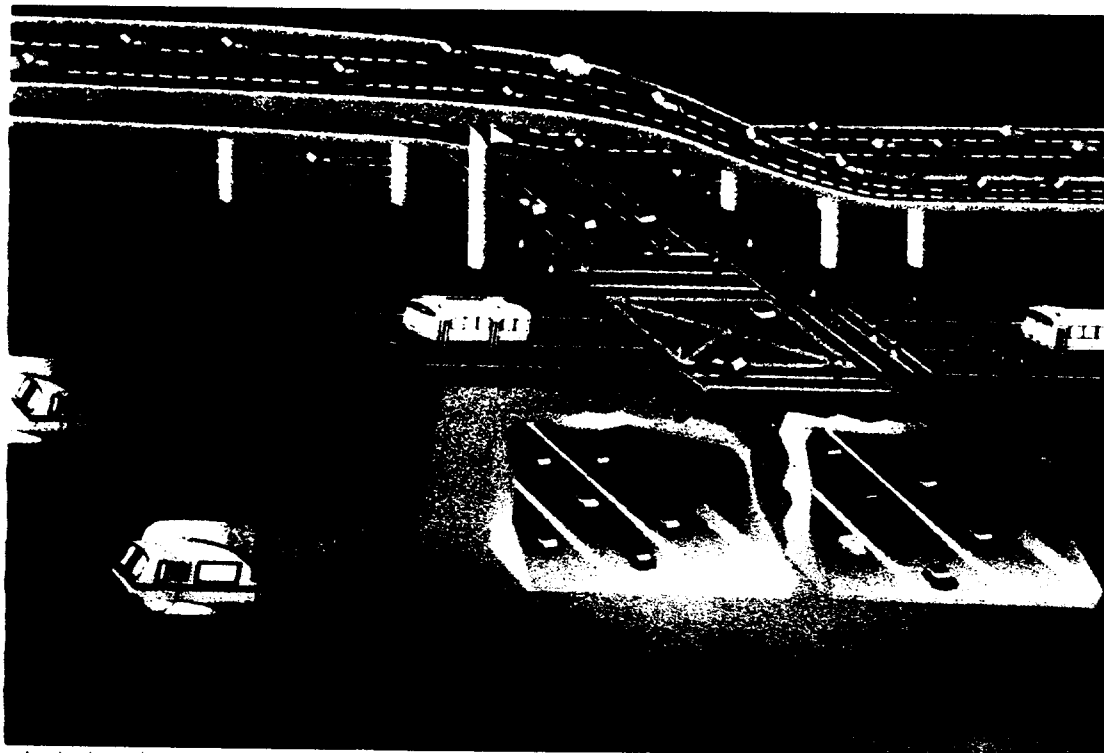
- TPE/PIE

Transport engineers in many cities have identified the need to provide a high capacity ring road for their cities. The idea is to provide accessibility to the city centre without clogging up surface streets. Major cities like Brussels, Mons, Antwerp and Liege have segments of underground roads of varying lengths at busy junctions. Brussels has a 7 km long ring road round its Central Business District (CBD) of which 2.2 km runs underground, and another 2.5 km tunnel

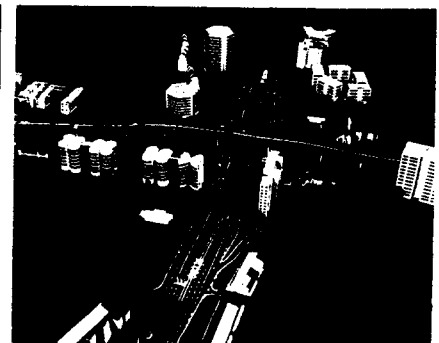
linking the north west region with the CBD.

Stockholm is developing a 25 km ring road for the city of which 15 km will be underground. The Swedes plan to recover construction cost through road tolls. While underground road systems theoretically promise unlimited expansion of capacity, the limiting factor in practice will be the exorbitant upfront investment and high recurrent operating cost.

We are now seriously studying the feasibility of building SURS. SURS promises the equivalent of 40% more road capacity within the city. With SURS, motorists can enjoy the same average travel speed with 40% more traffic. In addition, much of the current city-bound traffic can travel uninterrupted and by-pass some busy streets and intersections.



4 - tier interchange (including MRT tunnel) at Upper Serangoon Road / Braddell Road



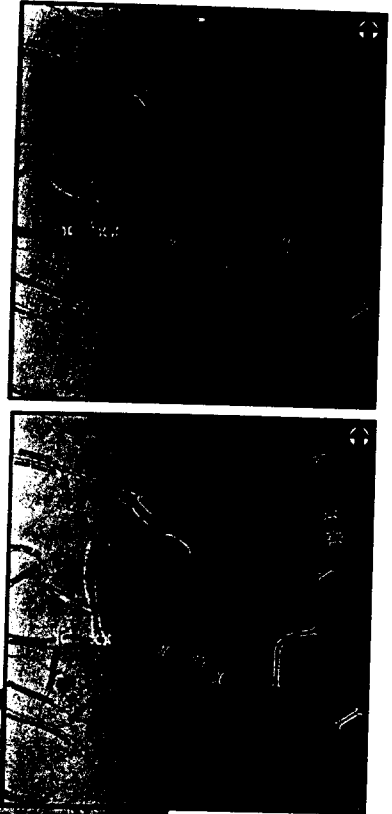
3-tier interchange at Holland Road / Farrer Road



3-tier interchange at Adam Road / Farrer Road

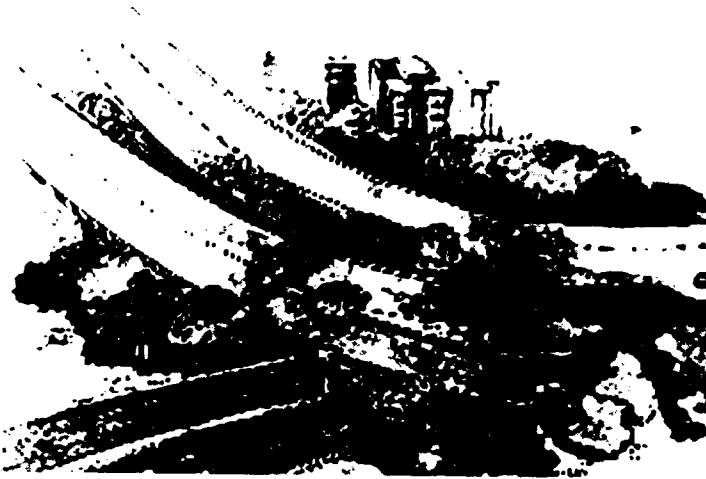
SURS will comprise two concentric rings of underground roads each roughly 15 km in length and 2 to 4 lanes wide (equivalent to 84 lane-km). We can have 8 interchanges and 33 entrances and exits to allow for easy connection from surface roads. SURS is expected to encircle the city centre and run through Marina South to serve the extended CBD. Because of its complexity, SURS will have to be built in phases and over a period of at least 15 years.

The capital cost is estimated at \$4.8 bn, almost the cost of NEL. Operating cost is roughly \$80 mn a year. If the project has to break even on the basis of usage charges alone, the fee may have to be as high as \$30 per pass. This would be prohibitive. However, the additional road capacity provided by SURS should enable us to increase the vehicle



Possible configurations for SURS

population significantly. The tax and COE revenues from these additional vehicles will be substantial. We should take them into account as benefits resulting from SURS, rather than try to recover the entire cost of the project through usage charges. Usage charges will still be necessary, but we can then set them much lower. The LTA will evaluate the SURS project very carefully, from an overall national point of view, before making a decision.



The entrances and exits of SURS are likely to be similar to those of the CTE Tunnels

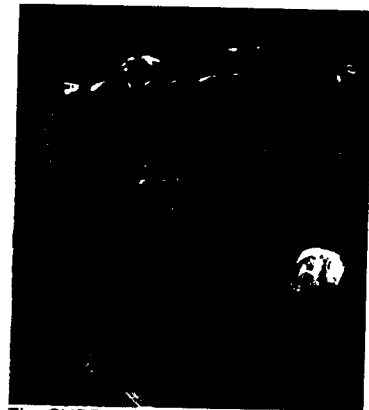


HARNESSING TECHNOLOGY TO MAXIMISE NETWORK CAPACITY

In addition to developing a comprehensive road network, LTA will also maximise network capacity by adopting advanced traffic management systems. Rapid advancement in computer, telecommunications and information technologies promises exciting improvements in the efficiency, safety and comfort of future road transport systems.

Over the next two years, LTA will employ the following technology to implement some improvements to our road network:

- Extension of the GLIDE intelligent traffic light system to cover the whole island. GLIDE increases the carrying capacity of our traffic light junctions by monitoring traffic flow in real time and optimising the duration of red and green signals for each



The GLIDE and CTE Control Centres



Advanced traffic monitoring system will make driving a more pleasant experience

direction of traffic. When completed, it will create smoother traffic flow, or more "green waves" island-wide by co-ordinating traffic signals at different junctions;

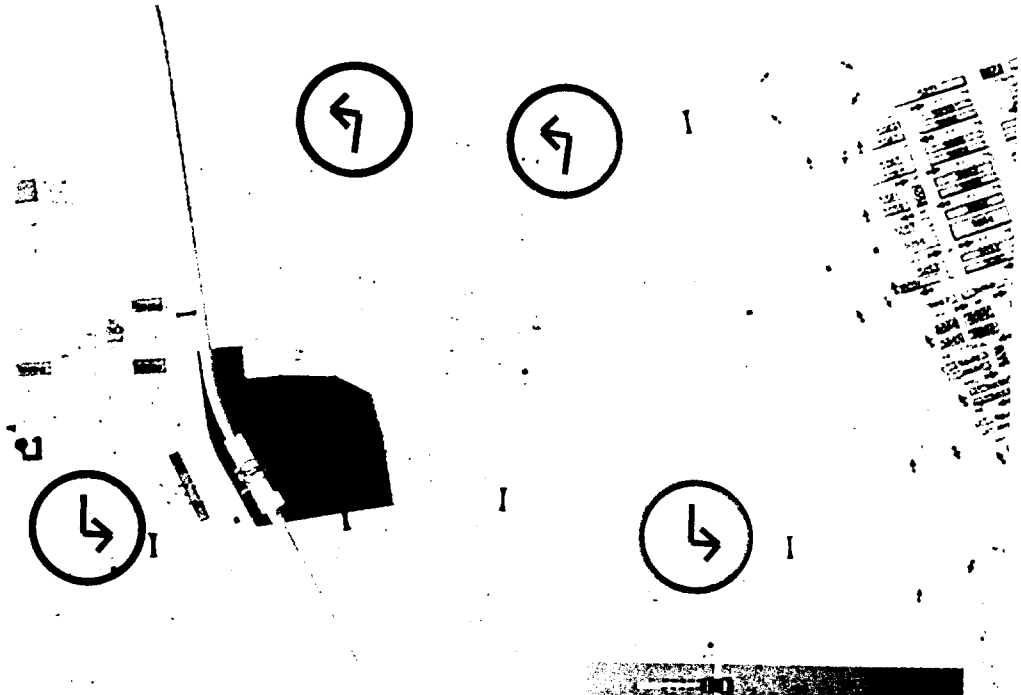
- Creation of "virtual slip roads". LTA will use green arrows to signal to motorists to turn left at selected traffic light junctions at appropriate times, even though the red-signal is on. It will be similar but more restrictive than the American right-turn-on-red. LTA will try out a pilot project on a stretch from the expressway into Ang Mo Kio Town Centre and Bedok Town Centre. This will save time for motorists getting into and out of the town centre; and
- Better traffic monitoring systems, like the pilot ANTTS project which commenced in August 95. Communications between interrogators installed at traffic light junctions and devices retrofitted in buses and taxis will allow traffic engineers to monitor travelling speeds on arterial roads and expressways. ANTTS will be one of the principal tools for monitoring island-wide traffic conditions and to help set road usage charges to relieve localised congestion. Closed-circuit televisions will also be installed at 15 critical junctions in the city centre to enable visual monitoring of traffic situations.

LTA will then further develop ANTTS or other vehicle location systems to provide navigational and traffic information now available in Tokyo and London. Motorists can then be informed through the radio, telephone hotlines or variable message signs

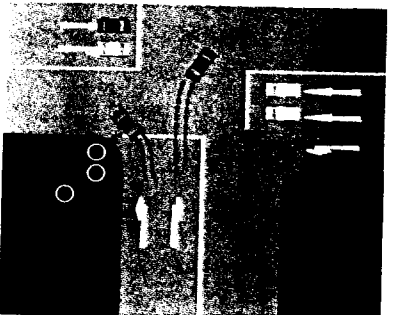
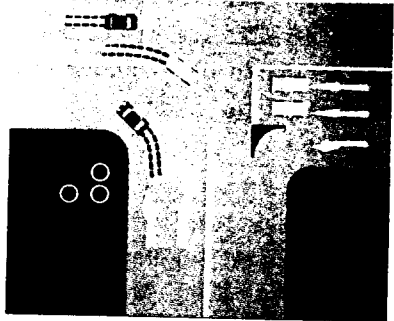
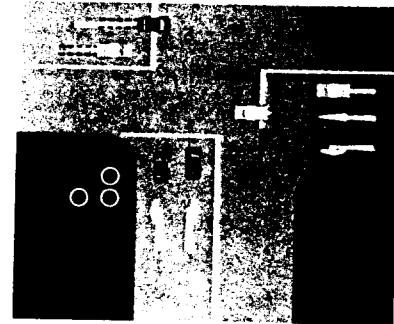
along the roads of prevailing traffic conditions, and alternative routes to bypass congested spots. The technology will also allow motorists to be advised on the optimal travelling speeds. This will reduce congestion resulting from motorists travelling too slowly, and motorists travelling too fast and having to brake suddenly, causing a stop-go situation for everyone behind.

In future, advancements in technology could allow closer interaction between motorists, their vehicles and the road network. Palm-sized devices could in theory allow every motorist to access a wide variety of information while travelling. The information provided would include the motorist's location, prevailing traffic conditions, road works, parking facilities, even the optimal route based on criteria selected by the motorist, be it cost or length of journey. Systems could also be designed to warn the driver against falling asleep. Special vehicle guidance systems could even allow a motorist to be automatically piloted to his destination at the optimal speed and with minimum interruption along the journey.

Countries around the world have come up with similar but different concepts of intelligent road transport systems. Examples are the Intelligent Vehicle Highway System initiative in the United States, the Intelligent Transport System initiative in Japan and the PROMETHEUS programme in Europe.



It will be some time before such sophisticated systems are reliable and affordable. LTA will in the interim monitor trends, evaluate the latest traffic management products and adopt appropriate systems which can increase the network's capacity and improve safety ■



The virtual slip road will allow the red car more time to turn left



DEMAND MANAGEMENT

DEMAND MANAGEMENT

Ownership measures

COEs

In Singapore, we rely on ownership measures to moderate the demand for cars, and on usage measures to restrain utilisation. VQS is one of the principal tools used to manage ownership. It has achieved the transport objective of controlling total vehicle population by effectively reducing vehicle population growth from 6% to 3%. VQS also satisfies the equity objective by incorporating an element of progressivity in having different COE categories by engine capacity for cars. With VQS, more Singaporeans will own cars if we continue to moderate vehicle population growth to 3% per annum. By 2010, the car to population ratio will be 1:7, compared to 1:10 now.

As the VQS had no precedent, we started with a fairly simple system. The objective was to allow vehicle population to grow in tandem with road capacity. With the introduction of VQS, we lowered another upfront cost — the Additional Registration Fee (ARF) — to partially offset the COE quota premiums. The ARF was reduced from 175% to 160% of Open Market Value (OMV) on 1 November 1990 and further to 150% on 1 February 1991. But prices increased to compensate for the lower ARF rate. Further reduction of ARF will not fundamentally change the cost of owning a car as COE prices will adjust to balance supply and demand.

To allow more cars to be driven primarily during week-ends, we started the Weekend Car Scheme (WEC) in May 91. The WEC was



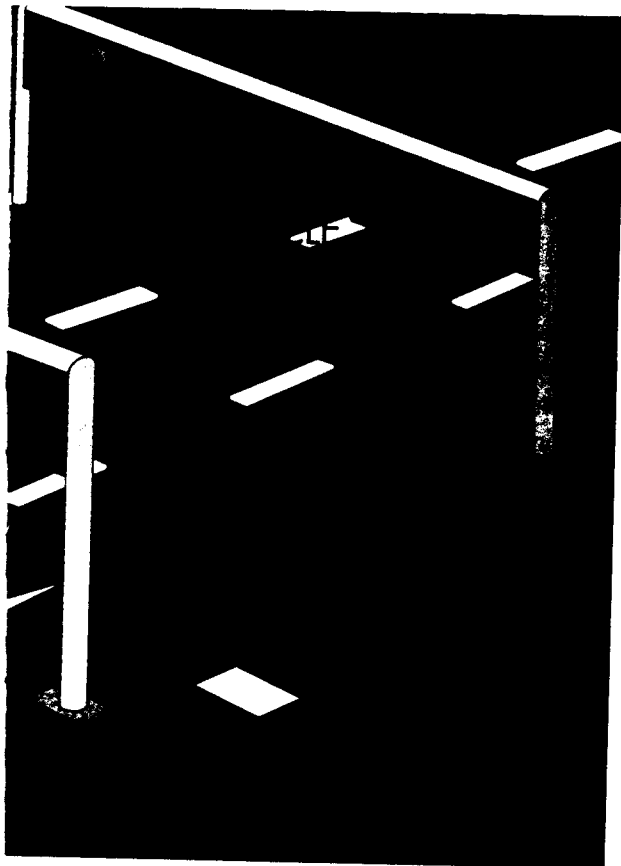
HOW ERP WILL WORK

1. IU/ SMART CARD

2. Antennas at 1st Gantry

3. Antennas at 2nd Gantry

4. Enforcement Camera



later merged with the Off-Peak Car Scheme (OPC) to plug some loopholes whereby owners of bigger capacity cars were taking advantage of the WEC. In March 95, MINCOM agreed with the Government Parliamentary Committee (GPC) on Transport and Communications to introduce a one-year trial to determine whether curbing "double transfers" would reduce COE prices. The trial is now in progress. We will study the results of the experiment before deciding whether to confirm the changes to the COE system, revert to the previous arrangements, or make further modifications to improve the scheme.

We will continue to review and refine the VQS in the light of experience. We will experiment with "Pay-As-You-Bid" (PAYB) if need be at a later stage. Many Singaporeans believe that PAYB is fairer than the current "Single Strike Price" method, and will moderate COE prices.

However, it is worth reiterating that as long as the supply of COEs remains unchanged, modifications to the VQS are unlikely to affect COE prices significantly. COE prices are determined by supply and demand. Changes to the details of the COE scheme do not increase the number of COEs available, nor do they do anything to reduce demand for cars. So the equilibrium price of COEs will not change.

Of course it is possible to allocate a fixed supply of COEs to lucky recipients at prices which are below the market clearing price, as some have suggested, by way of a ballot.

— **Every vehicle will be equipped with an In Vehicle Unit (IU) holding a credit card size smart card.**

— **The IU will communicate with the antennae and deduct the fee payable from the smart card.**

— **The IU will communicate with the antennae to verify the validity of the transaction.**

— **An image of the rear registration number plate of a violator's vehicle will be captured by the camera.**

But even this will not increase the number of COEs, or the number of Singaporeans who can obtain COEs. Furthermore, this would be unfair to the many Singaporeans not lucky enough to receive an under-priced COE.

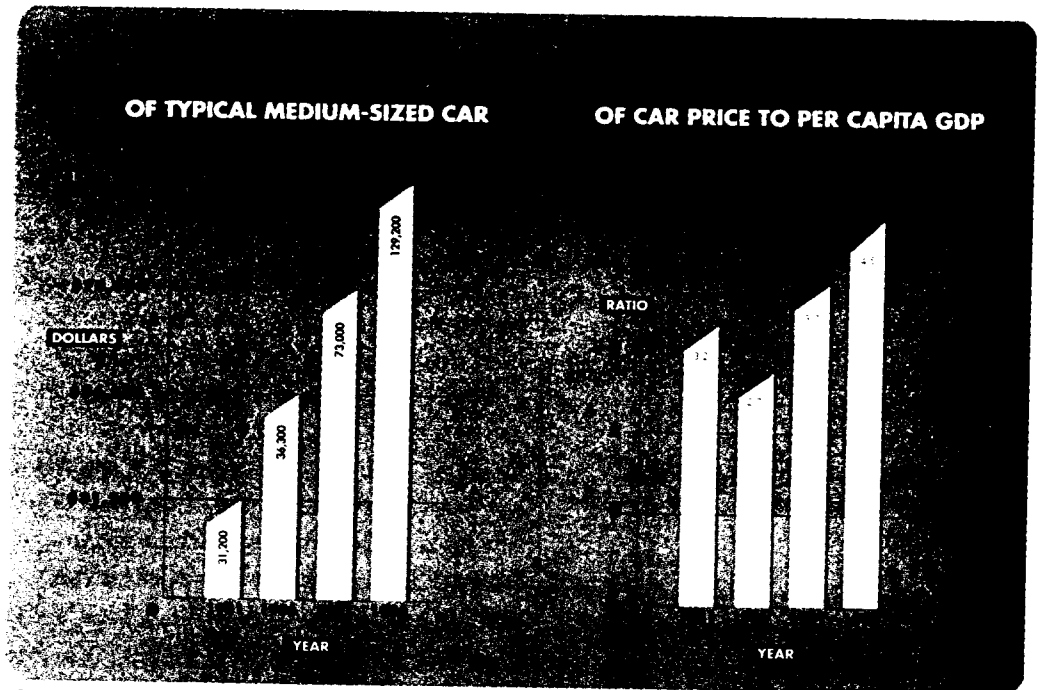
Many Singaporeans have asked whether VQS is necessary once we have widespread usage measures like ERP. Some have argued that we can do away with COEs once ERP is operational. This would be unwise, for two reasons. First, we are not yet sure how effective the ERP will be. If there is a sudden surge in the desire to own and use cars, we may not be able to raise ERP charges quickly

enough to keep the roads clear. Second, we will still need a balance between ownership and usage measures if we are to avoid over-relying on any single control measure.

VQS has worked well. Over the years, Singaporeans have come to accept the need for COEs. We should retain it.

Singaporeans will continue to want to own cars because the private vehicle is flexible, comfortable, and confers status on the owner. These aspirations will be left unsatisfied unless there is scope to release more COEs. See Figure 1. We therefore need

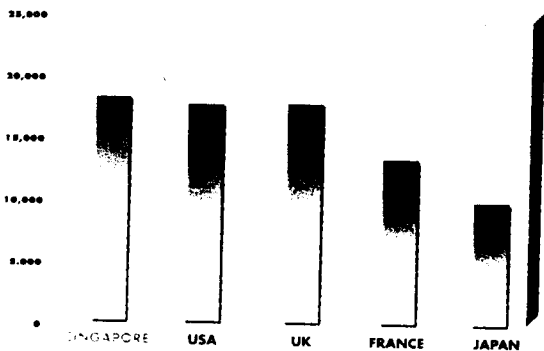
Figure 1



Source : Yearbook of Statistics; The Highway

Figure 2

Average annual mileage of cars



Source : World Road Statistics, 1991; LTA

to implement more usage-based measures. If these demand measures work effectively, we can release more COEs and allow more Singaporeans to own cars.

While we have tightened up on ownership controls through the COE system, we have not tightened controls on usage. As a result, the mileage clocked by a car here averages 18,600 km per year — very high by international standards. See Figure 2. The data is not entirely surprising. The Singaporean motorist is quite rational. Having invested heavily upfront on a car which is relatively cheap to use, he then “capitalises” on his investment and drives as much as he can. This trend is not sustainable.

Road pricing

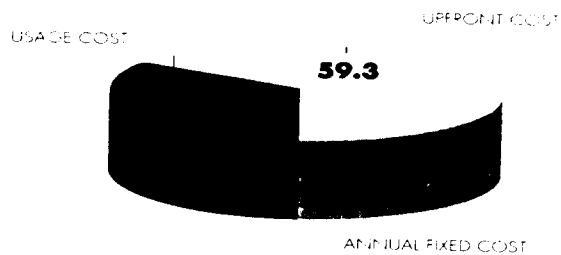
Measures which are not location or time specific are blunt instruments for controlling congestion. Road tax is one example — it is essentially a one-off cost paid annually by the motorists. Excise duty on petrol, which has remained unchanged for many years, is

another.

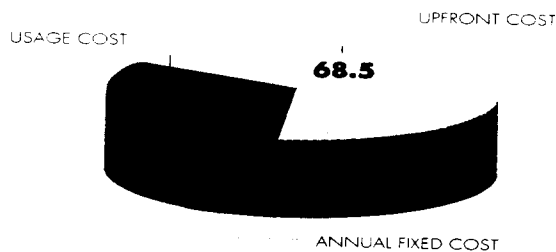
Road pricing allows motorists to be more aware of the cost of congestion they impose on other people every time they use their vehicles. Road pricing will encourage motorists to consciously plan their trips and consider public transport alternatives. With more extensive road pricing, we can keep the crucial arterial roads and expressways linking our economic centres relatively smooth flowing, while sustaining a higher car population.

Figure 3

COST OF MOTORING IN SINGAPORE (TYPICAL MEDIUM-SIZED CAR)



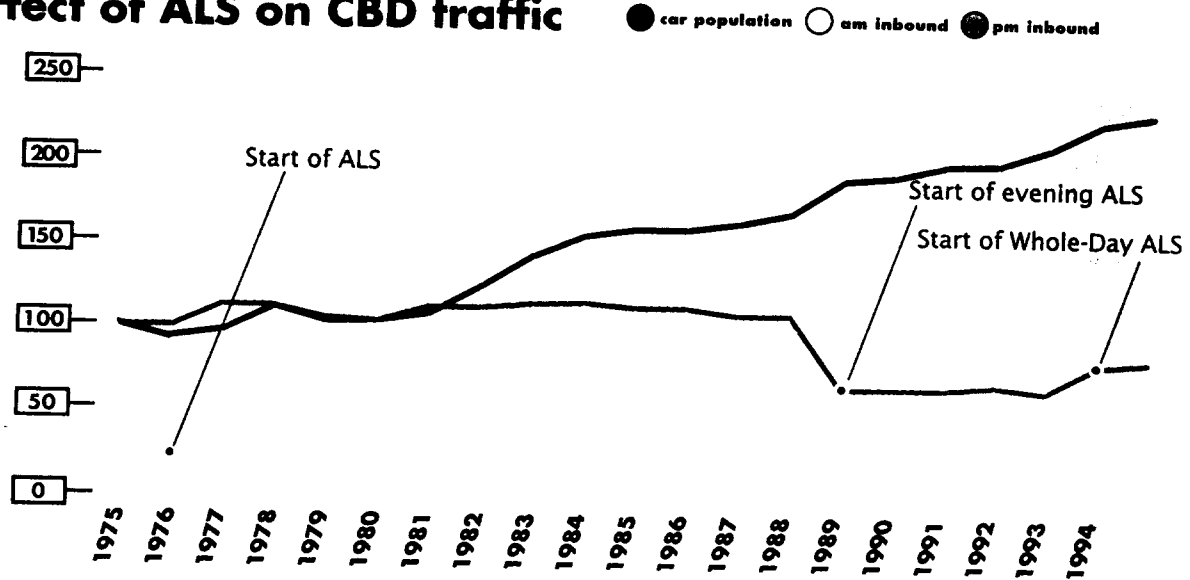
COST OF MOTORING IN SINGAPORE (TYPICAL LUXURY CAR)



Source : LTA, The Highway
 Upfront cost based on price of brand new car.
 Usage cost includes petrol, road usage charges, parking and maintenance.
 Annual fixed cost includes road tax and insurance.

Figure 4

Effect of ALS on CBD traffic



Source: LTA
Data are scaled to 100 for base year 1975

ALS and RPS

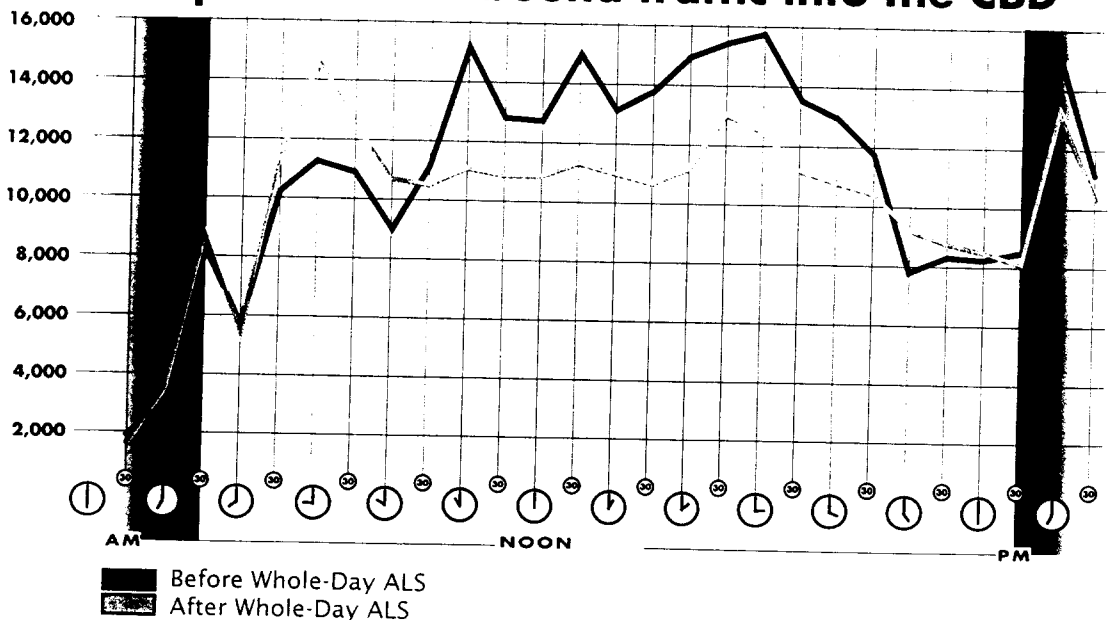
Road pricing is not new to Singaporeans. It has contributed significantly to keeping our roads free flowing.

We started with a cordon road pricing scheme when we introduced ALS in 1975. ALS has effectively controlled congestion in the CBD, even though vehicle population has more than doubled. In 1994, the

introduction of the Whole-Day ALS reduced traffic volume in the CBD by 9.3%. The current two-tier pricing system has evened-out traffic flow throughout the day, allowing for more efficient use of roads. See Figures 4 and 5. In June 95, we started a passage pricing scheme when the RPS was implemented along the East Coast Parkway (ECP). RPS has helped spread traffic to other times and alternative routes.

Figure 5

Comparison of inbound traffic into the CBD



Source: LTA

We will need to use road pricing more extensively and intensively. While the CBD has been kept clear, several expressways are already seriously congested. Along certain stretches of the CTE, the congestion is so bad that the volume of traffic flow during the peak period is in fact much lower than during the periods before and after the peak period. We will probably need to extend RPS to CTE and PIE within the next two years. We cannot wait for ERP to be ready, because by then the traffic would have deteriorated even further. An effective solution must include improving public transport and allowing it priority and unimpeded access on the road. Then motorists who now use the CTE or are awaiting the final completion of NEL will have a viable public transport alternative.

ERP

Manual pricing schemes like ALS and RPS have limited coverage and flexibility to respond to changing travel patterns. In contrast, the ERP project will allow us to charge for road usage in a more efficient and equitable way. With ERP, we can encourage a more optimal usage of the road network throughout the day.

We will start ERP by automating the existing manual road pricing schemes. We will then progressively extend its coverage to include choke points along expressways, and later, other congested arterial and ring roads. However, there is a limit to the number of these large gantries along our roads, without affecting their aesthetics.

LTA has selected the smart card as the mode through which motorists will pay their ERP


charges. ERP charges will be deducted from the motorist's smart card as and when he crosses a gantry, thus making it unnecessary to have a central billing system to track the movement of vehicles in order to bill the motorist at the end of the month.

ERP will apply to all vehicles alike, since they all use road space. However, we will cushion the impact of ERP on road users, by making offsetting adjustments to other charges, for example road taxes. This is similar to the approach we used when we introduced the Goods and Services Tax (GST). The GST system had no special exclusions or zero ratings, but the Government implemented a comprehensive scheme of offsets so that, overall, households paid no more tax after GST than before.

To be effective, ERP charges will have to be of a meaningful order of magnitude. If ERP could be implemented immediately, the charges, on balance, should be comparable to today's road pricing charges. Over time, ERP charges will have to rise, to reflect a larger proportion of the social costs of the congestion caused by road users. The more fully and accurately ERP charges reflect these social costs, the more COEs we will be able to release.



Prototype ERP gantry



As we introduce ERP, we will concurrently rationalise the current road tax structure. The present structure has accumulated over time, and lacks a consistent basis for charging. For example, the present road tax is based on engine capacity for cars and motorcycles, maximum laden weight for goods vehicles, seating capacity for some buses, and an arbitrary flat fee for some classes of goods vehicles and buses. We aim for a more consistent vehicle tax structure, based on road space occupied after giving proper regard to social and equity considerations.

Owners of scheduled buses are currently exempted from ALS and RPS. The LTA is therefore particularly mindful that the implementation of ERP should not impose a heavy burden on them. The rationalisation of the road tax structure will mean that these owners will pay significantly less road taxes than before. So while owners of scheduled buses will be subject to ERP charges like other vehicles owners, overall they will not have to pay more in taxes and ERP charges than they now do.

ERP will affect taxi operators more than private cars owners, because taxis travel many times the distance of private cars. However taxi operators can cushion this impact by changing the way they operate. The Government will also help by phasing in ERP charges for taxis over a number of years. This is discussed further in Chapter 6.

We will also give rebates on road taxes, to help motorists adjust to ERP. The rebates should be largest at the beginning, when the

motoring public are still adjusting, and will tail off over time.

With ERP, LTA will be able to strike a good balance between ownership and usage management measures.

Post-ERP

If we successfully moderate demand for road space, we will have scope to release more COEs.

ERP is a leading edge technology. It will be the first such system in the world, and will therefore have limitations. For example, we can only erect a limited number of ERP gantries at fixed points, so the amount we charge for using road space will not be very precise. But we cannot afford to wait indefinitely for the ideal system to evolve. The LTA has awarded the contract for the ERP system to the Philips/ Miyoshi consortium. The system should begin operation by late 1997. We will learn from the experience of using this first system. Although it will not be perfect, it will be a major improvement over the status quo. The heavy initial investment will be recovered within a few years.

Given rapid technological advances, we must expect to replace this first ERP system within a decade. We should start development work now for the second ERP system, which could possibly use satellite or GPS technology. Such a second-generation system will provide better service to the motoring public, and enable us to manage usage of roads still more sensitively and accurately ■



IMPROVING PUBLIC TRANSPORT

IMPROVING PUBLIC TRANSPORT

Singapore will need a public transport system that provides high quality service, in order to satisfy the transport needs of commuters and offer an attractive alternative to the motor car. LTA will therefore give high priority to improving public transport, and creating a wider range of public transport options. Improved public transport resulting in its wide usage is the cornerstone of our land transport policies.

Every day, 51% of all motorised trips are by public transport — 3 million by bus and another 700,000 by MRT. In the long run, we must increase the percentage of public transport trips, by making public transport more accessible, more convenient, more comfortable and faster. In Zurich city centre, 75% of trips are by public transport. Zurich's experience shows that a judicious combination of measures to moderate road usage coupled with an excellent public transport system can achieve this.

In a recent survey, 40% of motorists said that they would definitely not switch to public transport; another 23% were unsure. The main complaints against taking public buses were long waiting times (45%), unknown waiting times (43%), and long journeys (31%). As for MRT, the criticisms are overcrowding during peak hours (56%) and stations not easily accessible (32%). These areas need to be addressed.

Buses

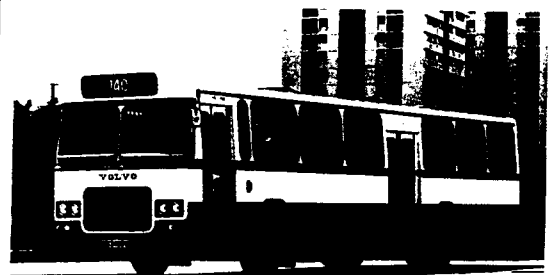
Buses will continue to be a major mode of public transport in Singapore. They are very efficient carriers of passengers. For illustration, a single-decker bus can carry 89

passengers while a double-decker can carry 131 passengers. Moreover, unlike buses which are normally fully packed at peak hours, the passenger load per private car averages 1.4. Buses are therefore roughly 39 times more efficient than cars in terms of road usage. We must therefore give buses priority over cars in road usage. Unlike trains, buses also have the flexibility

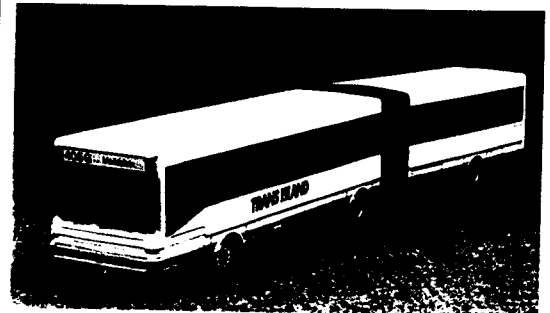
1960s



1980s

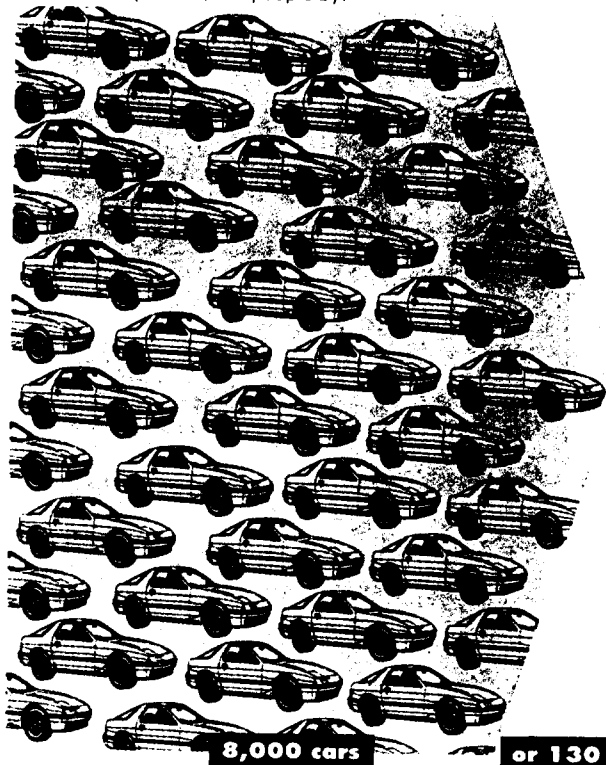


1990s



Bus services have improved significantly over the years

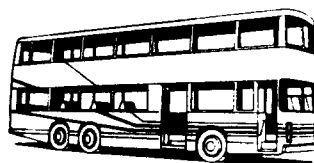
We can transport 11,200 people by:



8,000 cars



or 130 single-deck buses



or 85 double-deck buses

to change routes and time schedules to suit commuters' demands, and are relatively cheap to operate. In terms of flexibility and efficiency, buses are unmatched by any other modes of transport. However, the disadvantage of buses is that service quality deteriorates rapidly once there is congestion, or when demand exceeds a certain threshold.

The bus has always been the basic form of public transport providing basic services at very affordable fares. Over the last 10 years, bus fares in real terms increased by 1.5%, lower than the average (CPI) increase of 2.3% and real wage increase of 7-9% per annum. Improvements in service standards have been significant. But bus operators can do more to meet increasing expectations of

their customers. Our bus companies must constantly strive for greater efficiency, respond to the needs of their customers, and attract more customers wherever possible.

They must recognise that a good bus service is made up of several components, including a short and sheltered walk to the bus stop, a comfortable wait, and a fast and safe ride.

To keep pace with rising commuter expectations, LTA and the bus operators will implement the following key improvements over the next 2 years:

■ **Faster bus rides.**

LTA will give buses priority on the roads, so that bus rides are as smooth as possible. The key improvements are as follows:

- Priority to buses at more traffic light junctions. More traffic lights will be fitted with "B"-signals, which will come on before the green light for other vehicles. This will give buses a headstart and allow bus drivers to filter across lanes;
- Intelligent traffic lights to detect approaching buses and turn green automatically; and



Examples of bus priority scheme - bus lane and "B" - signal light



Premium bus service

- Another 33 km more bus lanes, 15 km of which had just been introduced along Changi Road, Geylang Road and Bukit Timah Road. We aim to provide a bus lane if the peak hourly throughput is at least 50 buses;

■ **More choices.**

Over the next two years, commuters can expect the following additional services:

- More BusPlus services;
- New air-conditioned express services; and
- New short haul supplementary services to cater to peak loads between certain points.

In Nov 94, PTC prescribed basic standards for all bus operators. As a result, 7 trunk

services, 16 feeder services have seen service improvements. We will take this exercise one step further. We will improve the frequency of 30 feeder services (47% of total residential feeders) by end 95 beyond the basic PTC standards.

LTA, together with PTC and the bus operators, will study possible new intra-town services in the bigger housing estates, to provide a north-south and an east-west link across neighbourhoods within the same estate. While the fares for these long intra-town services need not match trunk fares, neither should they be identical to current feeder fares. If there is demand, we will replicate the services for other towns.

With ERP, car owners will pay a larger share of the costs of congestion, and public transport will become more attractive relative to private transport. This will make more public transport services viable, including bus services. Bus companies can then introduce more direct and express services which are currently not viable.

Meanwhile, the LTA will encourage operators to run express services to areas where there is serious congestion, and where we need to shift commuters from cars to buses in order to keep expressways free flowing. One such area could be the north-east sector, pending the completion of NEL.

At the same time, we should move towards a fairer fare structure. Current feeder fares are not distance-related and

are priced below break-even level. This discourages operators from providing longer feeder routes or integrating feeder routes. The result is commuters having to change feeders more than really necessary.



Providing real-time bus arrival information

We should progressively move towards a distance-related fare structure and align feeder fares with the minimum trunk fare. This will take several fare revisions. The result will be a fairer and more efficient structure.

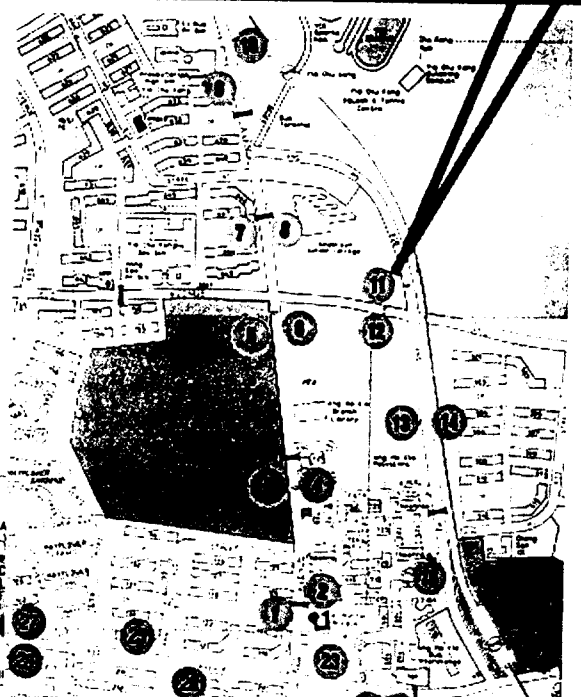
■ **Better Use of Time.**

LTA will consciously reduce the burden and anxiety of waiting for buses. LTA has embarked on a pilot project to display bus arrival times at 2 selected bus stops along Orchard Boulevard.

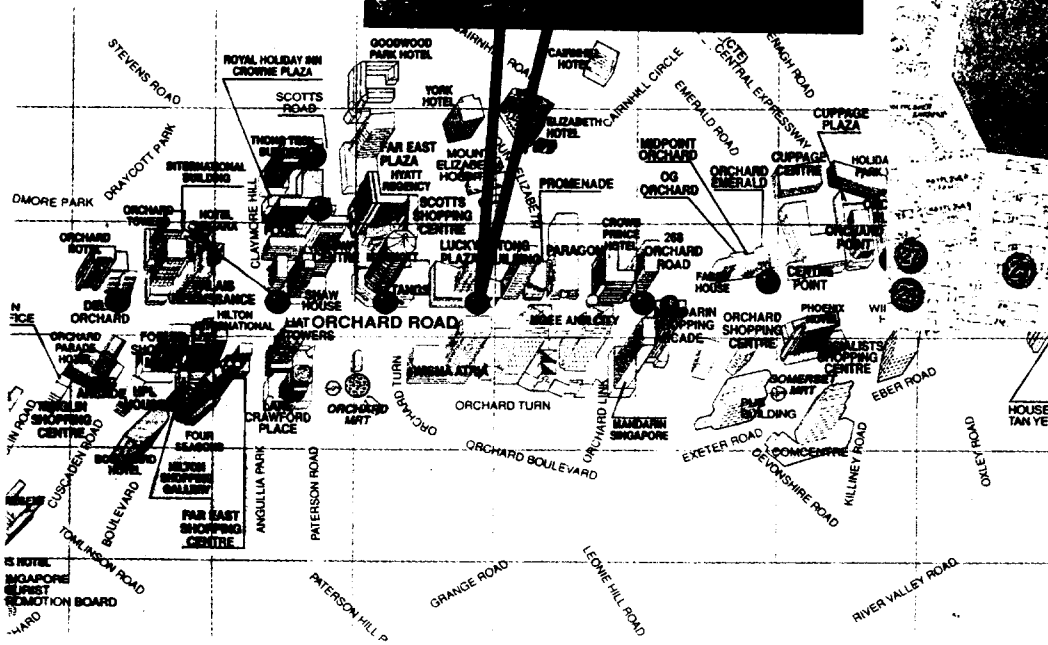
Over the next 2 years, LTA will work with the relevant organisations to expand these projects. At a later stage, bus arrival information can be made available through say, Teleview, Internet or telephone hotlines to allow commuters to plan their trips from home.



Pilot bus stop scheme for city area



Pilot bus stop scheme for Ang Mo Kio



Commuters can then make better use of their time at bus stops, MRT stations or at home;

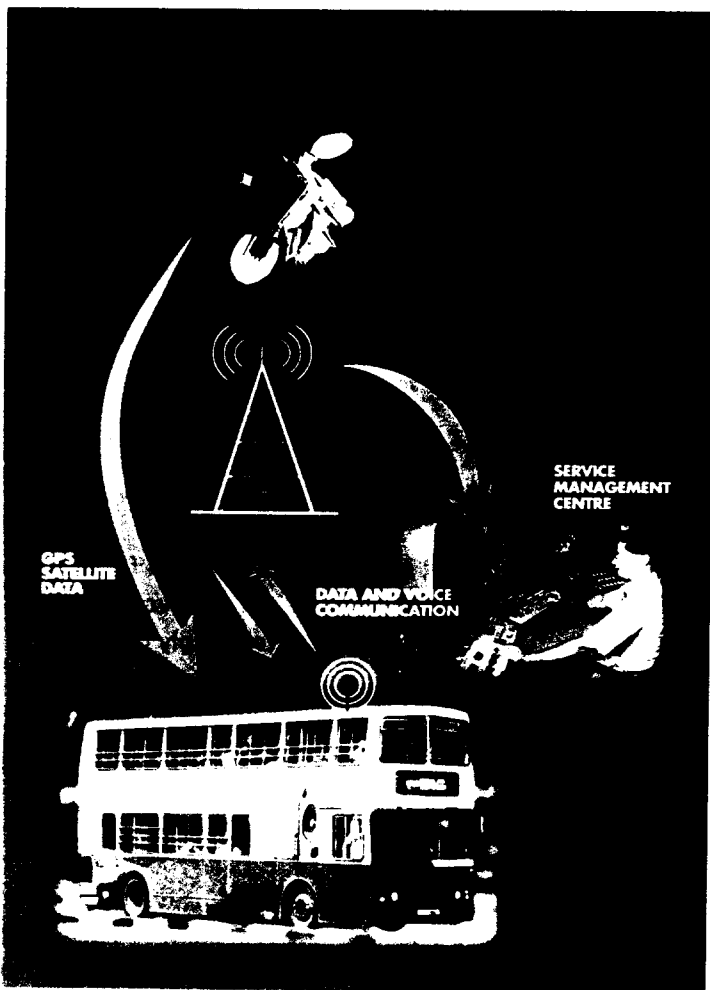
■ **Better service.**

The initiatives are as follows:

- LTA has started a pilot project to refurbish over 100 bus stops in the city centre and in Ang Mo Kio new town. The bus stops will have amenities like telephones, water-coolers, ceiling fans, and magazine-dispensing machines.

Lighted advertisement panels will make bus stops brighter at night and help make waiting at bus stops after dark even safer;

- LTA will also provide covered linkways and overhead pedestrian bridges between MRT stations and bus stops to the nearest building; and
- LTA will encourage operators to provide comprehensive information to commuters in a user-friendly format, including route details, timetables and fare structure.



GPS will improve bus services

We will also encourage higher operational efficiency. With the GPS technology, bus operators will soon be able to use satellites to pin-point the locations of their buses. This will provide them with a very powerful fleet management tool, as they will know, in real time, the exact locations of all their buses, and whether they are running according to schedule.

If a bus is found to be late usually because of heavy congestion, bus operators can take remedial action — they can send spare buses, or request for priority at traffic light junctions. This way, bus operators will have a much better appreciation of demand patterns. They can plan their bus schedules more efficiently to minimise waiting time for commuters and maximise the productivity of their buses.



Bus industry structure

Having the state intimately involved in every aspect of public transport is not satisfactory, as can be seen through the experience of many countries. Invariably, it ends up subsidising or operating loss-making services. At the other extreme, free-for-all bus competition in Britain has resulted in more services but for only the popular routes. Competition, which is along the busiest routes, has led to streets congested with buses and dangerous driving practices, as operators compete for fares. They are also reluctant to renew their buses as this will eat into profits. The net result of free-for-all competition is overall loss of patronage, lack of integration of networks, increasing congestion and a few financially successful operators. We cannot let market forces alone determine our public transport system.

LTA's philosophy is therefore not to opt for a totally regulated regime, nor a completely laissez-faire approach. It is to let private operators run public transport services in as competitive an environment as possible. Given our constraints of a small domestic market, and the obligations to provide universal service, we have chosen to modify the competitive regime to suit our circumstances.

The present bus industry structure is a sound one. It has allowed commuters to enjoy the fruits of competition between the two major bus operators — Singapore Bus Services Pte Ltd (SBS) and TransIsland Bus Services Pte Ltd (TIBS) — and the benefits of the restructuring undertaken by bus

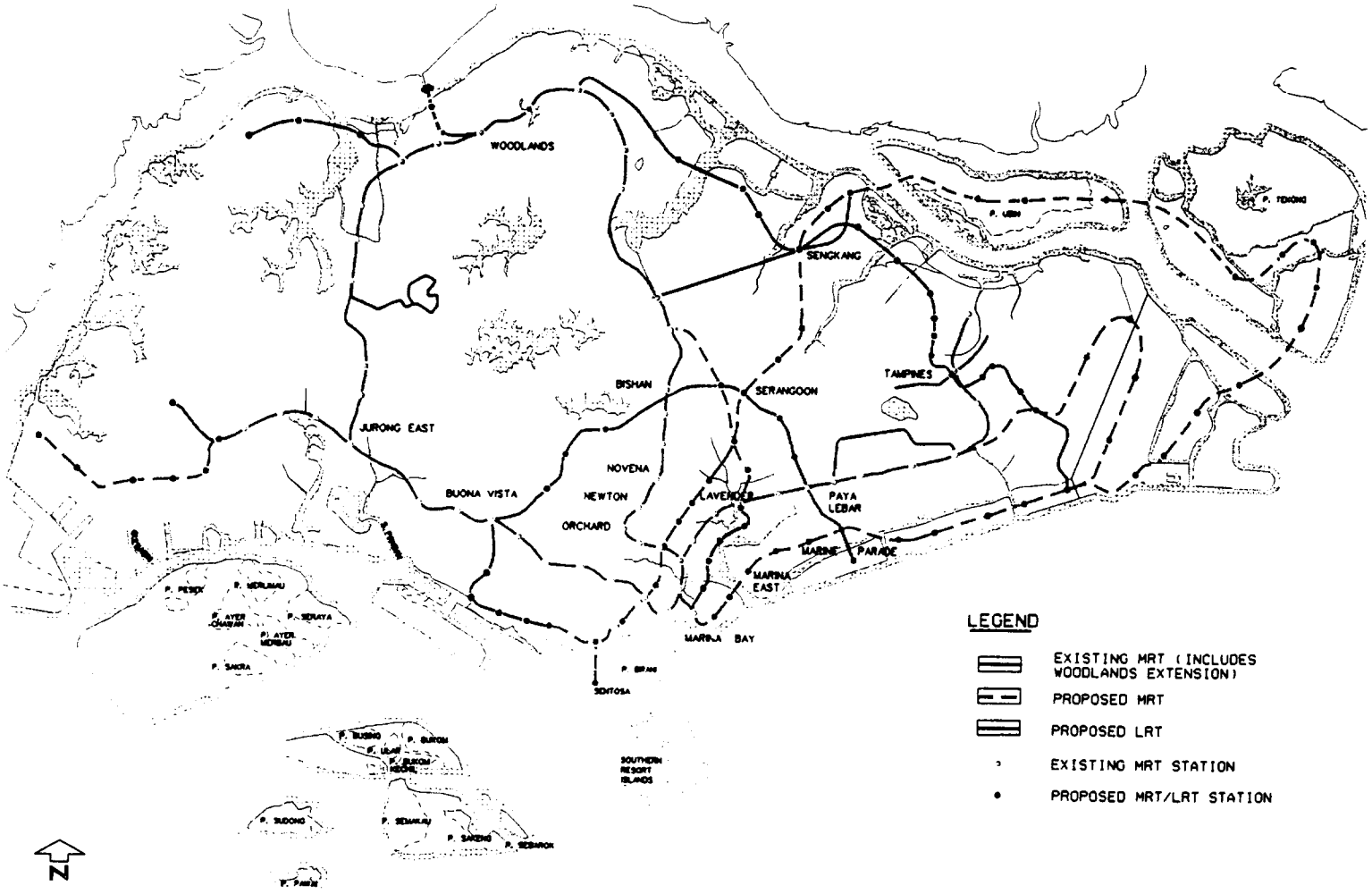
companies over the last 2 decades. Fares today are low and service levels much higher. The two major bus operators, SBS and TIBS, compete in terms of efficiency, cost-effectiveness and service levels.

In return for competition mainly on a territorial basis, the bus companies are obliged to ply all routes, even unprofitable ones, at prescribed frequencies and regulated fares. Because of our small domestic market, the bus companies must be appropriately sized to enable them to have sufficient resources and scope to invest in service improvements. Consumers' interest are safeguarded in the duopolistic market by the PTC, which regulates bus routes, service standards and public transport fares while balancing commuters' interests with the need for the operators to remain financially viable. This industry structure has benefited the bus companies in terms of profitability, and commuters in terms of service levels and affordability.

MRT/LRT

While an efficient and comprehensive bus network is adequate to serve the lighter corridors, buses cannot be the solution for a compact city like Singapore. This is because their service levels deteriorate sharply once demand exceeds a certain threshold. For compact cities, the only acceptable solution is a good rail network. Only rail can offer services with high frequency, reliability, speed and comfort.

We will plan for MRT to serve the heavy corridors of traffic. But investments for MRT are costly, and only justifiable where the



MRT / LRT network for Year X

traffic is extremely heavy. For lighter corridors, LRTs, which require less capital investment, are a more practical alternative. LRTs will serve as feeders to the MRT network, and ply commercial corridors where there is sufficient ridership or where there is a need to relieve local congestion.

The LRT's comparative advantage over buses is the capacity for higher frequencies, greater reliability and the sense of permanence although it is more costly. We are studying how we can introduce LRTs in HDB estates. The LRT feasibility studies on Bukit Panjang and Buona Vista are currently under evaluation. We are also studying how we can configure an LRT to serve Orchard/Bras Basah Road and Marina South.

Singapore now has 67 km of MRT. Preliminary studies indicate that we could have a comprehensive rail network comprising at least 160 km of MRT and LRT over the long term. The possibilities include the following:

- The Woodlands line — 16 km by February 1996;
- The North-East line (NEL) — 20 km;
- The Kallang line — 16 km;
- The Northshore Line — 20 km; and
- LRTs for commercial areas with high ridership and HDB estates.

Another possibility is to link up with Malaysia's rail network. Malaysia plans to develop its rail network as an essential part of its domestic transport system. The Malaysian Government has informed Singapore of its proposal to build a high-speed passenger electric train service

between Kuala Lumpur and Singapore. The line will eventually reach the Thai border, where it can link up with the Thai rail network. Eventually, the Malaysian electric train may form part of a regional rail network that connects up Asian cities, the same way that European cities are connected together by efficient and convenient rail services.

Both Governments will discuss those aspects of the Malaysian proposal which concern Singapore. When the proposal is implemented, the Malaysian high-speed electric train can link up directly with our MRT system. This will give travellers from



MRT offers greater comfort and reliability

both countries an economic and fast alternative to travel by road and air, and increase economic growth in both countries.

If we start today, the first LRT could be ready in 3 to 4 years while an MRT extension like NEL could take 7 to 8 years to come.

Another type of transit system is the guided busway system which allows specially fitted buses to traverse at high speeds along dedicated rights of way, usually along viaducts. Such systems are less costly than LRTs but have had very limited applications elsewhere for a variety of reasons.

To expand our rail network will not be easy because these systems are very costly to build and operate. Under our current financial arrangement, few projects will take off. Therefore, to enable the LTA to expand the rail network, we will need to review our financing regime for rail. This will be dealt with in Chapter 8.

Many countries rely on the private sector for financing of public transport projects. While there is no financial need for us to do so, we may find advantages in letting the private sector build and operate some parts of the rail network, e.g. through Build-Operate-Transfer (BOT), Build-Operate-Own (BOO) or Build-Transfer-Operate (BTO) schemes. We can then try out new ideas and fresh approaches which may prove more cost effective. Such BOT, BOO or BTO projects should enjoy similar financing terms as Singapore MRT Pte Ltd (SMRT) or the bus companies, in order for the comparison to be fair. For example the Government can bear the capital cost, while the service is

required to break even on operating cost. Such projects must naturally also provide seamless travel through integrated fares and commuter facilities.

Taxis

Taxis constitute the high end of the spectrum of public transport modes. They play a key role in bridging the gap between private transport, and bus and rail transport. Every day, taxis provide about 500,000 vehicular trips. Provided taxis are subject to the right level of transportation taxes and levies, we can let market forces determine both the supply and the availability of taxis.

Taxis occupy the same road space as a car, but generate more congestion than cars, because of empty cruising. The average taxi cruises empty for about 35% to 40% of the time. Furthermore, our taxi service suffers from the imbalance of supply and demand. During the morning and evening peak hours, demand outstrips supply and it is hard to hail a taxi immediately. During off-peak hours, taxis cruise about mostly empty, looking for passengers. This imbalance is even more exaggerated during festive seasons. It results from the rigid, uniform fare structure which does not make enough allowance for these variations in supply and demand.

Our taxi fares are very cheap by international standards. A major reason taxi fares are low is that taxi operators pay low taxes, especially compared to owners of private cars, even though both types of vehicles occupy the same amount of road space. To illustrate, a 1,600 cc car registered as a taxi

enjoys a substantial tax discount upfront – i.e. \$41,000 instead of \$84,000¹. The concession comes from lower ownership taxes (e.g. ARF of \$2,000 versus 150% OMV for private car, much lower import duty,

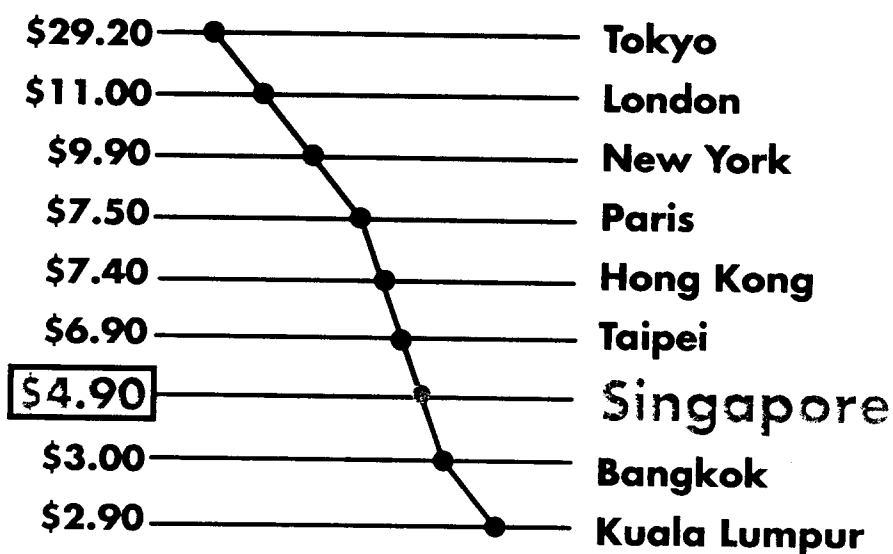
disparity between petrol and diesel taxes, the DT would have to be much more than the present rate of \$6,600 per year. Furthermore, the DT is a one-off annual charge, and is not proportional to distance travelled, unlike petrol excise duty. The tax for each additional km travelled on a taxi is only 14% of that for a petrol powered private

car. As a result, the incremental cost to the taxi of driving an additional km is therefore very low.

The Government recognises that taxis are a form of public transport, unlike private cars. It therefore will not treat taxis completely like cars, in terms of tax. But if the gap in the tax per km is too wide, it will

Figure 6

Comparison of taxi fares (1995)



Source: LTA
Distance used to calculate fares is the average trip length of 6.9 km.

lower registration fee), lower road tax, and allowing taxi operators to pay the Prevailing Quota Premium (PQP) for Category 2 COEs instead of bidding for Category 3 COEs.

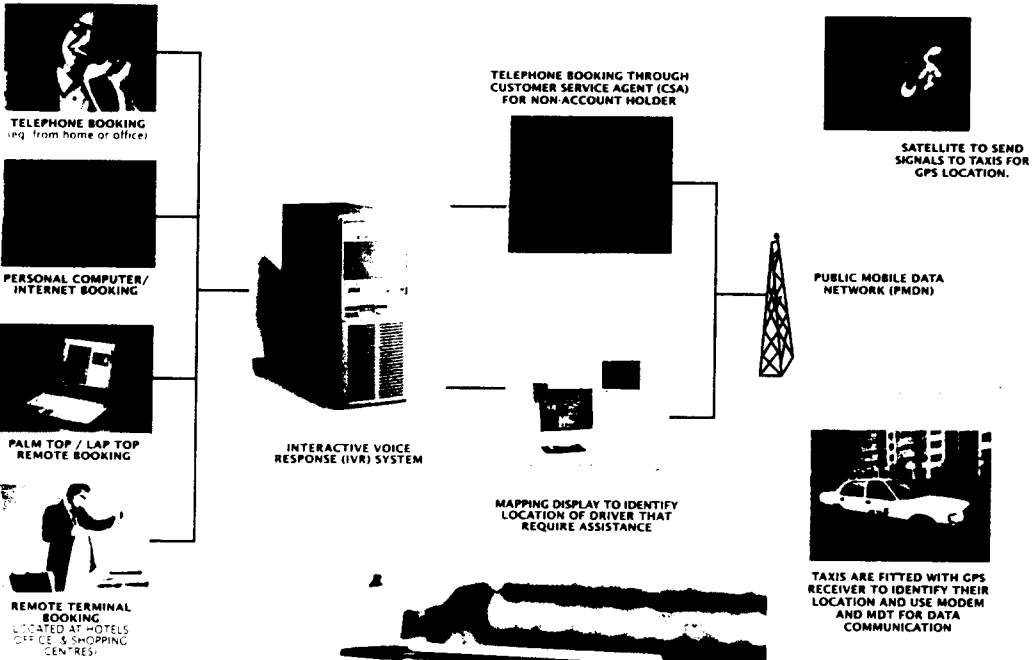
The Diesel Tax (DT)² is intended to compensate for the fact that taxis use diesel, which is only lightly taxed, whereas private cars use petrol which is subject to heavy excise duty. But to compensate fully for the

create excessive demand for taxi services. The ERP will shift the balance away from ownership taxes into usage charges, and narrow this cost difference between taxis and cars.

The Government will phase in ERP charges for taxis gradually, over several years. This will give taxi companies, drivers and commuters ample time to adjust to the new

¹ Using OMV of \$25,000 and PQP (3rd quarter 1995) of \$40,000.

² DT was set based on the difference in fuel cost for a vehicle with annual mileage of 120,000km using petrol and diesel.



GPS will better match demand and supply of taxis

An example of a future taxi stand



operating environment. At the same time, taxi operators themselves can substantially reduce the ERP charges they have to pay by changing their mode of operation, and spending less time cruising empty in search of passengers. For example they can wait at taxi stands to be called, like taxis in some other countries. They do not do so now, because under the present fare and cost structure, it makes more financial sense for taxis to cruise than to wait. Taxi drivers who try to wait for passengers find themselves losing out. But the ERP will change the balance between waiting and cruising. Taxis will then use road space more economically, and free up space for other road users, especially buses.

Taxi fleet operators already realise this, and are anticipating the changes that will be necessary, in order to be well prepared for the transition. They know that they cannot blithely expand their fleet now, to meet present demand under the current fare structure, but must consider the impact of any fleet expansion on the taxi business when ERP comes on stream. They are upgrading their radio-phone despatch systems, to use satellite navigation and automatic vehicle location techniques. This will minimise empty cruising time, and help the operators to despatch taxis more accurately, and to match supply and demand better. It may also enable taxi companies to offer new services — e.g. multiple passengers can easily be matched to share a cab if they so desire.

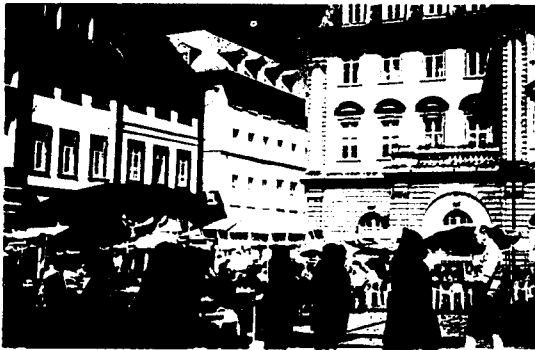
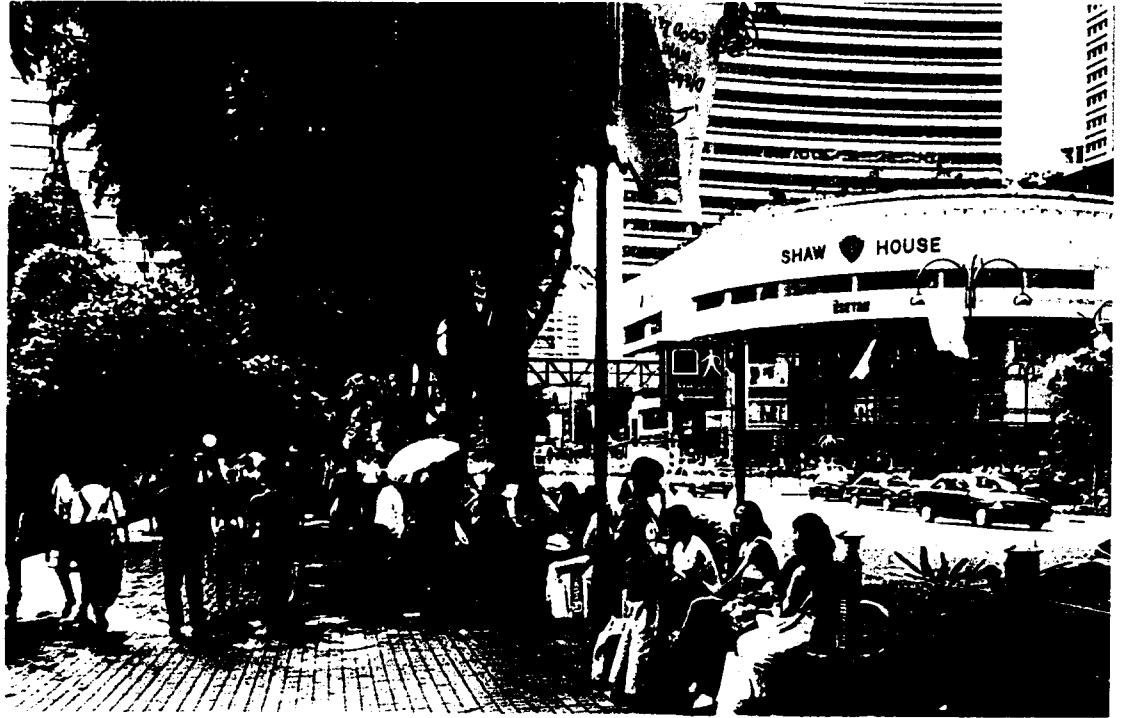
In the interim, LTA will be studying how best to adopt the following measures to further improve our taxi service:

- A performance evaluation scheme on the performance and service rendered by fleet operators;
- Publication of performance indicators together with incentives for the best performing fleet operator. This is to motivate taxi fleet operators to provide better taxi services to commuters, encourage better management of their fleet and hirers, and to improve their productivity and efficiency;
- Differential pricing to address the problem of supply-demand imbalance during peak periods; and
- More flexibility for taxi operators to offer a variety of differentiated services to give commuters more choice according to their needs and pockets ■



SUPPORTING MEASURES

SUPPORTING MEASURES



We should not discount the possible contributions of other transport-related measures, however trivial they individually appear to be. Some of the measures listed below have been adopted to varying degrees of success in some other countries:

- Promoting walking through better pedestrianisation and town planning. Good pedestrianised areas add to the vitality of the town centre. Bad ones are shunned by most people, especially at night;

Examples of good pedestrianisation in different countries

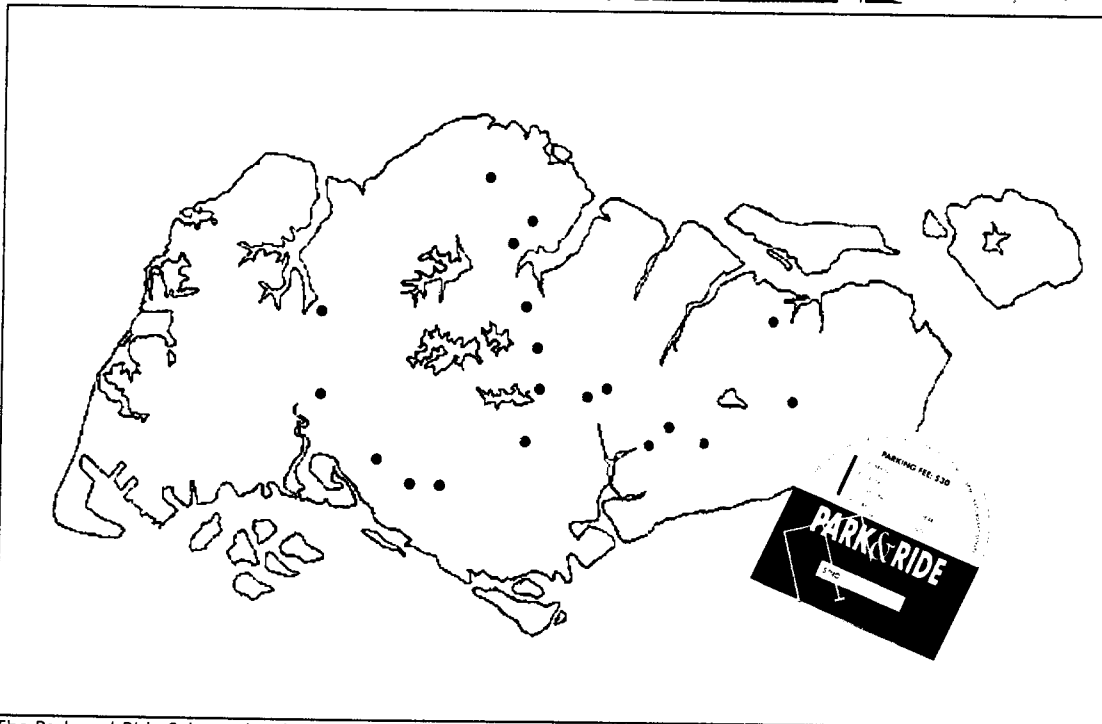
Cycle facility at MRT station



- Building cycle facilities at MRT and bus interchanges away from the city;
- Starting more park-and-ride locations. The Scheme has recently been extended to more MRT stations and bus interchanges; and
- Using parking policies to moderate the attractiveness of the car.



Multi-storey parking system in Japan

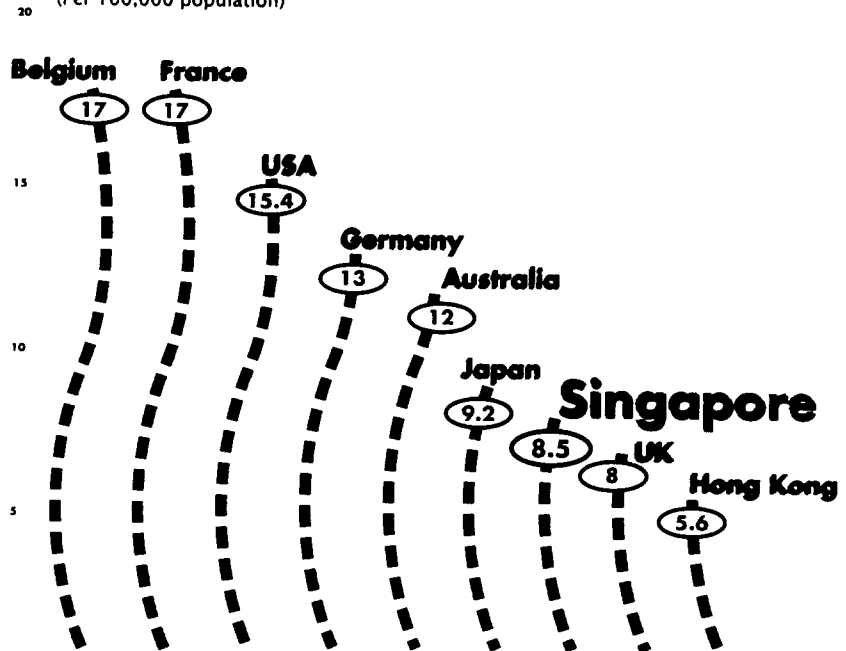


The Park-and-Ride Scheme has been extended to 19 MRT stations and bus interchanges

Figure 7

Road accident fatality in 1992

(Per 100,000 population)



Source: Traffic Police

ROAD SAFETY AND AIR QUALITY

Our land transport policies must also support a quality living environment and a higher quality of life in general. Besides congestion costs, pollution and road accidents are also costs which are not apparent to motorists but adversely affect our quality of life.

The co-ordinated efforts between various ministries and departments have successfully made our roads one of the safest in the world. See Figure 7. Through our concerted efforts, we have managed to reduce our traffic accident fatality rate from about 11 to 13 per 100,000 population in the mid 80s to about 8.7 in 1994.

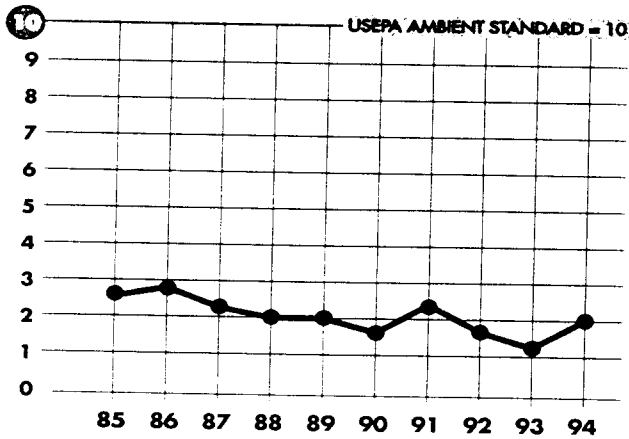
We have also maintained good air quality, despite a growing vehicle population and intensive industrialisation over the years. Measures like the introduction of unleaded

petrol in 1991 and tightening of vehicle emission standards have been very effective in keeping roadside pollution in check. For example, our levels of roadside lead and carbon monoxide are well within the ambient air quality standards prescribed by the United States Environmental Protection Agency. See Figure 8.

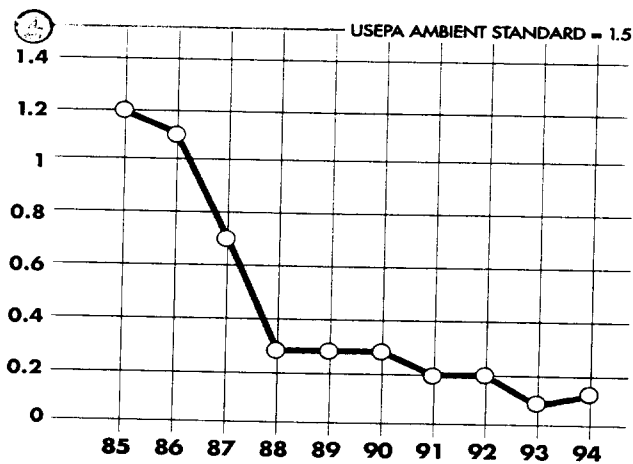
LTA will continue to work with the Ministry of the Environment and the Traffic Police to keep our air clean and our roads safe. This will be done through regular review of vehicle standards, public education and enforcement programmes. In addition, we will pay more attention to noise alleviating measures.

Figure 8

ROADSIDE CARBON MONOXIDE LEVELS



ROADSIDE LEAD LEVELS



Source : Ministry of the Environment





FINANCING FRAMEWORK



FINANCING FRAMEWORK

The widely held belief is that the key question on financing is who pays. This view is often expressed in debates on the provision of services, including transport services. It is unfortunately mistaken because whatever the arrangements, the burden is ultimately borne by the people themselves. The real issue is not who pays, but what system can best encourage fiscal prudence, individual financial discipline and efficient operations.

Our financing policy for transport must continue to be based on the concept of partnership. The Government provides the transport infrastructure, commuters pay for the operating cost, while operators extract efficiency dividends within the service standards and fare structure approved by PTC. This basis is sound as commuters who demand higher levels of service must be prepared to pay more.

Principles of financing

In setting up our financing system, we must stick to three sound and tested principles. These are:

- Fares have to be realistic and regularly revised to account for justifiable cost increases;

- The services must at least recover operating cost; and
- Provision for depreciation and asset replacement must be adequate.

First, fares have to be realistic and revised periodically to take into account cost increases. These will be necessary, despite our best efforts to extract operational efficiencies. Over the decade from 1981 to 1990, there was only one across-the-board bus fare increase. This has led the public into thinking that any fare increase is unnecessary and must be for the sole benefit of the operators. This misplaced perception needs to be corrected.

In the earlier days, we could keep bus fare revisions few and far between because we could derive major productivity gains by reorganising the public transport system. These changes included the change to one-man-operated buses, double-decker buses, the rationalisation and integration of bus and MRT routes. However, future productivity improvements will be more difficult because:

- The industry is essentially a service industry. Staff cost, now 50% of operating cost will rise. So will energy cost from time to time. In fact, wage increases for drivers are likely to be higher than the national average, because of increasing recruitment difficulty; and
- The public will increasingly demand better service standards, not only shorter waiting time, but also more duplication of routes and more direct services. This will increase operating cost without correspondingly increasing ridership.

As incomes rise, the public will want continued improvements in the public transport system. If the bus and train companies cannot recover the additional costs of providing the better service, they will not find it viable to provide it.

Furthermore, the public's willingness to pay for the service is an important indication that they value the service, and that they believe that it provides more comfortable modes of travel, raises their quality of life, or increases property values. It also shows that it is worthwhile for the public transport companies to provide the service.


At the same time, public transport must always be affordable to all Singaporeans. To protect commuters, it cannot be operated on a cost-plus basis, otherwise inefficiencies will just be translated into higher fares.

Fare increases must be properly justified to the PTC. The PTC will continue to look after the public interest by following these principles:

- Fare adjustments should be justified and in small steps, rather than large and irregular steps;
- The increases need not be effected across the board, but should be implemented in sectors where there are service improvements and other changes; and
- The fare revision will result in what PTC considers to be an acceptable rate of return to the public transport operators.

These principles are consistent with the recommendations of the Cost Review Committee.

Second, public transport projects must at least recover operating cost. The Government will fund the capital cost of the projects, but the project must at least break even on its operating expenditures. The LTA will implement projects so long as they meet this hurdle rate. This is the market test for deciding whether to proceed with them. This criterion is especially relevant to projects involving very high capital expenditures, such as MRT, LRT, or SURS. For major projects, we will apply it on a project by project basis, in order to keep cross-subsidies on operations to a minimum.



In other words, each major project should recover its own operating costs from fares and other revenues. This approach will help us to expand and develop a comprehensive public transport network. We will apply this criterion to future LTA projects, as we have done for all MRT extensions, including the North-East Line (NEL).

The alternative is to try to fund future expansions of the MRT out of revenues from the existing network. The result will either be rapidly rising fares for riders using the existing network, which is unfair and unjustified, or increasing losses by the MRT operator. Every expansion will add to the financial burden of the company, instead of strengthening it. Operations will become run down and service standards will slip. Ultimately the company will cease to be viable, leaving us with the equally unpalatable options of either shutting down services or sanctioning a bail-out by the state.

Third, we need a sustainable policy on asset replacement. Each generation should pay for the services and assets it consumes. We should not fund projects through excessive borrowing, and let future generations pay for the present generation. But neither should we require the present generation to provide totally for future generations.

Currently, public transport services are funded by both the Government and commuters. For existing MRT projects, Government pays for building infrastructure

like MRT tunnels, viaducts and MRT stations. The Government also pays for the first set of operating assets, which include trains and signalling systems. Commuter fares must cover the operating cost of these transport systems, including accumulating enough reserves to replace the operating assets with a second set in due course.

This policy of requiring fare collection to cover current operating costs, plus the second set of operating assets, is prudent but conservative. It permits only self-sustainable systems to be built. Once the Government has paid for the initial capital cost of the project, the project will be able to continue indefinitely without further financial help from the Government.

However, because the cost of operating assets are high, even when amortised over many years, the current arrangement places heavy financial pressure on the rail operator.

This in turn exerts upward pressure on fares. For example, the first set of operating assets for the existing North-South, East-West MRT lines cost \$1.6 billion. By 2017, when a second set of operating assets will be needed, it may cost \$6.9 billion, assuming asset inflation is 5%. If the MRT operator is to be solely responsible for the full replacement cost, this would translate into an immediate fare increase of 30 cents across the board.

This definition of operating cost, to include full asset replacement, in effect places the

burden of paying for the future operating assets on the present generation of riders.

It may be fairer to define operating costs to cover not full asset replacement, but only depreciation of existing assets. This is considerably less.

When the second set of operating assets needs to be purchased, it will be paid for through a combination of fare revenue and co-financing from the Government. The fare revenue will cover the historical cost of the first set of operating assets, while the Government will pay for the balance. In effect, each generation will then pay for their own operating assets. The total Government grant will be higher than now, covering not only the initial capital costs, but also any subsequent increases in capital costs when the assets eventually need to be replaced.

The Government will change the financing terms for public transport operations to this revised definition of operating cost. Using the existing North-South/East-West lines as illustration, the operator's share of the replacement cost will be \$1.6 billion. The rest will be borne by the Government. The exact amount that the Government has to pay will depend on the actual rate of asset inflation. It could be \$5.3 billion assuming


historical asset inflation of 5% continues, or \$1.3 billion if inflation is only 2%.

This revision to the basis of charging and breaking even will moderate fare increases. It will also render viable some rail projects which under the existing terms are just short of being viable, and allow us to bring them forward by a few years. LTA will review the outstanding rail projects, especially the North East Line, in the light of this revision, and implement those which are now viable.

Responsibilities of the key players

In public transport, there is a triangular relationship between fares, service standards and the viability of the operators. We need clear linkages between these three parameters so that there is widespread understanding that even with Government providing costly infrastructure, fare increases are necessary from time to time to cover increasing cost and service improvements.

However, we will not run our transport system on a cost plus basis. The PTC will continue to protect the public's interests through the regulatory framework. The Council will scrutinise the operators and set them strict standards to follow. It will balance commuters' interests with service standards and system viability. As explained earlier, we will not leave it entirely to market forces to determine the market structure and fares. However, we will tap competition and market forces wherever possible to impel



operators to run efficiently, improve services and provide value for money. This way we can balance the responsibilities and interests of the main stakeholders — commuters, operators, and the Government.

The financing framework will free operators from worrying about the escalating cost of trains, and allow them to concentrate on providing good service. To effectively fulfil their fiduciary responsibility to their shareholders while improving service levels, they must be continually motivated to improve their operational efficiency.

The Government is committed to investing in an expanded rail network to provide a significantly better public transport system which charges affordable fares, meets the needs of Singapore and is sustainable in the long run. The North-South/East-West line and the Woodlands line already costs \$6.3 billion. The North-East Line will cost \$5 billion. LRT projects still under evaluation could cost up to \$1 bn ■



CONCLUSION



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If we can achieve all that is set out in this White Paper, Singapore will have a transport system that will be as widely acknowledged as its port and airport as among the best in the world.

But LTA cannot do this alone. We will have to work with many other agencies which share the objective of improving the infrastructure and quality of life in Singapore. More importantly, we will need the co-operation, understanding and support of the people.

Singaporeans must understand the challenges ahead, and be prepared for the changes to come. We must start solving tomorrow's transport problems today. Otherwise the problem will only grow and we would have condemned future generations to even greater difficulties. We must act quickly lest we end up besieged by the many painful dilemmas that face so many congested cities. We therefore seek both understanding and co-operation from Singaporeans as we embark on this exciting enterprise. Your feedback and suggestions will be most welcome.

Many of the improvements we have outlined will take several years to complete, and for the effort to bear fruit. This is the nature of the problem. Indeed the exercise is not one in which the problem can be tackled once and for all. It will have to be managed all the time, and the improvements made continually. But if we stay true to the philosophy and approach of this White Paper, we should be able to have the world class transport system that Singaporeans deserve ■