

A SMART WAY TO TRAVEL

&

A SMART WAY FOR TRANSPORT SAFETY AND  
EFFICIENCY

(THE FINAL REPORT OF THE INTELLIGENT TRANSPORT SYSTEMS  
(ITS) STRATEGY REVIEW)

TRANSPORT DEPARTMENT

GOVERNMENT OF THE HONG KONG  
SPECIAL ADMINISTRATIVE REGION

NOVEMBER 2001

# TABLE OF CONTENT

## **1 Introduction**

- 1.1 Definition
- 1.2 Background
- 1.3 Purpose of the Review

## **2 Intelligent Transport Systems Strategy Review**

- 2.1 Review Process

## **3 An ITS Framework**

- 3.1 Need for a Framework
- 3.2 Applications Areas, Applications and Systems
- 3.3 Public-Private Partnership

## **4 ITS Strategy 2001-2010**

### **4.1 ITS Strategy Objectives**

### **4.2 A Smart Way to Travel**

- ◆ Transport Information System

### **4.3 A Smart Way for Transport Safety and Efficiency**

- ◆ Area Traffic Control Systems
- ◆ Traffic Control and Surveillance Facilities
- ◆ Traffic Management and Information Centre
- ◆ Journey Time Indication System

## **5 Programme**

## **6 Costs**

## **7 Partners and Stakeholders**

## **8 Way forward**

### **Acknowledgement**

### **Appendix A - Overseas Intelligent Transport Systems Deployment**

### **Appendix B - Local Advisory Panel**

### **Appendix C - Expert Review Panel**

### **Appendix D - Groupings of Application Areas, Applications and Systems**

# 1 INTRODUCTION

This report summarizes the findings and recommendations of the Intelligent Transport Systems (ITS) Strategy Review. The Review which was conducted by Transport Department (TD) commenced in May 2000. The objectives of the Review is to formulate an ITS Strategy and Deployment Plan for Hong Kong.

## 1.1 Definition

1.1.1 ITS refers to the deployment of advanced information and telecommunication technologies to enhance the safety, efficiency, reliability and user and environmental friendliness of the transport system.

## 1.2 Background

1.2.1 ITS is widely used in Europe, U.S.A., Japan and Singapore. Experience in these countries indicates that with the use of ITS, travel time could be reduced by 20% to 40%, road capacity could be increased by about 17% to 25%, accident rate could be reduced by about 15% to 50%, and fuel consumption could be decreased by about 40%.<sup>1</sup>

1.2.2 ITS has been in use in Hong Kong over the last twenty years. Area Traffic Control (ATC)<sup>2</sup>, Traffic Control & Surveillance<sup>3</sup>, Autotoll, Octopus Card, Electronic Parking Meter, Red Light and Speed Enforcement Cameras, are all applications in the ITS area.

1.2.3 Our experience indicates that adoption of these systems has brought benefits in terms of reduction in the number of injuries caused by traffic accidents, savings in travelling time and convenience to road users. A before-and-after survey on the Sha Tin ATC system showed that the reduction in travel time was about 30%, the reduction in stops 28% while the total stopping time was drastically reduced by 52%. The Autotoll system, which was introduced in 1993, has since achieved popular usage. About 40% of all vehicles in Hong Kong use Autotoll at present.

---

<sup>1</sup> Extract from the Final Report of the Consultancy Study on the Provision, Management and Operation of Traffic Control & Surveillance Facilities for Strategic Road Network (SRN). The study was conducted by Transport Department in 1999 to examine the deployment of modern traffic surveillance, information, control technologies and technique on SRN in Hong Kong.

<sup>2</sup> Area Traffic Control is a computerised system that integrates the control and operation of traffic signals within a district.

<sup>3</sup> Traffic Control and Surveillance facilities include Closed Circuit Television Systems, Variable Message Signs and Lane Control Signals installed on expressways.

---

Red light camera and speed enforcement cameras were introduced in 1993 and 1999 respectively. A before-and-after comparison showed that red light jumping was reduced by 43-55%; speeding cases were reduced by 50% and the overall traffic accidents involving injury were reduced by 40%. The Octopus Card, which is an automatic fare collection system using contactless smartcards, was jointly developed by major public transport operators. 7.4 million cards have been issued and a total of 6 million transactions are made daily on most public transports. Electronic Parking Meters, which use cashless smartcards, were launched in April 1998 to replace mechanical meters.

1.2.4 However, the existing applications in the ITS area are mostly single purpose systems, and implemented on a small scale. To cope with the rapid development of the society, present day ITS should emphasise the integration of systems as well as the integration of functions, both transport and non-transport.

1.2.5 Advance in information and telecommunication technologies has provided us with vast opportunities for innovation on traffic management and for improvement in transport services, enabling transport planners to maximise the utilisation of limited road space.

### **1.3 Purpose of the Review**

1.3.1 Both local and overseas experiences indicate that implementing ITS applications requires a strategic plan of co-ordinated and long-term development to ensure compatibility of standards, proper co-ordination and efficient and effective use of resources. The ITS Strategy Review (the Review) was therefore conducted with the purpose of formulating a Strategy and Action Plan for the future development and implementation of ITS in Hong Kong.

---

## **2 INTELLIGENT TRANSPORT SYSTEMS STRATEGY REVIEW**

### **2.1 Review Process**

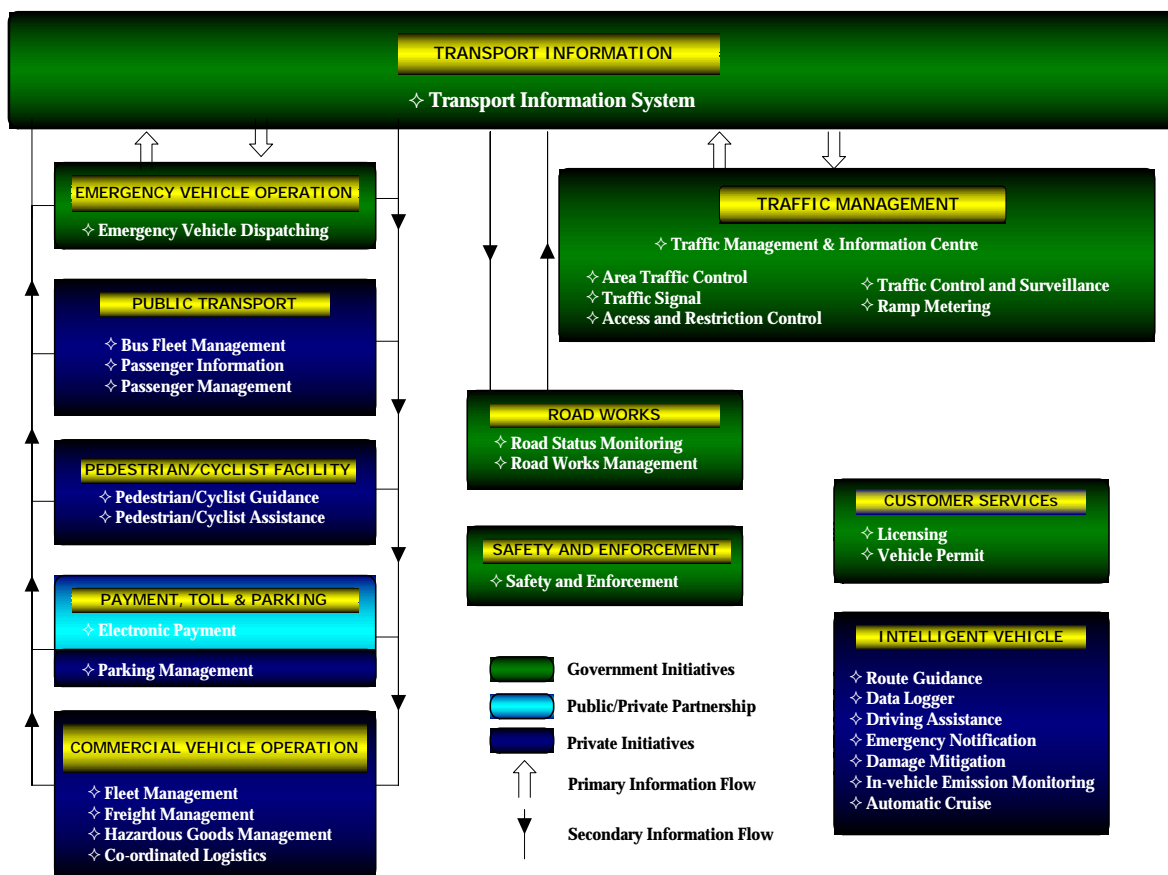
- 2.1.1 The Review was divided into three major phases: Preliminary Review, Evaluation of Potential Applications and Development of Strategy & Implementation Plan.
- 2.1.2 Preliminary Review: an inventory list was prepared on existing ITS applications in Hong Kong. Details are outlined in 1.2.2 to 1.2.4. In addition, the development of ITS and the associated technologies employed in the U.S.A., Japan, Europe and Singapore were examined in detail. A brief account of the overseas ITS deployment is given in Appendix A.
- 2.1.3 Evaluation of Potential Applications: over 30 potential applications were identified for evaluation. A questionnaire survey was conducted in mid August 2000 among existing ITS stakeholders in the Government, the transport sector and other related industries in Hong Kong. The survey aimed to solicit local ITS stakeholders' views on future ITS Applications.
- 2.1.4 A Local Advisory Panel consisting of members from the local industries and tertiary institutions was formed to provide advice and input to the evaluation. Membership of the Panel is at Appendix B.
- 2.1.5 11 ITS Application Areas with their associated Applications were selected for further examination.
- 2.1.6 Development of Strategy & Implementation Plan: The relationship of the selected applications were examined to form an ITS Framework which illustrated the most efficient integration of systems and functions. Details are set out in Section 3. Based on the ITS Framework, a strategy on the ITS development and an implementation plan were worked out. Details are set out in Section 4.
- 2.1.7 An Expert Review Panel formed by experienced ITS Government officials from the U.K., U.S.A, Japan and Mainland China was invited to provide independent reviews on the proposed ITS Strategy. Membership of the Panel is at Appendix C.

### 3 AN ITS FRAMEWORK

#### 3.1 Need for a Framework

- 3.1.1 The ITS Framework as shown in the chart below defines the relationships and interaction of various components in ITS systems and services to achieve optimum deployment of the selected ITS applications in Hong Kong.
- 3.1.2 To ensure that various ITS systems can support more than one Application to achieve interoperability and efficiency, the Applications and ITS systems for each of the Application Areas were defined. Detailed groupings of Application Areas, Applications and the systems are provided in Appendix D.
- 3.1.3 The ITS Framework is functional and service driven, instead of technologically driven. This is consistent with the socio-economic conditions and development of Hong Kong.

ITS Framework



---

## 3.2 Application Areas, Applications and Systems

3.2.1 By evaluating the needs, effectiveness and related priority of the potential ITS applications, 11 Application Areas had been selected for implementation. These Application Areas with their grouping of services and functionalities are briefly described below -

### 1. Transport Information

- To provide a robust transport data infrastructure to support efficient and effective collection, processing and dissemination of transport and traffic data; an Application, namely Transport Information System is proposed to be implemented under this Application Area

### 2. Urban Traffic Management

- Area Traffic Control – To increase the function, performance and coverage of the automated computerised systems that control signalised junctions within the urban area and some new towns
- Traffic Signal Equipment – To enhance traffic signal equipment to increase the efficiency, durability and effectiveness of the traffic control system
- Access and Restriction Control – To automate access and restriction control and enforcement

### 3. Strategic Road Network Management

- Traffic Control & Surveillance (TCS) – To expand the coverage of TCS systems which include field equipment such as CCTV systems, variable message signs, lane control signals, automatic incident detection systems, variable speed limit signs and over-height detection system
- Traffic Management and Information Centre (TMIC) – To establish a TMIC as a centralised centre for traffic and incident management. It will also be responsible for traffic information collection and dissemination on the Strategic Road Network (SRN)<sup>4</sup> in Hong Kong
- Ramp Metering – To regulate the access traffic onto the SRN

### 4. Public Transport

- Bus Fleet Management - To improve fleet operation efficiency
- Passenger Information – To enhance the provision, facilities and quality of service information for passengers

---

<sup>4</sup> Strategic Road Network consists of primarily high-speed segregated roads with limited frontage access. There were about 195km of SRN in 1997. SRN would be expanded to about 300km in 2011.



- 
- Passenger Management – To facilitate crowd control and management
- 5. Safety and Enforcement**
- To fully automate the enforcement procedures e.g. red light cameras and speed enforcement cameras to assure greater safety, efficiency and effectiveness
- 6. Payment, Toll & Parking**
- Electronic Payment – To enhance electronic monetary transaction on transport-related services including public transport, road and tunnel toll and fee for parking meter/car park
  - Parking Management – To facilitate parking asset management and reservation
- 7. Commercial/Emergency Vehicle Operation**
- Fleet Management - To facilitate the operation of commercial fleets
  - Taxi Fleet Management and Dispatch – To facilitate the implementation of a management and dispatch system
  - Emergency Vehicle Dispatching – To provide dynamic traffic information to the emergency vehicle dispatching system of the Fire Service Department and the Hong Kong Police Force
  - Freight Management – To facilitate and improve efficiency of goods delivery by better co-ordination of activities related to the logistic chain from supplier to receiver through proper integration with fleet management
  - Hazardous Goods Management – To facilitate better management in transport and storage of hazardous goods
  - Co-ordinated Logistics - To facilitate better distribution, storage and delivery of goods and facilities
- 8. Pedestrian/Cyclist Facility**
- Pedestrian/Cyclist Assistance – To provide and enhance facilities to assist the elderly and the physically impaired
  - Pedestrian/Cyclist Guidance – To guide pedestrian to a destination through streets or to the nearest transport facility
- 9. Intelligent Vehicle**
- Route Guidance – To facilitate route direction, alternative routes and destination information to motorists
  - Data logger – To facilitate the tracking of vehicle operation data for accident prevention and incident investigation
  - Driving Assistance – To facilitate measures in vehicle design for safe and efficient driving
-

- Emergency Notification – To equip vehicle with location indicator and communication to enlist emergency services
- Damage Mitigation – To equip vehicle with automatic detection devices to avoid collision
- In-vehicle Emission Control – To equip vehicle with emission monitoring and control device
- Automatic Cruise

#### **10. Road Works**

- Road Status Monitoring
- Road Works Management

#### **11. Customer Services**

- Licensing – To implement the Vehicles And Drivers Licensing Integrated Data system (VALID) as an open access model for on-line processing of vehicle licences
- Vehicle Permit – To introduce electronic vehicle permit

### **3.3 Public-Private Partnership**

From the functionalities listed above, it can be seen that many of the Applications are Government projects such as Area Traffic Control Systems, Traffic Management and Information Centre, etc. On the other hand, there are also many Applications that would depend on private initiatives. Public and private collaboration exists in the sharing of data and information for better fleet management and for better distribution of information to the public.

## **4 ITS STRATEGY 2001-2010**

### **4.1 ITS Objectives & Strategy**

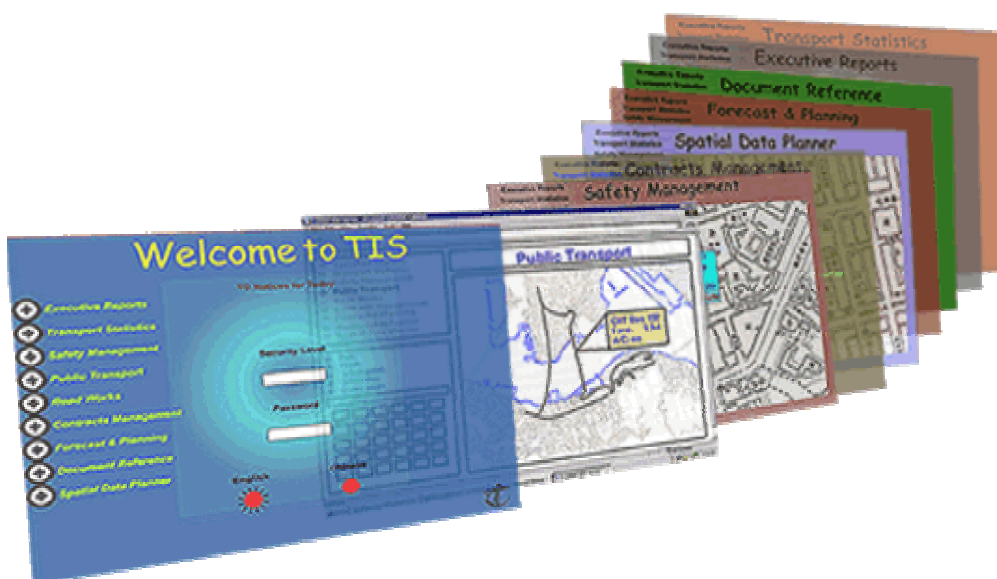
The review concludes that it is necessary to prioritise the Applications to be implemented by Government for the best delivery of our ITS objectives within a timeframe. The main ITS objectives have been identified as follows:-

- ◆ To create greater efficiency in traffic management
- ◆ To make better and more informed choices by providing road users with access to real-time information
- ◆ To provide better interaction among people, roads and vehicles
- ◆ To better utilise existing transport infrastructure

For 2001 to 2010, the review recommends an ITS Strategy which focuses on two main initiatives, namely “A Smart Way to Travel” and “A Smart Way for Safety and Efficiency”. Core projects are selected to form the Strategy for the coming 10 years.

### **4.2 A Smart Way to Travel**

4.2.1 Under this initiative, a **Transport Information System** (TIS) serving as a centralised data warehouse will be set up in TD by end 2003. Adopting spatial information and web-based technologies, the TIS supports real-time updating and retrieval of transport and traffic information.



Prototype of Transport Information System

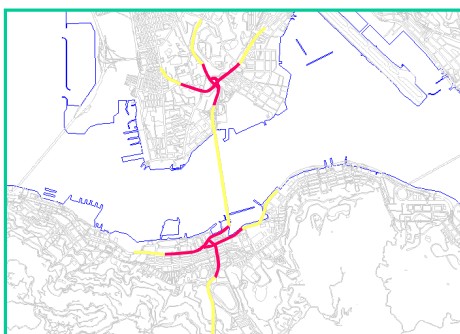
4.2.2 The general public will have access through the Internet to information on routing and public transport services. Information on routes and fares, including options based on price, time and the need to interchange will be provided under the public transport enquiries services of the TIS. This pre-trip planning function would encourage the use of public transport and better use of transport facilities for motorists. Route finding function with linkage to relevant information such as car park or petrol filling station locations could also be provided.



### Traffic Information

Traffic speeds

- 0 – 15 km/h
- 15 – 30 km/h



### Traffic Information

CCTV images





4.2.3 Traffic information will be made available to Government agencies for the planning and management of their transport-related operations. This would result in more efficient traffic regulation/diversion by the Police and better coordinated road maintenance works by Highways Department. Fire Services Department and the Police will be provided with real time information to avoid congestion points when deploying their emergency vehicles.

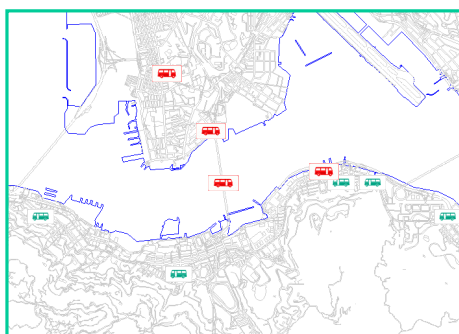


- 4.2.4 The transport operators such as bus companies, railway companies, tunnel operators and commercial vehicle fleet operators would be able to adjust their operation readily to cope with changes in the traffic conditions.
- 4.2.5 The private sector, such as third party service providers, would be able to develop value-added applications such as fleet management, personal notification of traffic conditions via mobile telephones, and in-vehicle route display units for drivers.
- 4.2.6 Other private sector initiatives will benefit from the TIS. Passenger Information Systems that provide pre-schedule, real-time scheduling and other related information, such as bus location, bus stop information, traffic condition and weather can be developed by the public transport operators, together with their fleet management system.
- 4.2.7 Parking Management Systems could be implemented by the car park operators and at major public venues. Dissemination of information on available parking spaces could be via on-street Variable Message Sign, radio, Internet, in-vehicle navigation unit or mobile phones. Parking reservation could also be provided.

### Value-added Services

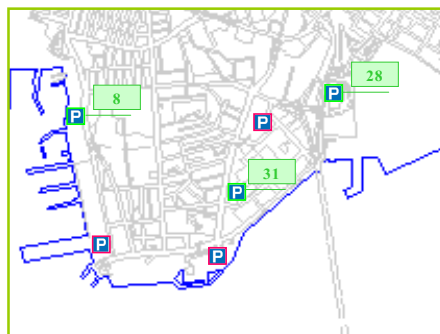
#### Fleet management

-  Route No. 2
-  Route No. 18



### Traffic Information

#### Carpark locations – with number of vacant spaces



4.2.8 Route Guidance and Pedestrian/Cyclist Guidance Systems can be developed with the data feed from TIS. They will have vast commercial value for packaging into consumer services and entertainment information. With the launching of the 3<sup>rd</sup> Generation Mobile Phone service in 2002/3, it is expected that these types of general information packages and personalised services will be in demand in the very near timeframe.



Value-added Services

Personalised/location-based information services



4.2.9 TIS will be an integral part of the transport and information infrastructure in Hong Kong providing the general public, transport operators and Government agencies with a smart and convenient way to travel.



---

### 4.3 A Smart Way for Safety and Efficiency

4.3.1 Under this initiative, the priority is to have comprehensive traffic control and surveillance coverage over the territory and develop territory-wide coordination among control centres for traffic and incident management. In this connection, the following projects will be put in place:-

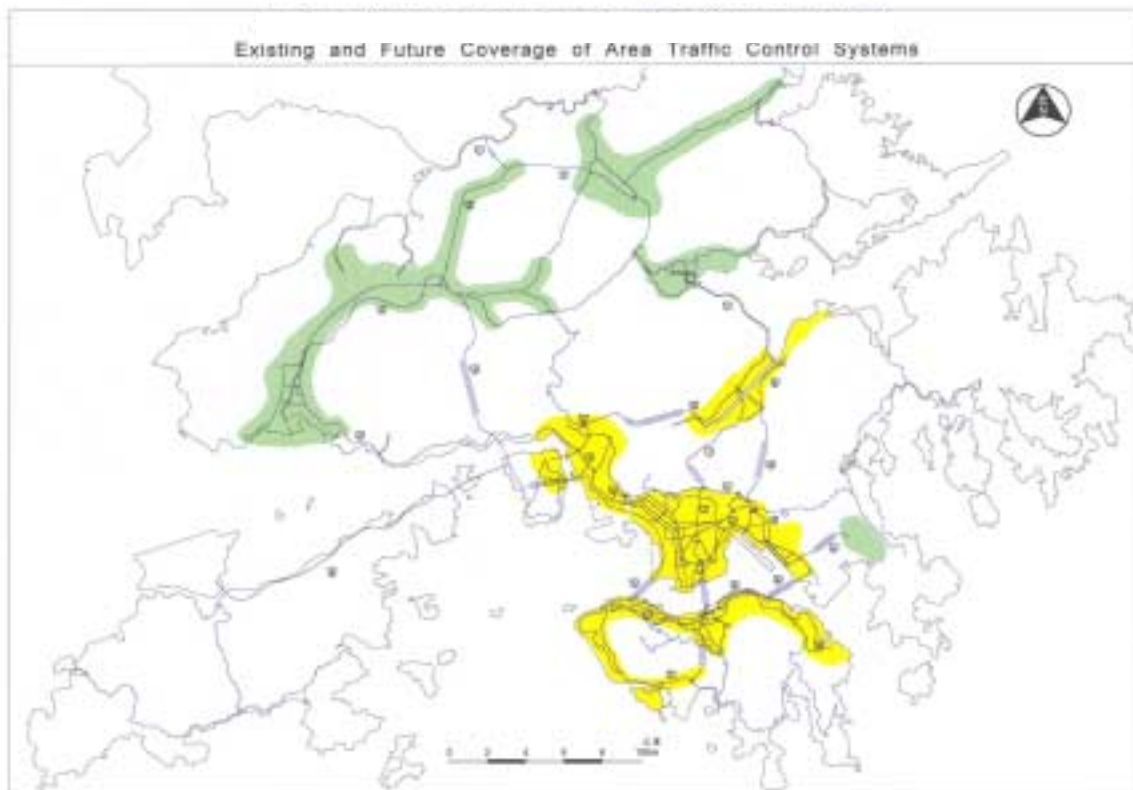
- (i) extension of the coverage of Area Traffic Control (ATC) System;
- (ii) installation of Traffic Control and Surveillance (TCS) facilities on all major expressways;
- (iii) establishment of a Traffic Management and Information Centre (TMIC);  
and
- (iv) implementation of a Journey Time Indication System (JTIS).

4.3.2 In Hong Kong, traffic is controlled and monitored by computerised traffic signals operated through the ATC system, and TCS facilities, such as Closed Circuit Television Systems, Variable Message Signs, and Lane Control Signals, installed on expressways.

4.3.3 At present, ATC systems only cover the urban areas and the New Towns of Tsuen Wan/Kwai Chung/Tsing Yi and Shatin/Ma On Shan. For areas without an ATC system, traffic signals cannot be adjusted automatically in response to changes in the traffic flow level, which means there could be under-utilisation of junction capacity at one point yet traffic congestion at the other.

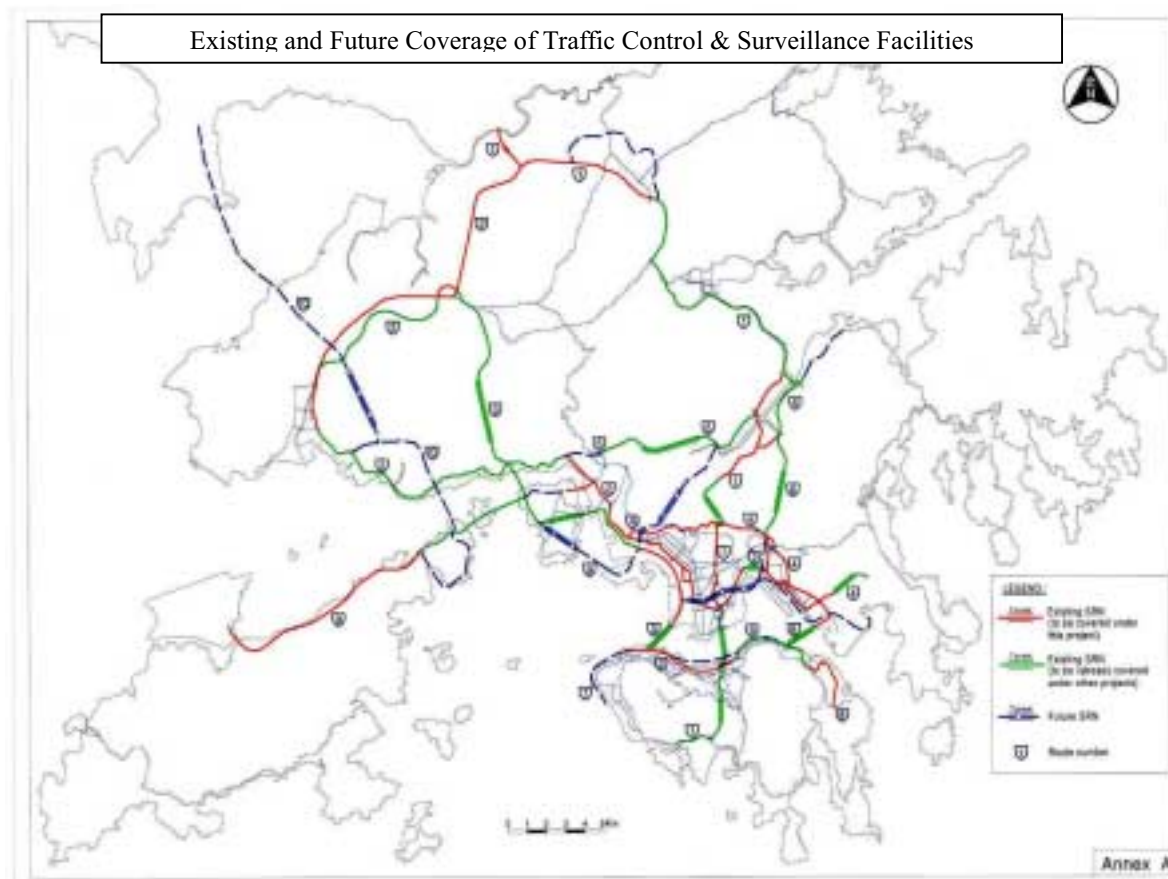
4.3.4 Currently, CCTV Systems are only installed on limited sections of expressways, i.e. Tuen Mun Road, North Lantau Expressway and the West Kowloon Expressway. To continuously monitor the traffic condition of expressways without CCTV Systems, we will have to rely on the public to report any incidents. This could lead to delays in taking appropriate measures and result in undue congestion, or even secondary incidents. With the growth in population in the northwest New Territories and various new towns, the traffic demand on existing roads will naturally increase. ATC and TCS systems need to be installed in these areas to provide adequate traffic control and management.

4.3.5 ATC systems are proposed to be extended to cover all New Towns including Tai Po/North District, Tuen Mun/Yuen Long and Tseung Kwan O.



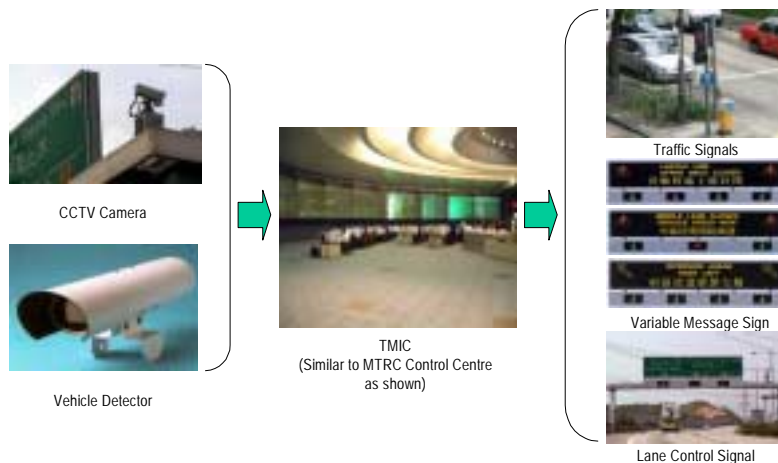
- Existing
- Future

4.3.6 Comprehensive TCS facilities including CCTV cameras, variable message signs and lane control signals are recommended to be installed on all major expressways. These systems will be installed on all new expressways from 2001 and will be retrofitted on existing expressways as part of the renovation programme.

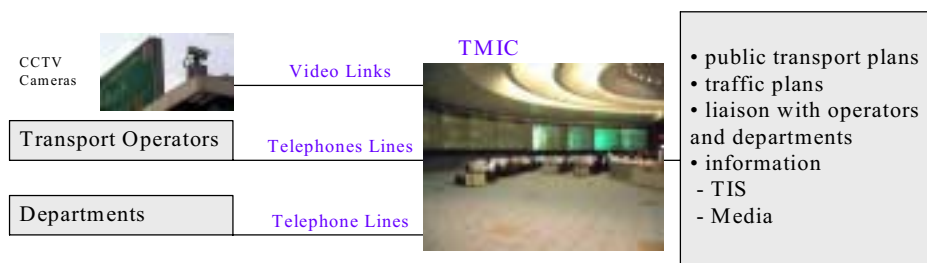


- 4.3.7 The existing ATC and TCS systems are controlled and managed by their own respective control centres, with limited linkage among them. There is a lack of direct communication between these centres and thus overall control of the systems. This will render coordination of incident management less efficient and effective especially in cases of emergency or major accidents with widespread impact.
- 4.3.8 The proposed TMIC will coordinate territory-wide traffic and incident management. Specifically, it will have direct control of TCS facilities on the SRN and ATC systems, and will co-ordinate closely with tunnel/bridge control centres. The TMIC will also serve as a major source of real-time traffic information for TIS. TMIC is proposed to commence its service in 2006.

### Traffic Control and Surveillance



### Transport Incident Management

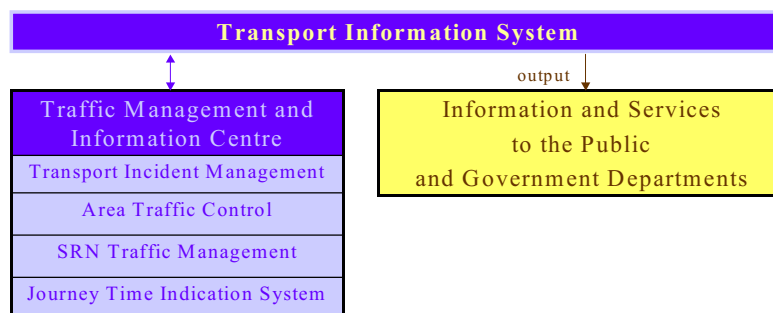


4.3.9 In addition, JTIS will be implemented in Hong Kong Island as a pilot project to advise motorists of the estimated journey time for travelling to the Kowloon exits of the three cross-harbour tunnels.

4.3.10 With comprehensive coverage of TCS and ATC, the establishment of TMIC and the implementation of JTIS, safety and efficiency in travelling around Hong Kong can be assured.

## 5 PROGRAMME

### Core Projects



- 5.1 Core projects to support the two major initiatives in the coming 10 years are summarised above.
- 5.2 Implementation of the TIS is scheduled to start in 2001, for completion in phases in 2003.
- 5.3 The extension of ATC systems to cover the remaining New Towns will be implemented in phases starting from the year 2001. The system will be extended to Tai Po and North Districts first. Implementation is expected to start in September 2001 for completion in November 2003. Implementation of the Tuen Mun and Yuen Long system will start in September 2002 for completion in 2005. The ATC System will then be extended to cover Tseung Kwan O, completion of which is scheduled to be after 2006.
- 5.4 The provision of comprehensive TCS facilities will become a standard feature of all new expressways and selected trunk roads. The provision of such facilities will be implemented in stages in conjunction with relevant road improvement works. By 2010, it is anticipated that most of the major expressways and selected trunk roads will be provided with comprehensive TCS facilities.

- 5.5 The preliminary project feasibility study of the TMIC will be completed soon. It is expected that the Centre will start operation in 2006. Once the TMIC is in operation, real-time traffic information would be fed into the TIS.
- 5.6 The JTIS will be implemented in phases. Phase I involves the installation of digital indicators ahead of the three cross-harbour tunnels and the associated approach roads on the Hong Kong side. Preparation and implementation will start in 2001 for commissioning in end 2002. The tentative locations are Canal Road Flyover northbound, Gloucester Road eastbound and Island Eastern Corridor westbound. Subject to the satisfactory performance of the system, the system will be extended to major approach roads on the Kowloon side, and subsequently to other tunnels and the associated approach roads.

### Implementation Programme

	01	02	03	04	05	06	07	08	09	10
TIS		Implementation		System Expansion & Enhancement						
ATC		Tai Po & North					Tseung Kwan O			
			Tuen Mun & Yuen Long							
JTIS		HK Island		Expansion to Other Tunnels & Trunk Roads						
TCS		Tolo Highway & Other Committed Projects				Expansion to Other Sections				
TMIC				Design & Construction		System Expansion and Enhancement				

\_\_\_\_\_ funding has been earmarked in RAE

----- planned for future expansion

## 6 COSTS

An estimated amount of \$3.2 billion over the next 10 years would be required for the implementation of the TIS, extension of the ATC systems to all New Towns and installation of the TCS facilities on all major expressways and selected trunk roads, and the setting up of the TMIC. A summary of the estimated expenditure is as follows –

Item	Estimated Expenditure in \$M
TIS	64
ATC	610
TCS	2,219
TMIC	210
Others (e.g. journey time indication system, red light and speed enforcement cameras)	135
<b>Total</b>	<b>3,238</b>

## **7 PARTNERS AND STAKEHOLDERS**

7.1.1 Relationship with ITS partners and stakeholders should be cultivated and maintained. Local ITS partners and stakeholders include:

- ◆ Highways Department
- ◆ Electrical & Mechanical Services Department
- ◆ Hong Kong Police Force
- ◆ Information Technology Services Department
- ◆ Government Land Transport Agency
- ◆ ITS Industry representatives
- ◆ Hong Kong Tourism Board
- ◆ Academic bodies
- ◆ Transport operators
- ◆ Information technology industry
- ◆ Telecommunication companies
- ◆ Insurance companies

7.1.2 It is recommended to retain the Local Advisory Panel that has been set up for this Strategy Review and that quarterly meetings should be held. This would provide a venue for TD to keep abreast of the local industry product development as well as the R&D development in the tertiary institutions.

7.1.3 The Expert Review Panel provided a useful link with major overseas governments on ITS. International benchmarking and sharing of information are essential for fast-paced development of technology. It is recommended that such overseas partnership should be maintained through regular exchange and organisation of ITS related activities.



## **8 WAY FORWARD**

- 8.1 ITS applications will form part of the transport infrastructure to be provided by the Government to make our transport system more efficient and user-friendly. In addition, they would provide the necessary information to facilitate commercial utilisation such as development of navigational guidance systems for motorists and fleet management systems for public transport and freight operators. It is expected that general information packages and personalised services for individual road users would become more popular with the advent of 3G mobile phone technologies.
- 8.2 Transport Department will be responsible for implementing the key projects under the ITS Strategy 2001-2010; promoting the development of ITS applications through public-private collaboration; and monitoring the development of ITS worldwide.

---

## ***Acknowledgement***

Transport Department would like to express appreciation to the following parties who have responded to our survey and provided us with much of the study materials. Our special thanks also go to members of the Local Advisory Panel and our guests of the international Expert Review Panel who have given us invaluable advice on the ITS Strategy Review.

### Tunnel, Toll, Carpark Management Companies

- ◆ AutoToll Limited
- ◆ China Tollways Limited
- ◆ Serco Guardian
- ◆ Tsing Ma Management Limited
- ◆ Wilson Group

### Vehicle Tracking, Fleet Management Service Companies

- ◆ Global Telematic Service Limited
- ◆ Hong Kong Intelligent Transport Services Limited

### Public Transport Operators and related organizations

- ◆ Hongkong Tramways Limited
- ◆ Hong Kong Kowloon Taxi & Lorry Owners' Association Limited
- ◆ New Lantau Bus Co. (1973) Ltd.
- ◆ New World First Bus Services Limited
- ◆ New World First Ferry Services Limited
- ◆ Peak Tramway Company, Limited
- ◆ The Kowloon Motor Bus Co. (1973) Ltd.
- ◆ The "Star" Ferry Company, Limited
- ◆ Kowloon-Canton Railways Corporation
- ◆ KCRC - Light Rail Division
- ◆ Mass Transit Railways Corporation Limited

### Electronic Payment

- ◆ Creative Star (Octopus)

### Government Department

- ◆ Fire Services Department
- ◆ Hong Kong Police Force

- ◆ Hong Kong Observatory
- ◆ Highways Department
- ◆ Government Land Transport Agency

---

## ***Appendix A –***

### ***Overseas Intelligent Transport Systems Deployment***

#### **The U.K.**

In 1992, U.K. government estimated that road traffic will be increased by 100% by 2020. It would not be possible to use traditional construction or road management strategies to cater for the increased traffic. Hence, it was decided that road should be built for off peak capacity only and that traffic management measures will be introduced to cater for the peak hour flow. Subsequently, pilot ITS projects such as ROMANSE, Road Management System for Europe, for travel information at southern England started in 1992 and became operable since January 1996; and MATISSE, the Midlands Driver Information System between London and the Midlands has been operable since December 1998.

In May 2000, the Transport Committee for London issued the document “Towards an ITS Strategy for London”. It illustrates how transport policy objectives are to be met and how the use of ITS can help address some of the transport problems in London. The document states that the collection, processing, integration and dissemination of information are integral parts of ITS, which enables Government agencies, transport operators and individual travellers to make better informed and more intelligent transport decisions. The key ITS solutions identified include, inter alia –

- Urban traffic control systems, with real-time traffic adaptive system, to control the signalised junctions in the urban area
- Bus priority at signalised junctions
- Speed and red-light violation enforcement cameras
- CCTV systems to assist Police in traffic monitoring
- Parking management to direct vehicles to the nearest available car park
- Tactile devices at pedestrian crossings, separate cyclist lane and signal aspect to help vulnerable road users
- Variable Message Signs known as the London Driver Information System

#### **The U.S.A.**

The U.S. government has, since 1991, increased the local government’s powers to deploy the type of transportation projects under the federal initiative of Intermodal Surface Transportation Efficiency Act (ISTEA). The ISTEA changed the transport mission from one of solely constructing new infrastructure to one including real time traffic management with the

---

use of computer, communication, and information technologies.

In 1996, the U.S. Department of Transport issued the “National Architecture for ITS: A Framework for Integrated Transportation into the 21<sup>st</sup> Century”. It states that ITS is about the collection, sharing, processing and redistribution of transport information to move people and goods better. It enables travellers to make better decisions and helps improve the efficiency and safety of transport systems including transit systems, freeways, toll facilities, rail intersections, truck regulatory facilities and rural roadways. Under this framework, a number of ITS user services have been identified and are grouped into the following six categories –

- Travel and traffic management – pre-trip travel information, route guidance, traffic control, incident management
- Commercial vehicle operations – electronic clearance, fleet management
- Public transport management – transit information, public transport management
- Electronic payment – payment services
- Emergency management – emergency vehicle management, emergency notification
- Advanced vehicle safety systems – collision avoidance, automated vehicle operations

## Japan

Headed by the Prime Minister, the Japan Advanced Information and Telecommunication Society Promotion Headquarters adopted the “Basic Guidelines on the Promotion of an Advanced Information and Telecommunication Society” in February 1995. The guidelines outline the principles of promoting ITS in Japan. In July 1996 a “Comprehensive Plan for Intelligent Transport System (ITS) in Japan” was published. This is a master plan on ITS in Japan that clarifies targets for the functions, as well as its long-term vision for development and deployment in order that the construction of ITS is promoted systematically and efficiently in Japan. The plan is basically divided into nine key areas –

- Development of navigation systems – route guidance, destination-related information
- Electronic toll collection systems – non-stop payment at toll gate
- Safe driving – hazard warning and driving assistance
- Optimisation of traffic management – traffic signal control, traffic diversion information
- More efficient road management – improvement in maintenance operations, management of special vehicles, provision of roadway hazard information
- Public transport support – public transport information, public transport

operations management

- More efficient commercial vehicle operations – commercial vehicle operations management, automated platooning of commercial vehicles
- Pedestrian support – pedestrian route guidance, safety measures to avoid vehicle-pedestrian accidents
- Support for emergency vehicle operations – automatic emergency notification, route guidance for emergency vehicles

## **Singapore**

The Singapore government announced in June 2000 that Singapore has leveraged and will continue to leverage on technologies and innovative transport management schemes to manage traffic and enhance attractiveness of the road and public transport system. Under i-transport, the multi-modal integrated master plan, the Land Transport Authority of Singapore began in 1997 to implement a wide range of measures such as traffic.smart, transit.smart, travel.smart and manage.smart covering all aspects of land transport travel. The umbrella system can be functionally divided into an information system and a management system. Specifically, ‘traffic.smart’ integrates Singapore’s traffic information while ‘transit.smart’ integrates information for public transport services. ‘Travel.smart’ integrates the two to provide a multi-modal information system. ‘Manage.smart’ provides the integrated management function for island-wide transportation.

## ***Appendix B –***

### ***Local Advisory Panel***

- ◆ Prof. Tony Eastham, Associate Vice President for Research & Development, Hong Kong University of Science and Technology
- ◆ Prof. Anthony Yeh, Chair in Urban Planning and GIS, The Centre of Urban Planning & Environmental Management, University of Hong Kong
- ◆ Dr. William HK Lam, Professor, Department of Civil and Structural Engineering, Hong Kong Polytechnic University
- ◆ Dr. Nelson HC Yung, Director, Laboratory for Intelligent Transportation Systems Research, University of Hong Kong
- ◆ Mr. John Sze, Convenor & Chairman, ITS - Hong Kong; Chairman of Electronic Division, The Hong Kong Institution of Engineers
- ◆ Mr. Tommy Wong, Fund Raising Sub-Committee, ITS - HK Preparatory Committee; Group Manager (Larger Project Group), Marconi Communications

## ***Appendix C –***

### ***Expert Review Panel***

- ◆ Prof. Wang Xiao-jing, Director General, China National ITS Engineering and Technology Research Centre, China
- ◆ Mr. Tadashi Okutani, Senior Researcher, ITS Division, Road Department, Public Works Research Institute, Ministry of Construction, Japan
- ◆ Mr. Ian Fraser, Highways Agency, U.K.
- ◆ Mr. James Paral, Director, Division of Traffic Operations, New Jersey Department of Transportation, U.S.A.



**Appendix D –**

**Groupings of Application Areas, Applications and Systems**

<b>Application Area</b>	<b>Application</b>	<b>Systems</b>
Transport Information	<ul style="list-style-type: none"> <li>• Transport Information System</li> </ul>	<ul style="list-style-type: none"> <li>• GIS, spatial database</li> <li>• Intranet/internet technology</li> <li>• computer network and wireless mobile communication (WAP/GPRS/3G)</li> <li>• navigable network</li> <li>• routing engine</li> <li>• probe vehicle</li> </ul>
Urban Traffic Management	<ul style="list-style-type: none"> <li>• Area Traffic Control</li> <li>• Traffic Signal</li> <li>• Access and Restriction Control</li> </ul>	<ul style="list-style-type: none"> <li>• CCTV camera</li> <li>• video image processing</li> <li>• vehicle detectors</li> <li>• traffic signal control</li> <li>• green wave operation</li> <li>• LED traffic signal</li> <li>• flashing amber/part-time signal</li> <li>• countdown indicator for pedestrian</li> <li>• electronic tag</li> <li>• Optical Character Recognition (OCR)</li> <li>• Dedicated Short Range Communication system</li> <li>• Vehicle Positioning System</li> </ul>
SRN Management	<ul style="list-style-type: none"> <li>• Traffic Control and Surveillance</li> <li>• Traffic Management and Information Centre</li> </ul>	<ul style="list-style-type: none"> <li>• CCTV camera</li> <li>• emergency telephone</li> <li>• automatic incident detection</li> <li>• variable message sign</li> <li>• lane control signal</li> <li>• variable speed limit sign</li> <li>• overheight detection</li> </ul>
Public Transport	<ul style="list-style-type: none"> <li>• Bus Fleet Management</li> <li>• Passenger Information</li> <li>• Passenger Management</li> </ul>	<ul style="list-style-type: none"> <li>• vehicle positioning system</li> <li>• communication system</li> <li>• surveillance and monitoring systems</li> <li>• in-vehicle units</li> <li>• road side display panel</li> <li>• CCTV camera</li> <li>• public announcement system</li> <li>• variable information display panel</li> </ul>
Safety & Enforcement	<ul style="list-style-type: none"> <li>• red light camera</li> <li>• speed enforcement camera</li> <li>• detecting overweight vehicles</li> <li>• automatic toll collection</li> </ul>	<ul style="list-style-type: none"> <li>• digital image and OCR</li> <li>• weigh in motion</li> <li>• mobile enforcement system</li> <li>• vehicle detection, identification and classification</li> <li>• violation enforcement system</li> <li>• speed enforcement camera</li> </ul>
Payment, Toll and Parking	<ul style="list-style-type: none"> <li>• Electronic Payment</li> <li>• Parking</li> </ul>	<ul style="list-style-type: none"> <li>• smartcard technology</li> <li>• electronic transaction</li> <li>• variable message sign</li> </ul>

<b>Application Area</b>	<b>Application</b>	<b>Systems</b>
Commercial/Emergency Vehicle Operation	<ul style="list-style-type: none"> <li>• Fleet Management</li> <li>• Emergency Vehicle Dispatching</li> <li>• Freight Management</li> <li>• Hazardous Goods Management</li> <li>• Co-ordinated Logistics</li> </ul>	<ul style="list-style-type: none"> <li>• vehicle positioning system</li> <li>• vehicle status monitoring</li> <li>• communication system</li> </ul>
Pedestrian/Cyclist Facility	<ul style="list-style-type: none"> <li>• Pedestrian/Cyclist Assistance</li> <li>• Pedestrian/Cyclist Guidance</li> </ul>	<ul style="list-style-type: none"> <li>• infrared/ultrasonic detector</li> <li>• hand-held mobile device</li> <li>• route guidance</li> <li>• positioning system</li> </ul>
Intelligent Vehicle	<ul style="list-style-type: none"> <li>• Route Guidance</li> <li>• Data Logger</li> <li>• Driving Assistance</li> <li>• Emergency</li> <li>• Damage Mitigation</li> <li>• Emission Control</li> <li>• Automatic Cruise</li> </ul>	<ul style="list-style-type: none"> <li>• in-vehicle device</li> <li>• digital recorder</li> <li>• automatic windscreen wiper</li> <li>• infrared detector or camera</li> <li>• vehicle-pedestrian collision avoidance</li> <li>• Mayday system</li> <li>• impact absorption</li> <li>• in-vehicle and roadside detection device</li> <li>• automated highway</li> </ul>
Road Works	<ul style="list-style-type: none"> <li>• Road Status Monitoring</li> <li>• Road Works Management</li> </ul>	<ul style="list-style-type: none"> <li>• embedded sensors</li> <li>• remote monitoring</li> <li>• Highways Maintenance &amp; Management System</li> </ul>
Customer Services	<ul style="list-style-type: none"> <li>• Licensing</li> <li>• Vehicle Permit</li> </ul>	<ul style="list-style-type: none"> <li>• VALID IV</li> <li>• electronic licence</li> </ul>