Overview and Challenges of ITS Development in Hong Kong

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Content

1. Background

2. Hong Kong Smart City Blueprint

3. ITS Applications in Hong Kong

4. Latest ITS Projects/Initiatives

5. Opportunities & Challenges of ITS in Hong Kong

1. Background

## *Basic Transport Statistics of Hong Kong*

Area	1,106 sq km
Population	7.41M
Length of Road	**2,112 km**
Length of Rail	231 km
No. of Licensed Vehicles	0.76M
No. of Licensed Private Vehicles	**0.55M** (or 74.6 veh / 1,000 population)
Average Daily Usage of Public Transport	12.7M
Public Transport Ridership	~88%

Sources:
Census and Statistics Department (2018), Highways Department (2017), Transport Department (2018), MTRC (2017)

Traffic Congestion in Hong Kong

Growth of Private Cars and Road Length

2,112

552,700

No. of Licensed Private Cars — Road Length (km)
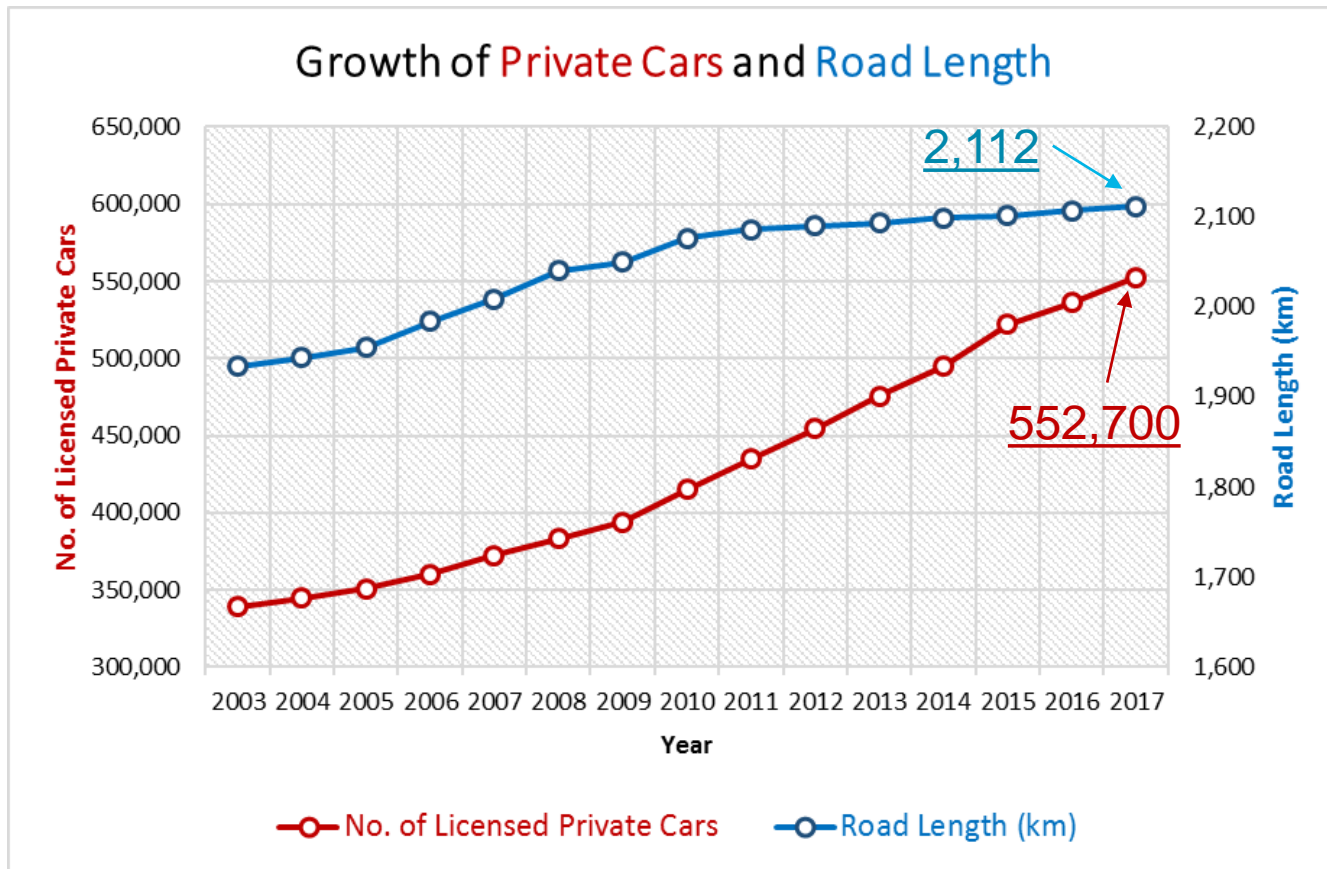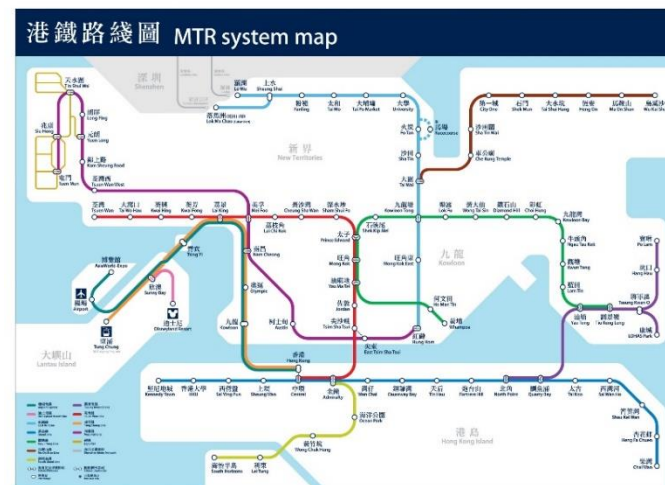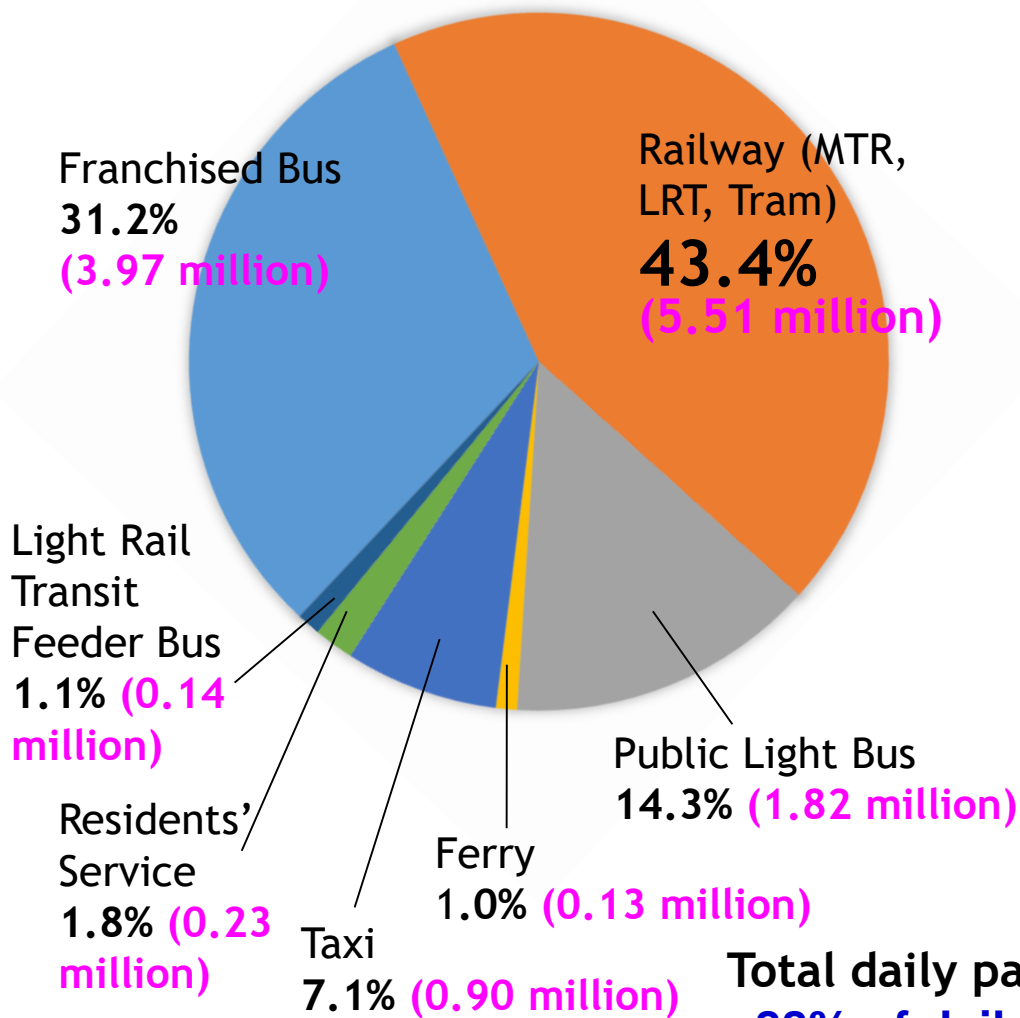
Source: Transport Department

No. of private cars: increased **> 60%** over the past 15 years

Road length: increased **< 10%** over the past 15 years

~12% of daily travel trips using private cars !

4

Usage of Public Transport in Hong Kong

Average Daily Passenger Journeys by Public Transport (2017)

Franchised Bus
31.2%
(3.97 million)

Railway (MTR, LRT, Tram)
43.4%
(5.51 million)

Light Rail Transit Feeder Bus
1.1% (0.14 million)

Residents' Service
1.8% (0.23 million)

Taxi
7.1% (0.90 million)

Ferry
1.0% (0.13 million)

Public Light Bus
14.3% (1.82 million)

Total daily passenger trips: 12.7 million
~88% of daily travel trips by Public Transport

Source: Transport Department

2. Hong Kong Smart City Blueprint

1 Vision   4 Missions   6 Plans

Embrace innovation and technology to build a world-famed Smart Hong Kong characterised by a strong economy and high quality of living

Smart Mobility
- **Intelligent Transport Systems and Traffic Management**
- Public Transport Interchanges (PTIs)/Bus Stops and Parking
- Environmental Friendliness in Transport
- Smart Airport

Smart Living
- **Wi-Fi Connected City**
- Digital Payment
- eID
- Support for the Elderly and Persons with Disabilities
- Support for Healthcare

Smart Environment
- **Climate Action Plan 2030+**
- Green and Intelligent Buildings, and Energy Efficiency
- Waste Management
- Pollution Monitoring

Vision
- Make people happier, smarter and the city greener, sustainable
- Enable the business to capitalise on the renowned business-friendly environment
- Provide better care for the elderly and youth & foster a sense of community
- Consume fewer resources while maintaining its vibrancy, efficiency and livability

Smart People
- **Nurturing Young Talent**
- Innovation and Entrepreneurial Culture

Smart Government
- **Open Data**
- Smart City Infrastructure
- Adoption of Technology

Smart Economy
- **Strengthen the current pillars by leveraging I&T**
- Promoting Sharing Economy
- Develop new economic pill

(Innovation and Technology Bureau, 2017)

3. ITS Applications in Hong Kong

(A) Traffic Information

HK eRouting	HK eTransport	HK eTraffic News

Journey Time Indication System

Integrated Traffic Control Centre

Speed Map Panel System

(B) Traffic Control

Area Traffic Control System

Traffic Control and Surveillance Systems

Smart Devices for the Elderly and People with Mobility Impairment

Enhancement to Electronic Audible Traffic Signal

(C) Enforcement

Red Light Cameras

Speed Enforcement Cameras

(D) Infrastructure

Closed Circuit Television

Transport Information System*

Traffic Detectors on Strategic Routes

Traffic & Incident Management System

Existing   Under Development   * - being upgraded

(A) Real Time Traffic Information

- Traffic Speed Map was launched in 2007 and updated in 2010 to provide the deduced traffic speed of main roads in Hong Kong Island, Kowloon and the New Territories (South) for every 5 minutes.

- Journey Time Indication System (JTIS) on Hong Kong Island was commissioned in 2003 and updated in 2009, and expanded to Kowloon in 2010 to provide average cross harbor journey time of main roads for every 2 minutes.

- Speed Map Panel (SMP) System was launched in 2013 to provide average traffic speed and journey time of main roads in the New Territories of Hong Kong for every 2 minutes.

資料一線通 DATA.GOV.HK
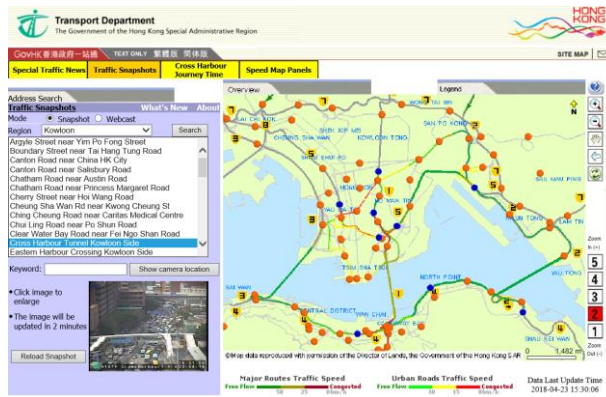
http://tis.td.gov.hk/rtis/ttis/index/main_partial.jsp
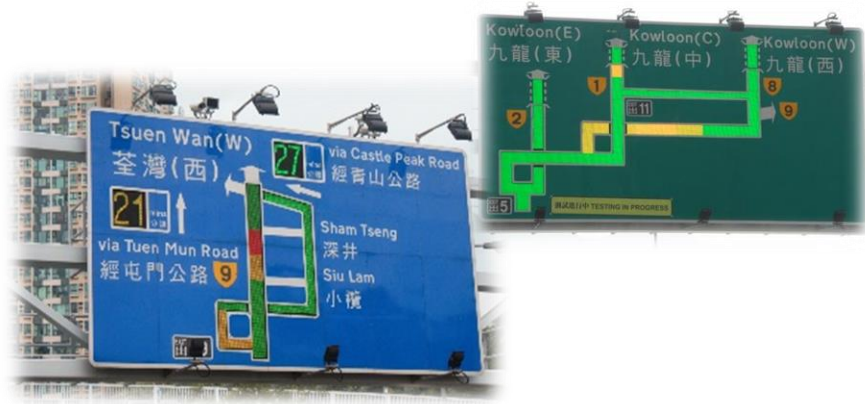
(A) Journey Planning on the go

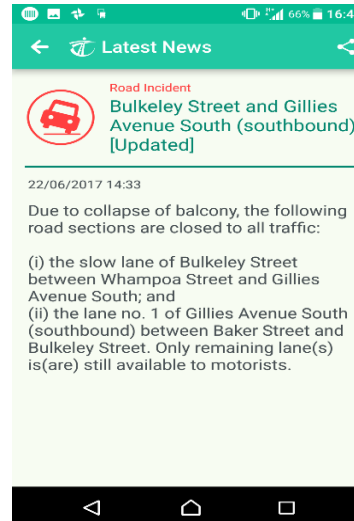Empowering travellers on all modes with pre-trip and in-trip information services via mobile devices, including:

http://hkerouting.gov.hk/drss/index.php?lang=EN

HK eRouting provides route search, traffic information & parking information

HK eTraffic News provides instant traffic update, traffic notice reminder, road works & event information

http://hketransport.gov.hk/

HK eTransport provides one-stop service of point-to-point public transport route enquiry for pre-trip planning, including MTR, LRT, Franchised Bus, Green Mini-Bus, Ferry, Tram & Cross Boundary Coach

9

(A) Traffic Control Centre (TCC)

- The Traffic Control Centre (TCC), which has been operating since early 2004, provides accommodation for
  - **the Emergency Transport Co-ordination Centre** (ETTC),
  - **the Area Traffic Control** (ATC) **systems** in the New Territories,
  - the **Traffic Control and Surveillance System** (TCSS) for Shenzhen Bay Bridge, Tuen Mun Road and part of Tolo Highway, and
  - the traffic monitoring system for Tsing Ma/Tsing Sha Control Area,

- The existing TCC will be relocated to the West Kowloon Government Offices in 2019. The new TCC will integrate the existing three ATC Centre, the ETCC and the TCSS Centre.

Traffic Control Centre (TCC) of Hong Kong Transport Department

Emergency Transport Co-ordination Centre (ETTC) in Wan Chai, Hong Kong

(B) Area Traffic Control (ATC) System

General Information

ATC Junctions: Approximately **1835** nos.

System Use: SCATS in Hong Kong Island, Kowloon, Shatin, Tsuen Wan & Tseung Kwan O
SCOOT in Tuen Mun, Yuen Long & Tai Po & North Districts

Traffic Adaptive Control (TAC)

Adjustment of signal timings in response to real-time variations in traffic demand

Hurry Call and Green Wave Capability

The traffic signal controller is forced to the demanded stage as quickly as possible to allow smooth passage of fire appliance to destination

General Results

- No. of stops reduced by approximately 20%
- Travel time reduction of about 30%
- Junction delay reduction of over 30+%

(B) Traffic Control & Surveillance System (TCSS)

- Closed Circuit Television System (CCTV)
- Over-height Vehicle Detection System (**OHVD**)
- Automatic Incident Detection System (**AID**)
- Lane Control Signal (LCS)
- Variable Speed Limit Sign (VSLS)
- Fully Variable Message Sign (FVMS)
- Speed Enforcement Camera (**SEC**)
- Tunnel Closed Sign (TCS)
- Wall Map Display and Traffic Plans
- Control Centre

CCTV

OHVD

AID Detector

LCS

LCS & VSLS

VSLS & FVMS

SEC

TCS

Wall Map Display and Traffic Plans

Control Centre

12

(B) Smart Devices at Signalised Pedestrian Crossing

Smart Device at Signalised Pedestrian Crossing for Elderly

- To investigate the feasibility of adopting a smart device to lengthen the crossing time for the elderly and persons with disabilities upon receiving their request

Electronic Audible Traffic Signals (eATS) at Signalised Pedestrian Crossing for Disabled

- To recommend replacement of the existing eATS and to explore opportunities to enhance walkability of disabled through applying latest technology

13

(C) Enforcement Device

Improving compliance and deterring non-compliance of moving traffic:

- **Red light cameras**: **195** by March 2016
- **Speed enforcement cameras: 125** speed enforcement camera housings as at the end of 2016
- **Variable speed signs** on the Strategic Roads

Red light camera

Variable speed signs

Speed enforcement cameras

14

(D) Closed Circuit Television (CCTV)

For surveillance of traffic condition, over **700 Closed Circuit Television (CCTV)** cameras were installed at strategic locations, of which **183 sites** have fixed CCTV cameras for disseminating real-time traffic image to the public via internet and mobile app.

http://traffic.td.gov.hk/SwitchCenter.do

15

(D) Traffic Detectors on Strategic Routes

- Installation of about 500 traffic detectors @~500m interval along the selected Strategic Routes
- Facilitate more efficient response to traffic incidents on Strategic Road Network (SRN)
- Provide more real-time traffic data to the public via electronic platforms e.g. DATA.GOV.HK, Traffic Speed Map, etc.
- Building up Big Data for transport in Hong Kong for Big Data Analysis
- Implementation Programme: April 2018 - December 2020

Swift detection of incidents on strategic routes → Earlier response to traffic incidents

Real-time traffic information to the public → Traveler can make informed route choice

Reduce Traffic Congestion
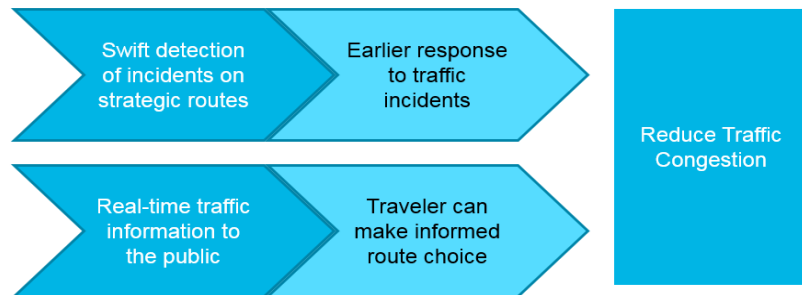
Visual / Thermal Detector for automatic incident detection & traffic volume


Bluetooth Detector for journey time

Automatic License Plate Recognition Camera for vehicle classification & traffic volume
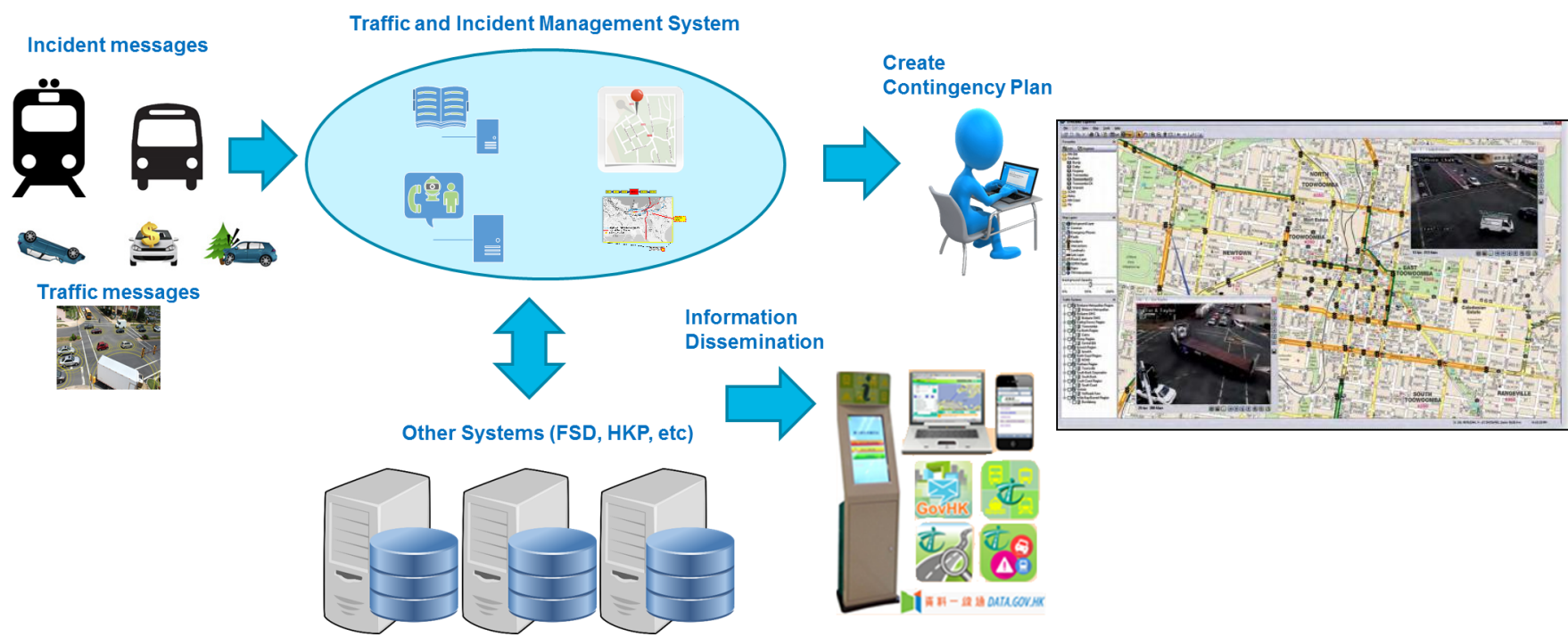
16

(D) Transport Information System

- The **Transport Information System (TIS)** is a **centralised data warehouse** for the collection, processing and dissemination of comprehensive transport information. It provides four key services, namely, Road Traffic Information Service (RTIS), Hong Kong eRouting, Hong Kong eTransport and Intelligent Road Network (IRN).

Transport Information System (TIS)

Intelligent Road Network (IRN)

Hong Kong eTransport

Road Traffic Information Service (RTIS)

Hong Kong eRouting
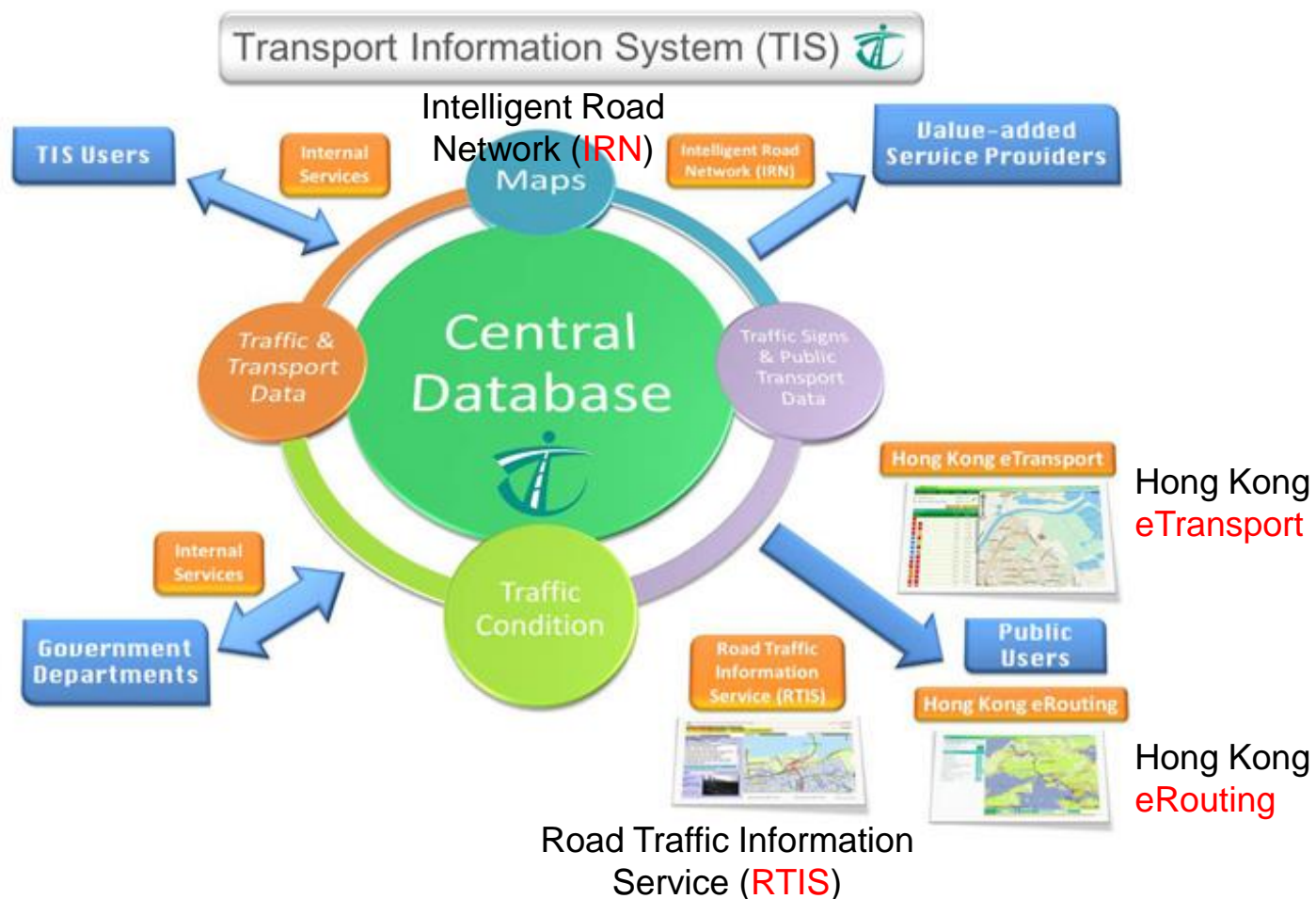
(D) Traffic and Incident Management System

- The **Traffic and Incident Management System (TIMS)** is a computerised system to perform automatic incident detection, generate suggested traffic and transport contingency plans, streamline the dissemination of traffic and transport information to the public.

Incident messages

Traffic and Incident Management System

Traffic messages

Create Contingency Plan

Information Dissemination

Other Systems (FSD, HKP, etc)

- This is a challenging project as TIMS will generate remarkable benefits to the public as well as providing a safe, efficient and smart transport system in Hong Kong by taking advantage of the advancement in applying ITS.

18

4. Latest ITS Projects/Initiatives
Trial of Autonomous Vehicles

West Kowloon Cultural District (WKCD) in Hong Kong
https://www.westkowloon.hk/en/visit/autonomous-vehicle-trial-service

This electric vehicle is 100% self-driving and can carry up to 11 passengers at a capped speed of 15km/hr.

Electronic Road Pricing (ERP) Pilot Scheme

Previous Studies

- Working Party set up in 1994 to examine ERP scheme for tackling traffic congestion in Hong Kong

- Feasibility Study on ERP was commissioned in March 1997, with the objective of evaluating ERP's cost effectiveness and consequences

Recent Studies

- A public engagement exercise for the ERP pilot scheme in Central **(CBD)** and its adjacent areas were carried out during December 2015 to March 2016.

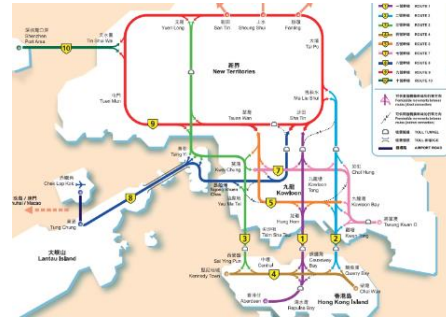- Detailed ERP Pilot Scheme and its implementation strategy in 2019.

5. Opportunities & Challenges of ITS in Hong Kong

| Strengths & Opportunities	Constraints & Challenges
Good transport infrastructure (e.g. comprehensive network of Strategic Routes, PT coverage) - Variety of transport modes - High PT patronage - Efficiency - High smartphone/smart devices penetration	- Densely populated - Ageing population - Wi-Fi coverage - Lack of resilience from congestion - Data shortage
- Renowned business-friendly environment to foster innovation - Strong collaboration generated by the Greater Bay Area Development Initiative	- Strict regulations & Ordinances - Different transport modes competing for right of way - Strong competition among neighbouring cities

Challenges Ahead

- Tackling the Growing Demand/Congestion on all modes of transport in megacity like Hong Kong

- Accommodating increases in Cross-Border movements of people and goods

- Providing a Multi-modal Transport Network with high Reliability, high Availability of service and Predictable journey times

- Improving Sustainability of the infrastructure and related services

- Enhancing the road infrastructure & Reviewing the Regulation/Standard to cope with the latest Technology Development

- Improving Travel Experience & Quality of Life of a Citizen

Hong Kong-Zhuhai-Macao Bridge
(Hong Kong Section)
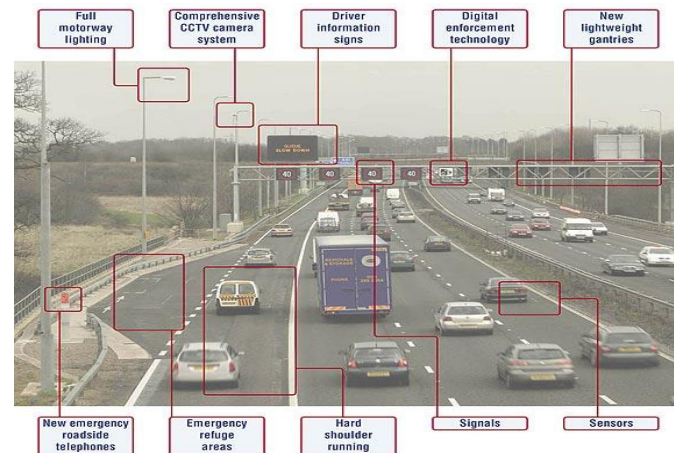
West Kowloon Station of the Guangzhou-Shenzhen-Hong Kong Express Rail Link

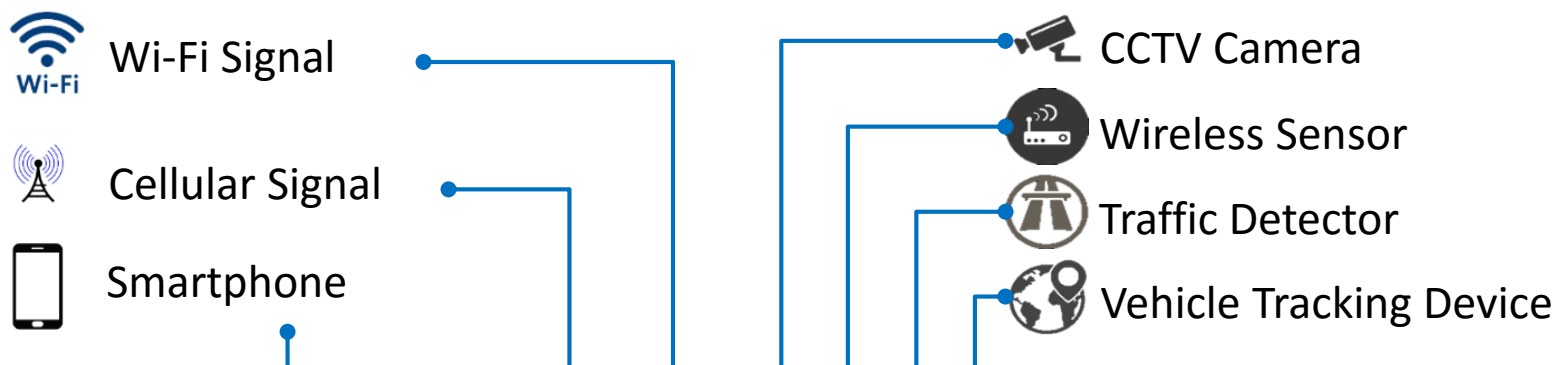# Other Challenges in Hong Kong

(1) Different types
of traffic detectors

(2) High capital cost
for detector installation

(3) Privacy Issues

Stationary and Mobile Sources of Multi-modal Traffic Data

Wi-Fi Signal

Cellular Signal

Smartphone

CCTV Camera

Wireless Sensor

Traffic Detector

Vehicle Tracking Device

What are the **sensing strategies** for collecting stationary and mobile sources of multi-modal traffic data and how are these data integrated and interpreted?

What are the **computing strategies** for centralized and distributed data transmission, processing, interfacing, analysis, sharing, dissemination, and storage, in the context of big data arena?
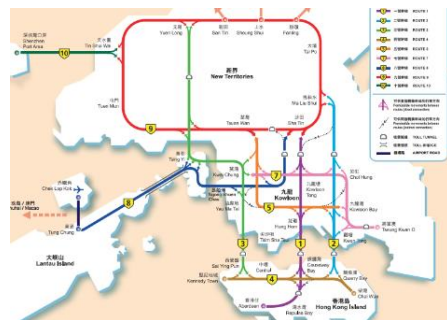
Source: ClouT Project
http://clout-project.eu/

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THANK YOU

The 23rd HKSTS International Conference
8-10 Dec 2018, Hong Kong
http://www.hksts.org