Overview and Challenges of ITS Development in Hong Kong

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# 1. Background

## Basic Transport Statistics of Hong Kong

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>1,106 sq km</td>
</tr>
<tr>
<td>Population</td>
<td>7.41M</td>
</tr>
<tr>
<td>Length of Road</td>
<td>2,112 km</td>
</tr>
<tr>
<td>Length of Rail</td>
<td>231 km</td>
</tr>
<tr>
<td>No. of Licensed Vehicles</td>
<td>0.76M</td>
</tr>
<tr>
<td>No. of Licensed Private Vehicles</td>
<td><strong>0.55M</strong> (or 74.6 veh / 1,000 population)</td>
</tr>
<tr>
<td>Average Daily Usage of Public Transport</td>
<td>12.7M</td>
</tr>
<tr>
<td>Public Transport Ridership</td>
<td>~88%</td>
</tr>
</tbody>
</table>

Sources:
**Traffic Congestion in Hong Kong**

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!

Source: Transport Department
**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)
- **Public Light Bus**: 14.3% (1.82 million)
- **Taxi**: 7.1% (0.90 million)
- **Ferry**: 1.0% (0.13 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

- **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 pillars

*(Innovation and Technology Bureau, 2017)*
3. ITS Applications in Hong Kong

(A) Traffic Information
- HK eRouting
- HK eTransport
- HK eTraffic News
- Integrated Traffic Control Centre
- Journey Time Indication System
- 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.

http://tis.td.gov.hk/rtis/ttis/index/main_partial.jsp

資料一線通 DATA.GOV.HK
(A) Journey Planning on the go

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


HK eRouting provides route search, traffic information & parking information

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

HK eTraffic News provides instant traffic update, traffic notice reminder, road works & event information
(A) Traffic Control Centre (TCC)

• The Traffic Control Centre (TCC), which has been operating since early 2004, provides accommodation for
  • the Emergency Transport Coordination 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
(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.
(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
(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
(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

- Visual / Thermal Detector for automatic incident detection & traffic volume
- Bluetooth Detector for journey time
- Automatic License Plate Recognition Camera for vehicle classification & traffic volume
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).
(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.

- 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.
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

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<td>▪ Variety of transport modes</td>
<td>▪ Densely populated</td>
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<td>▪ High PT patronage</td>
<td>▪ Ageing population</td>
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<td>▪ Efficiency</td>
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<td>▪ High smartphone/smart devices penetration</td>
<td>▪ Lack of resilience from congestion</td>
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<td>▪ Renowned business-friendly environment to foster innovation</td>
<td>▪ Data shortage</td>
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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

West Kowloon Station of the Guangzhou-Shenzhen-Hong Kong Express Rail Link

Hong Kong-Zhuhai-Macao Bridge (Hong Kong Section)
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

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

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