

# General Overview of Intelligent Transportation System (ITS) Development in HK

**Ir Charles So**

**Past President of ITS-Hong Kong (2016-2023)**

**Past President of HKIE- Logistics & Transportation Div (2022-2023)**

**Chairman of Smart Mobility Committee, Smart City Consortium**

**16 April 2024**



# **Contents**

**1. Background**

**2. Intelligent Transportation System (ITS)**

**Development in Hong Kong**

**3. Strategic Studies (in progress)**





# Why do we need Intelligent Transportation System (ITS) ?





# Implications of Traffic Congestion

Recent research from INRIX found the **Total Economic Cost** caused by congestion in **US, UK & Germany** to be **US\$87 billion/yr, US\$90 billion/yr & US\$44 billion/yr** respectively.

It also revealed that **London's drivers** in UK drivers **lost 156 hrs** & **Chicago's drivers** in US **lost 155 hrs** per year due to congestion.

## Tangible Loss

- Increase in travel time and cost
- Increase O&M cost of vehicles in delivery services and road-based PT operators

## Intangible Loss

- Increase environmental impacts
- Interfere with emergency vehicles and delay response to incidents
- Public safety concern

Cities are struggling to curb traffic congestion that drains **resources and productivity**, and **worsens pollution**.

A Growing Concern to tackle by ALL Governors to enhance a City's

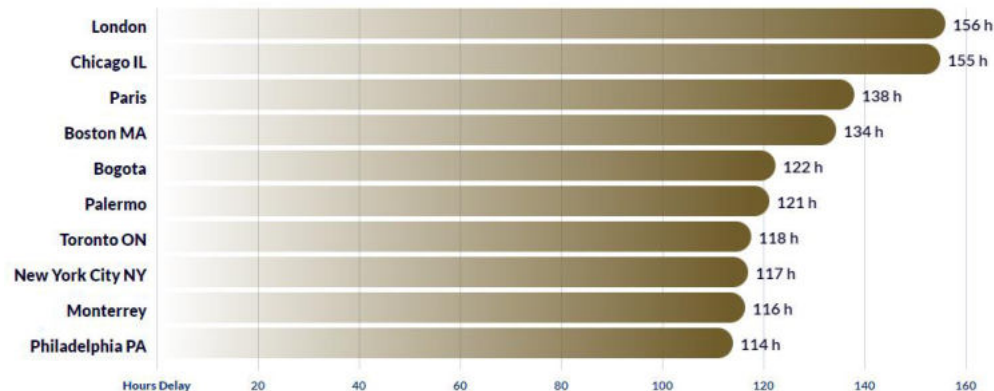
- **Mobility**
- **Quality of life**
- **Economic competitiveness, etc.**

and become a **Smart City**

## The Economic Cost of Congestion

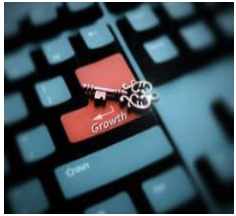


## Traffic Delay Times By City



Source: <https://inrix.com/scorecard/>

# What Makes a Smart City?



Smart Growth

- Compact
- Community focused
- Efficient infrastructure



Sustainable City

- Measurable + Certified
- Low Carbon focused
- Economically, socially and environmentally driven



Livable City

- Quality of Life
- Pedestrian oriented
- Accessible



Eco City

- Environmentally responsible
- Ecologically sensitive
- Green



Smart City

- **INTELLIGENT**
- **CONNECTED**
- **TECHNOLOGY-BASED**

“A **Smart City** is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants, businesses, visitors, organisations and administrators.

A Smart City goes beyond the use of digital technologies for better resource use and less emissions. It means *smarter urban transport networks, upgraded water supply and waste disposal facilities and more efficient ways to light and heat buildings*. It also means a *more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population.*” (EU)

# Smart Mobility

- Transportation, a daily necessity, is central to a smart city development & **Smart Mobility** is a way to move people and goods using new technology that is **faster, cleaner, more accessible** than traditional options, striving towards **frictionless, automated and personalised** travel on-demand.
- **Smart Mobility** aims to provide a **multifaceted, efficient, safe & comfortable** transport system, which is linked to **ICT infrastructure & open data**.
- **Mobile technology** is transforming how people travel. Smartphone Apps are transforming mobility by **improving access** to transportation services, **increase mobility**, and **enhancing traveler engagement**.
- **Intelligent Transportation System (ITS)** encourage more technology-enabled Smart Mobility initiatives can be deployed to
  - ❖ *provide travelers (including tourists) with **travel choices & problem-free accessibility**;*
  - ❖ *improve travel **experience and reliability**;*
  - ❖ *address **non-peak and non-commute** travel;*
  - ❖ ***maximise the carrying capacity***
  - ❖ *enhance **safety***
  - ❖ *incorporate **new travel modes**; and*
  - ❖ ***leverage new opportunities** offered emerging technologies.*

**QUALITY OF LIFE**, clean and sustainable **MOBILITY**, improve **ENERGY EFFICIENCY**, producing high **TECHNOLOGY**, offering culture, be assessable, reduced energy consumption, **PEOPLE**, eco-city, **ACCESSIBILITY**, smart nation, walkability, **SUSTAINABILITY**, citizen well-being, efficiency, **LIVEABILITY**, green building, energy saving, energy management,.....

# Smart Mobility

## What is “Smart” ?

What is **Smart**

- Automation
- Easy to Use
- Efficiency
- Scalability
- No limitation of Time & Space
- Integrated/Connected
- Open/Sharable
- Safe & Secure
- Lower Budget



## How to get Smart?

How to get **Smart**

- Use of Digital Technologies like ITS
- Change Process or Target
- New Business Model



# Hong Kong Fact Sheet



**285 sq-km**  
Built-up Area  
**1,118 sq-km**  
Land Area  
**~25%**  
Built Up Area



**7.5 M**  
Population  
**70%**  
Within 500m of Rail  
Station



**31 %**  
Population over  
60



**786,000**  
Total number of  
Parking Spaces  
**+8%**  
Growth in past 10  
years



**2239 km**  
Length of Public Road  
**+7%**  
Growth in past 10  
years



**271 km**  
Length of Railway  
**+24%**  
Growth in past 10 years

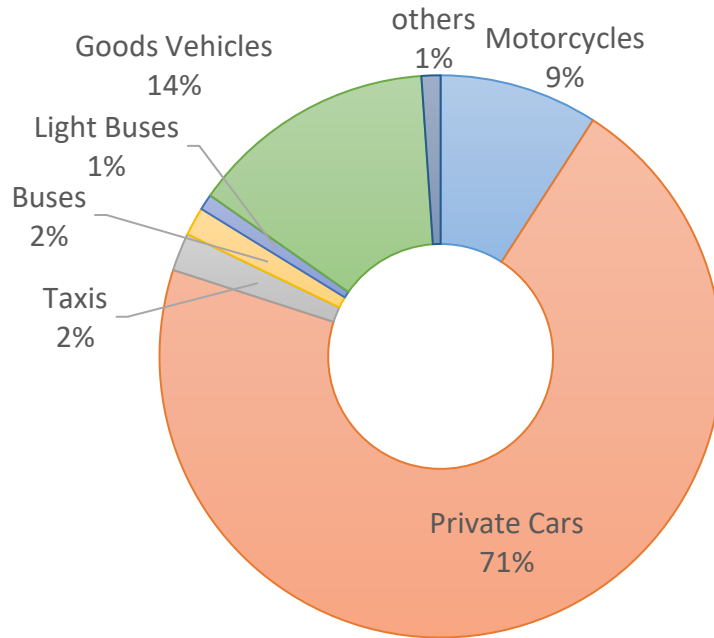


# Public Transport Mode



# Hong Kong Fact Sheet

Licensed Vehicle Mix (2023)

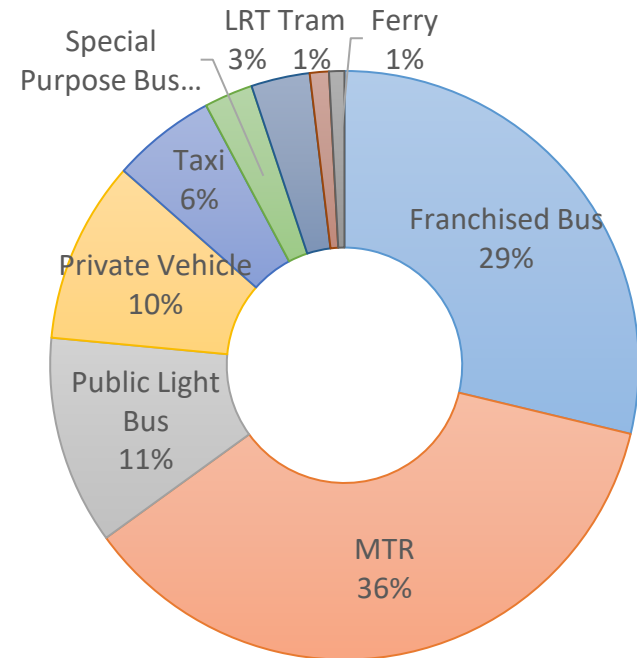


**0.82 Million Licensed Vehicles**

+20% Growth in past 10 years

- Total no. of **Parking Spaces is only 786,000** (even less than licensed vehicles) & the annual growth in parking space is only **+8% Growth in past 10 years**
- Roads are dense with **~ 360 licensed vehicles/km** of road on average

Modal Split (2023)



**Average Daily Patronage of 12M**

- **~40+% of patronage is taking MTR/LRT/Tram**
- **Over 90% of patronage is taking Public Transport**



# Development of Transport Policy in HK

## CTS-1 (1979)



- 1<sup>st</sup> – Improvement of the road system
- 2<sup>nd</sup> – Expansion and improvement of public transport
- 3<sup>rd</sup> – More economic use of the road system

-> *emphasis on infrastructure expansion*

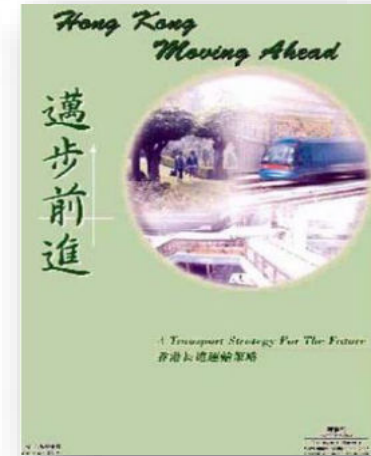
## CTS-2 (1990)



- 1<sup>st</sup> – Improving transport infrastructure
- 2<sup>nd</sup> – Expanding and improving PT
- 3<sup>rd</sup> – Managing road use

-> *emphasis on provision of transport infrastructure expansion (both rail & road) & possible traffic measures*

## CTS-3 (1999)



### 1<sup>st</sup> Pillar

- Better integration of transport and land use planning
- Better use of railways

### 2<sup>nd</sup> Pillar

- Better public transport services and facilities

### 3<sup>rd</sup> Pillar

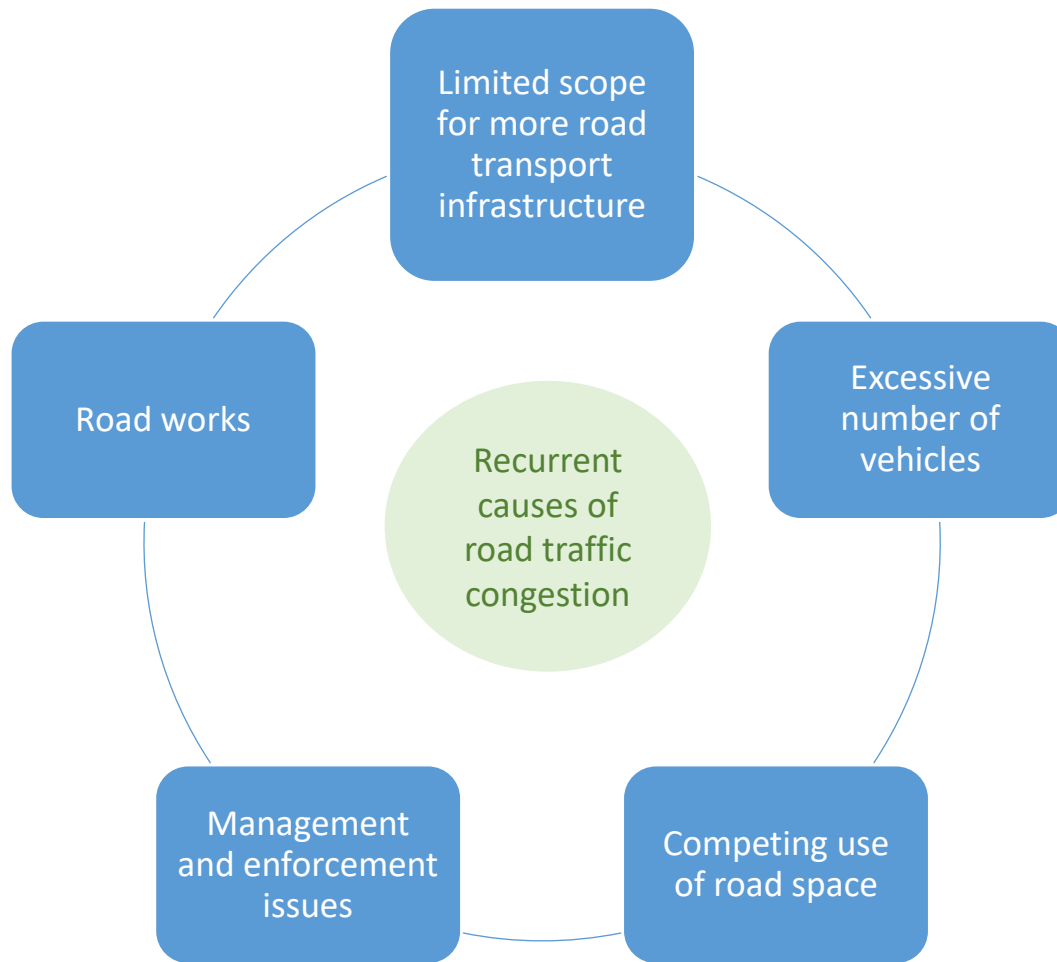
- Better use of new technologies

### Other

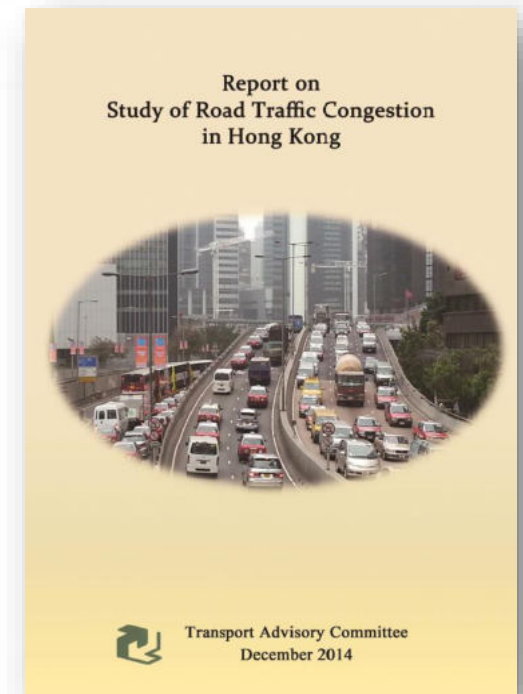
- Better environmental protection

-> *emphasis on pedestrian needs, use of technologies & environmental protection*

# Study of Road Congestion & Proposed TDM Measures in HK



## Causes of Road Traffic Congestion





# Hong Kong Smart City Blueprint

## 4 MISSIONS



The Government published the Smart City Blueprint for Hong Kong in **December 2017**, setting out **76 initiatives**

## VISION

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

Source: <https://www.smartcity.gov.hk>



To make people happier, healthier, smarter and more prosperous, and the city greener, cleaner, more livable, sustainable, resilient and competitive



To enable the business to capitalise on Hong Kong's renowned business-friendly environment to foster innovation, transform the city into a living lab and test bed for development



To provide better care for the elderly and youth and foster a stronger sense of community. To make the business, people and Government more digitally enabled and technology savvy



To consume fewer resources and make Hong Kong more environmental friendly, while maintaining its vibrancy, efficiency and livability

# 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 System and Traffic Management
- Public Transport Interchanges (PTIs)/Bus Stops and Parking
- Environmental Friendliness in Transport
- Smart Airport



Smart Environment

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



Smart Government

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



- Nurturing Young Talent
- Innovation and Entrepreneurial Culture



Smart Living

- Open Data
- Smart City Infrastructure
- Adoption of Technology



Smart People

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



Smart Economy

(Innovation and Technology Bureau, 2017)



# Roadmap for Smart Mobility under Blueprint

## Strategy and Initiatives

- Integrate existing applications into an all-in-one mobile app by 2018
- Develop "in-vehicle units" to receive real-time traffic information and pay fees
- Introduce pilot intelligent traffic signal systems with sensors
- Facilitate trials of autonomous vehicles



### Intelligent Transport System & Traffic Management

- Release real-time information of franchised buses through mobile devices
- Install new on-street parking meters to support multiple payment systems
- Encourage operators to provide real-time information on parking vacancy



### Public Transport Interchanges/Bus Stops & Parking

- Establish "bicycle-friendly" new towns and improve existing cycle tracks
- Take forward "Walk in HK" and encourage people to walk more  
"Make it smart" by providing user-friendly information on walking routes
- Pilot use of green technologies in local ferry operation



### Environmental Friendliness in Transport

- Explore the provision of seamless travel experience by using facial biometrics technology
- Provide hassle-free travel experience for passengers by expanding mobile check-in services to off-airport locations
- Facilitate the use of driverless vehicles in designated places



### Smart Airport

## Goals and Next Steps

### To Enjoy:

- environmental friendly transport modes
- better traffic planning and management
- easy and efficient travel with smart airport
- a pedestrian-friendly environment

### To Plan:

- the journeys more efficiently with real-time traffic information

## Looking Ahead

- Alleviate traffic congestion and tackle other traffic management and enforcement issues
- Facilitate development in vehicle-to-everything (V2X) and introduction of AV with integrated Internet access
- Enhance walkability and pedestrian wayfinding system

# Hong Kong Smart City Blueprint 2.0 (released in 2020)



Blueprint 2.0 issued in **December 2020** puts forth over **130 initiatives** which continue to **enhance and expand existing city management measures and services**. The new initiatives aim to bring benefits and convenience to the public so that residents can better perceive the **benefits from smart city and innovation and technology (I&T)** in their daily lives.

## Hong Kong Smart City Blueprint 2.0 (Dec 2020)

### **Intelligent Transport System and Traffic Management**

- Set up \$1 billion-Smart Traffic Fund to promote research and application
- Develop a Traffic Data Analytics System
- Conduct trial of geo-fencing technology to enhance bus safety

### **Public Transport Interchange (PTIs)/Bus Stops and Parking**

- Commission automated parking system pilot projects
- Conduct trials of installing sensors at non-metered on-street parking spaces to provide real time parking vacancy information

### **Environmental Friendliness in Transport**

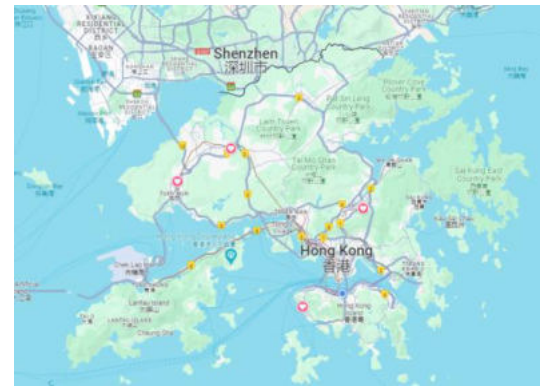
- Implement a pilot scheme for Electric Public Light Buses

### **Smart Airport**

- Apply 5G technologies to provide an independent & reliable wireless network
- Establish a “Digital Twin” of HK Airport to provide a 3D airport model in virtual reality to enable better facilities planning & operation management
- Commission an Automated Parking System at HK Port of the HK-Zuhai-Macao Bridge
- Application of Automation Video Analytics and Internet of Things (IOT) technologies to airport operation



# CHALLENGES FACED BY HONG KONG



Shortage of Housing Supply



Traffic Congestion

Land Supply/Funding Arrangement for Transport infrastructure

Job – Housing Mismatch



Aging of Population & Shrinking Labour Force

Carbon Neutrality before Yr 2050

Increase Demand of Cross Boundary Activities



Insufficient Parking Spaces

Economic Uncertainty

# Contents

1. Background

**2. Intelligent Transportation System (ITS)**

**Development in Hong Kong**

3. Strategic Studies (in progress)



# **Intelligent Transportation System (ITS) Development in Hong Kong**

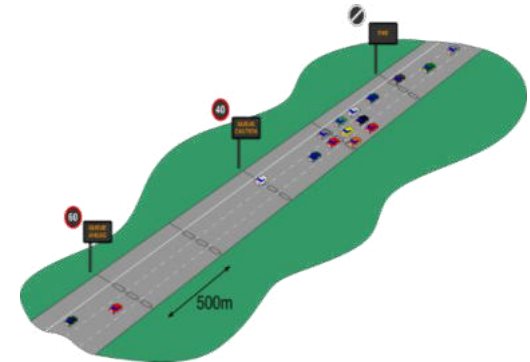
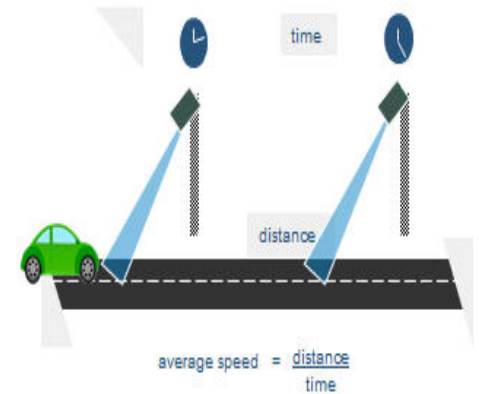
- *Traffic Control & Management*
- *Autonomous Vehicles*
- *Other Smart Mobility Initiatives*



# **(I) TRAFFIC CONTROL & MANAGEMENT**

## (I) Traffic Management & Control

- Hong Kong has a long history using Intelligent Transportation System (ITS) to enhance its Traffic Management & Control strategies **since 70s**. Transport Department initiated an ITS Strategy Review for Hong Kong in 2001 which provided a blueprint for the development of ITS in Hong Kong.
- In the past decades, the Government has stepped-up the deployment of ITS to **maximize the capacity and to enhance the performance of our existing transport system**.
- Common Traffic Control & Management Applications include:
  - ❖ *Area Traffic Control (ATC)*
  - ❖ *Traffic Control & Surveillance System (TCSS)*
  - ❖ *Automatic Incident Detection (AID)*
  - ❖ *Traffic Control Centre*
  - ❖ *Speed Map Panel*
  - ❖ *Journey Time Indicator*
  - ❖ *Electronic Parking Meter*
  - ❖ *Enforcement*



# (a) Area Traffic Control

## General Information

Since the 1970's, the Transport Department has been expanding the coverage of the ATC systems to all urban areas and new towns in the New Territories.

ATC Junctions: Approximately **1935** nos. out of 1962 nos. signalized junctions (as of mid 2023)

## 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+%**



Source: TD website



# 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



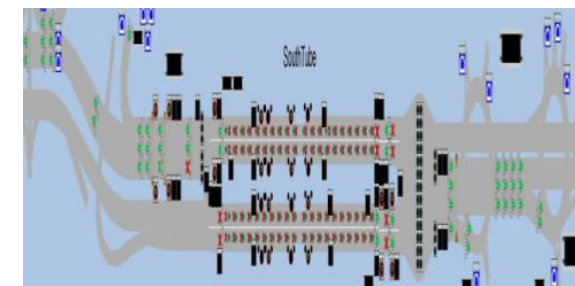
## Electronic Audible Traffic Signals (eATS) at Signalised Pedestrian Crossing for Disabled

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

## (b) Traffic Control & Surveillance Systems (TCSS)

Since early 1980's, all road tunnels and the Tsing Ma Control Area have been equipped with comprehensive Traffic Control and Surveillance facilities including :

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



# CCTV - Data Collection & Analytics

- One of the "Smart Mobility" initiatives in the "Hong Kong Smart City Blueprint" promulgated in December 2017 is to install **traffic detectors on all strategic routes** to provide real-time traffic information.
- Facilitate more efficient response to traffic incidents on SRN & Provide **more real-time traffic data to the public** via electronic platforms
- Installation of approx. **1200+ sets** of additional Traffic Detectors along the selected Strategic Routes recently. Public can now view ~ **200 CCTV images** via HKeMobility.
- 3 types of traffic detectors are installed:
  - a) **Video detectors** – collect data on traffic speed and volume and automatically detect traffic incidents on roads
  - b) **Automatic licence plate recognition detectors** – collect traffic volume of different vehicle classes on roads through matching of licence plate numbers in TD's vehicle licensing system; and
  - c) **Bluetooth detectors** – these detectors generate data on average vehicular speed and journey time by detecting Media Access Control addresses of bluetooth devices in vehicles.
- Building up Big Data for transport in Hong Kong for **Big Data Analysis**.
- TD has developed the **Traffic Data Analytics System**. This model uses a comprehensive range of historical and real-time data, including rainfall amounts, traffic incidents, and journey times across different road sections in Hong Kong to **forecast journey times for the upcoming 90-minute period**, considering traffic and weather conditions.



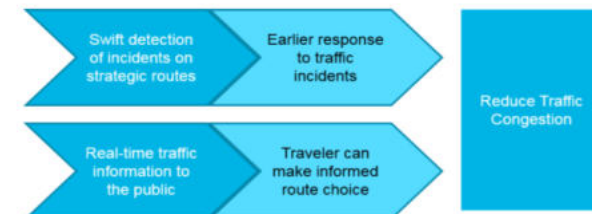
Bluetooth Detector



Video Detector

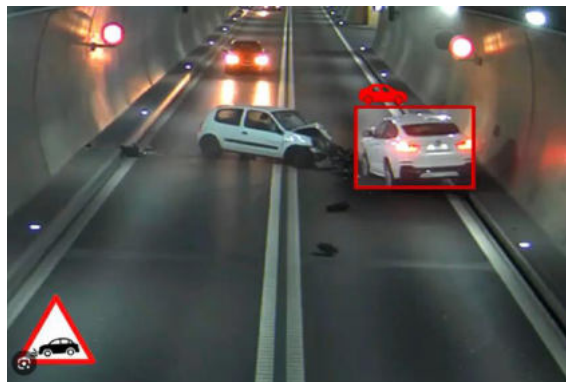
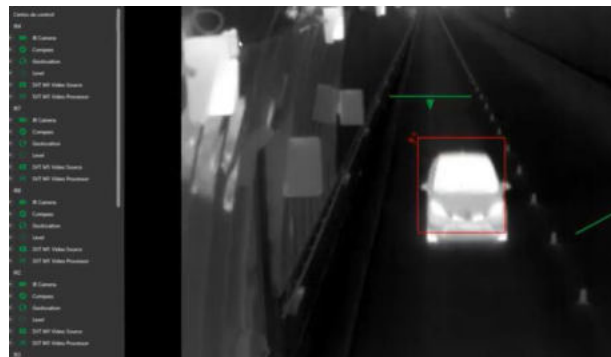


Automatic Licence Plate Recognition Detector





## (c) Automatic Incident Detection (AID) System

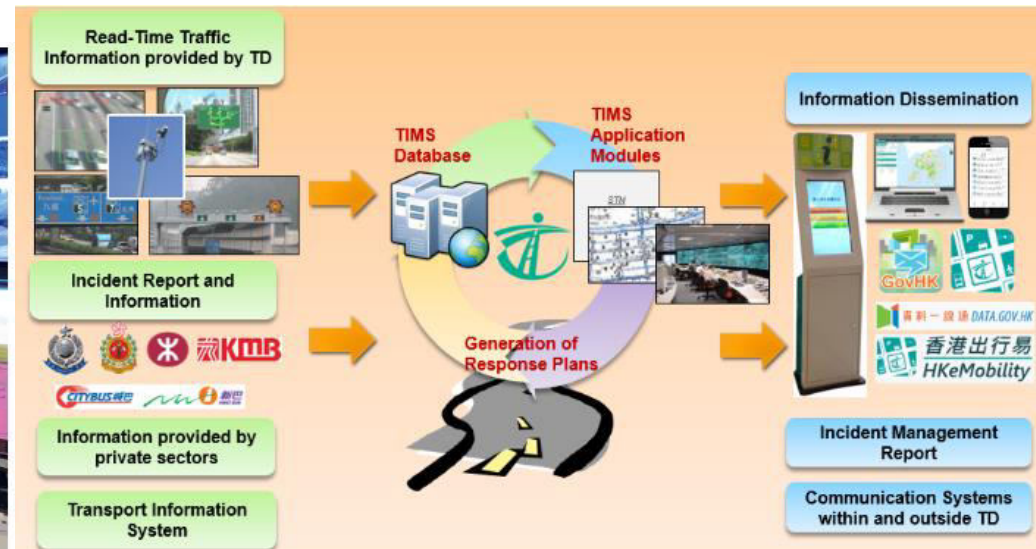


## (d) Traffic Control Centre

The **Traffic Control Centre (TCC)** provides accommodation for the *Area Traffic Control Centre (ATCC)*, the *Emergency Transport Co-ordination Centre (ETCC)* and the *Traffic Control & Surveillance Control Centre (TCSSC)*.

TCC is manned by TD's staff to monitor the traffic and transport situation.

- ❖ **ATCC** will **monitor and adjust on-street traffic signals timing** in real time having regard to the traffic conditions, particularly to alleviate traffic congestion arising from major traffic incidents.
- ❖ **TCSSC** operates the Traffic Control and Surveillance Systems installed at strategic roads and bridges which have no on-site control centres to help **monitor and control traffic according to road conditions**.
- ❖ **ETCC** will **disseminate real-time traffic and public transport news, and coordinate actions and responses of public transport and tunnel operators and other government departments in emergency situation** and during major events which have significant traffic implications, to ensure smooth traffic flow and adequate public relief measures.



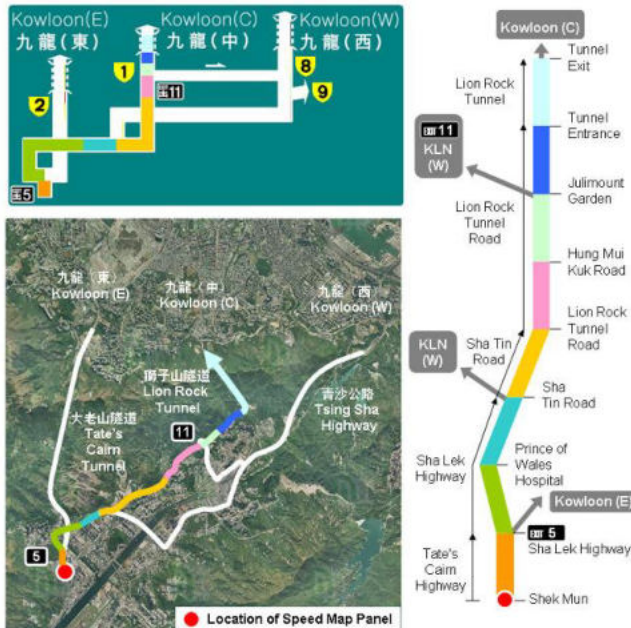
Traffic and Incident Management System (TIMS) was developed in end-2017 to enhance the efficiency and effectiveness in managing traffic and transport incidents, and in disseminating traffic and transport information to the public.



## (e) Speed Map Panel

Traffic Speed Map was launched on TD's homepage back in 2010

Route to Kowloon (C)



Speed Map Panel at Tate's Cairn Highway southbound near Shek Mun

## (f) Journey Time Indicator

JTIS commissioned in 2003 & as of Jun 2023, there are 29 sets of journey time indicators installed



Journey Time Indicators at Waterloo Road southbound near Kowloon Hospital

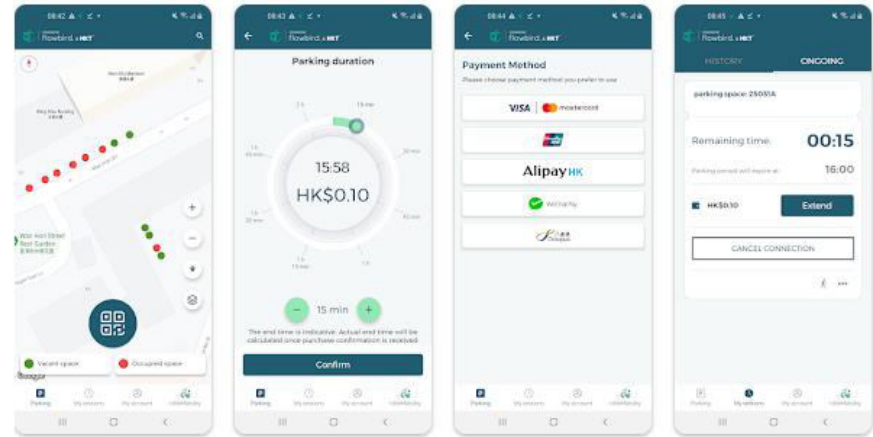


Journey Time Indicators at Gloucester Road Eastbound near Revenue Tower

Source: TD website



## (g) Electronic Parking Meter



There are about **19 000 metered parking spaces** in Hong Kong.

**In 1998**, the old mechanical parking meters accepting coins had been replaced with the electronic ones that accepted **disposable smart cards**.

**In 2004**, replace into the ones that accept **contactless Octopus**

**In 2021**, to promote Smart Mobility, TD had subsequently commenced to install **New Parking Meters** in January 2021 to replace all electronic parking meters that only accept contactless Octopus. (**~10,700 meters were installed**)

The new parking meters have three major functions and features:

- support payment of parking fees through **multiple means**
- support **on-site and remote payment** of parking fees through a new **mobile application, HKeMeter**; and
- equip with **sensors to detect whether a parking space is occupied**, and provide **real-time information to assist motorists in finding vacant parking spaces**



TRIAL SCHEME FOR INSTALLATION OF INTERNET OF THINGS SENSORS AT NON-METERED ON-STREET PARKING SPACES

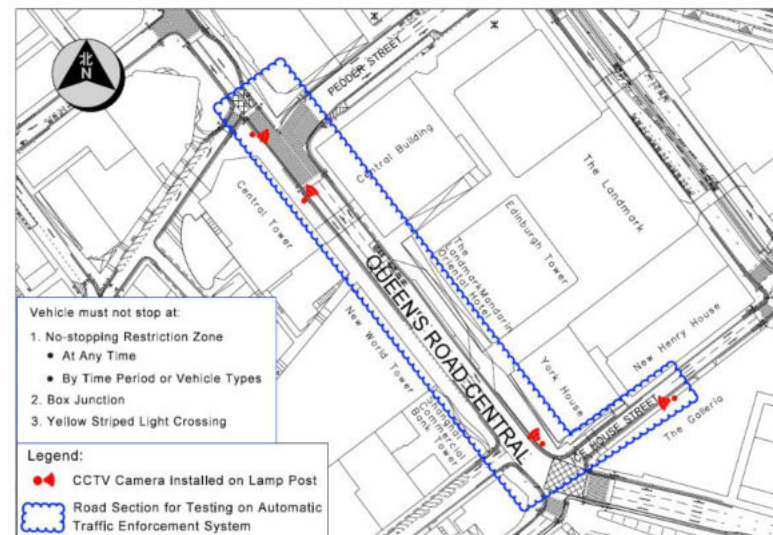
## (h) Enforcement



New Red Light Camera



New Speed Enforcement Camera



**Red Light Cameras** and **Speed Enforcement Cameras** were introduced in Hong Kong in 1993 and 1999 respectively as trials.

Source: TD website

**TESTING ON AUTOMATIC TRAFFIC ENFORCEMENT SYSTEM** were introduced in Central & Kwun Tong as trials to discourage vehicles **illegally parked along no-stopping restriction area** and reduce road congestion.



## (i) Unmanned Aircraft System (UAS)

Transport Department (TD) uses UAS for traffic monitoring and traffic survey purpose. In the case of traffic monitoring, UAS would supplement the CCTVs and traffic detectors installed along strategic roads and enable TD to obtain real-time area-wide traffic conditions for efficient handling of traffic incidents.

For traffic surveys, TD uses video analytics software to extract traffic volumes, vehicle types and other information from the videos taken by the UAS.

In using the UAS, TD emphasize on safety and protection of privacy.

- ❖ Video shooting will not start until the UAS has reached a height of at least 30m above ground (The resolution of the camera in the UAS operating at the above minimum height will not be sufficient for recognition of human faces and car plate numbers);
- ❖ Videos streaming will be encrypted before transmission to TD to prevent interception by other parties;
- ❖ No video will be recorded for traffic monitoring. Videos taken for traffic survey purposes will be erased according to our data retention policy; and



Source: TD website



## **(II) AUTONOMOUS VEHICLE (AV)**

# Autonomous Vehicle (AV)

## Connected & Automated Vehicle (CAV)

*- Examples of Application as part of Diversified Transport System*



Shuttle



Bus



RoboTaxi



Utility Vehicle



Mining



Port



Airport



Logistic

# Autonomous Vehicle (AV) – Robot Taxi

## WeRide Driverless Tests

Guangzhou • China



# Autonomous Vehicle (AV)

- 1<sup>st</sup> Trial of Autonomous Vehicle in 2017



## Trials of Autonomous Vehicles in HK

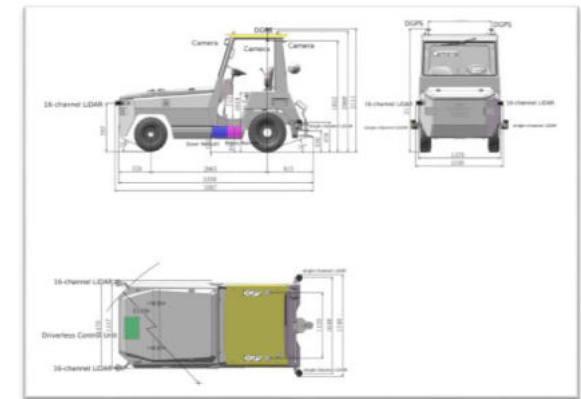
Source: TD website

# AV Development at HK Airport

## - Autonomous Baggage Delivery at Bonded Road



AET operation on Bonded Road was commenced on 30 Dec 2019



# AV Development at HK Airport

## - Autonomous Transportation System at HK Airport



➤ **Autonomous Transportation System** will be operated with Autonomous Shuttle

- Short term: between HKBCF and SKYCITY (i.e. Airport City Link) in **2025**
- Long term: extend to Tung Chung Centre and connect to Tung Chung Station in **2027/28**
- Capacity: **5,000 pax/hour**

Airport City - Autonomous Transportation System (source: HKAA)





# AV Development at HK Airport



**Operation Control Center (OCC)**



**Autonomous Electric  
Tractor Operation  
(2019)**



**Autonomous Patrol  
Car Operation  
(2021)**



**Autonomous Electric  
Cargo Tractor  
(2021)**



**Airside Autonomous  
Bus Service  
(2022)**



**Application in  
AirportCity Link  
(2025)**

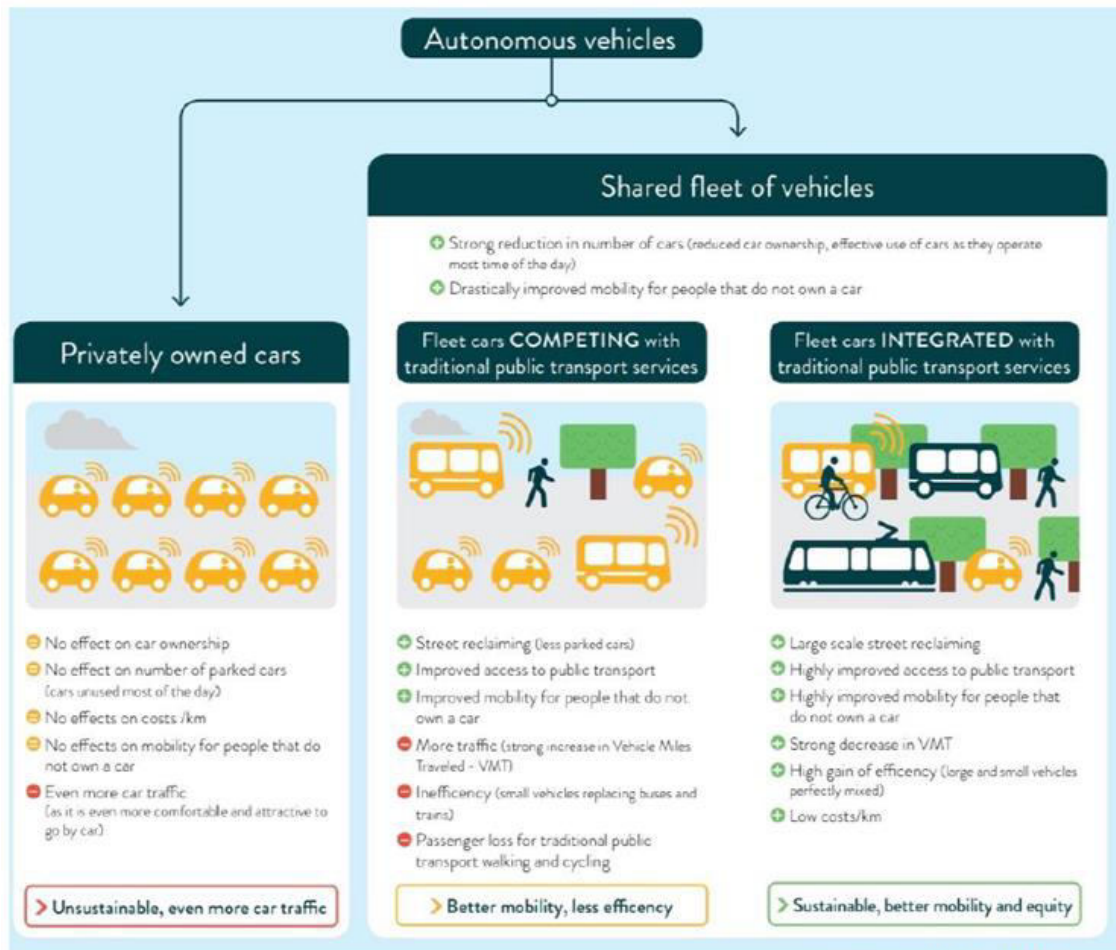


**Application in  
ATCL  
(2028)**

# Autonomous Vehicle (AV)

## Connected & Automated Vehicle (CAV)

- Shared Fleets integrated with Public Transport

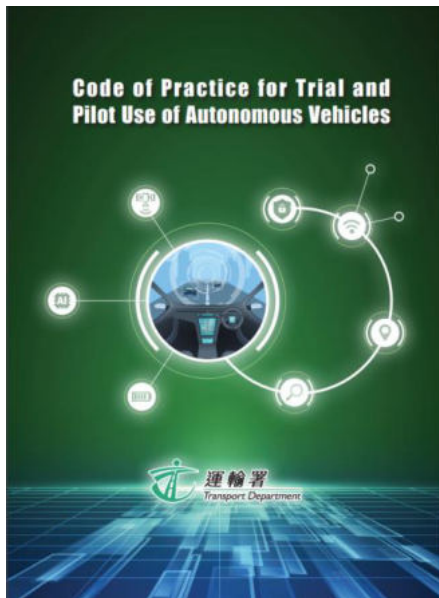


*The benefits of AV will only be fully materialized if AVs are introduced in fleets of **Driverless Shared Autonomous Vehicles** of different sizes reinforcing an **efficient high capacity public transport network** supporting active mobility.*

Source: UITP (2018)

# New Regulatory Regime for Autonomous Vehicles (AVs)

The **Road Traffic (Autonomous Vehicles) Regulation**, which was made under the Road Traffic (Amendment) (Autonomous Vehicles) Ordinance 2023 (AV Ordinance), sets out a specific statutory and regulatory regime to facilitate the wider trial and use of autonomous vehicles (AVs) in Hong Kong. On the premise of ensuring road safety, it will facilitate the industry in testing and applying AV technology with more flexibility, thereby promoting smart mobility. Any person or institution who intends to test and use AVs on the roads in Hong Kong must apply to the Commissioner for Transport for a **pilot licence** and an **AV certificate** in accordance with the new legislation. The new regulatory regime for AVs come into effect on **1 March, 2024**.



Transport Department also published **Code of Practice for Trial and Pilot Use of Autonomous Vehicles**.

The purpose of the Code is to **set out detailed technical and operational requirements** in relation to autonomous vehicles (AV) to ensure that applicants and holders of pilot licences and AV certificates conduct trial and pilot use of AVs safely.

The **major contents** of the Code include: (1) **general requirements of trial and pilot use of AVs**; (2) **backup operator's requirements**; (3) **vehicle requirements**; and (4) **infrastructure requirements**.

## 新規管制制度的優勢

### Advantages of the new AV Regulatory Regime

容許在更多路段或範圍內進行更廣泛、涉及更多自動車、為期較長的測試或應用  
Allow more extensive and longer-term trials or applications which involve more AVs on wider range of roads or areas

更有系統地規管自動駕駛車輛的設計、構造和運作  
More systematically regulate the design, construction and operation of AVs

給予更大彈性，賦權豁免某些窒礙自動車的測試或使用的條文  
Build in more flexibilities to make disapplications to certain legislative provisions which hinder trial or use of AVs

在現行發牌制度下登記領牌，受現行法例所規管，提升安全保障之餘，容許例如載客等的更全面使用  
Registered, licensed and regulated under existing regime so as to enhance safety as well as allow more comprehensive use (e.g. allowing passenger-carrying)



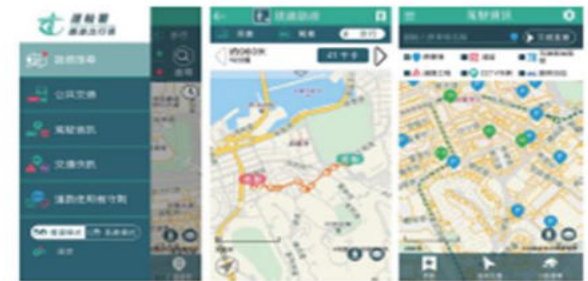
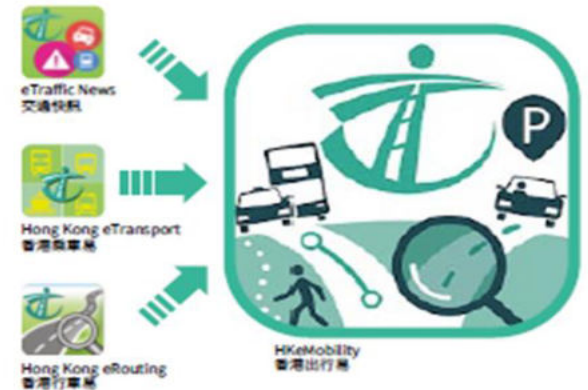
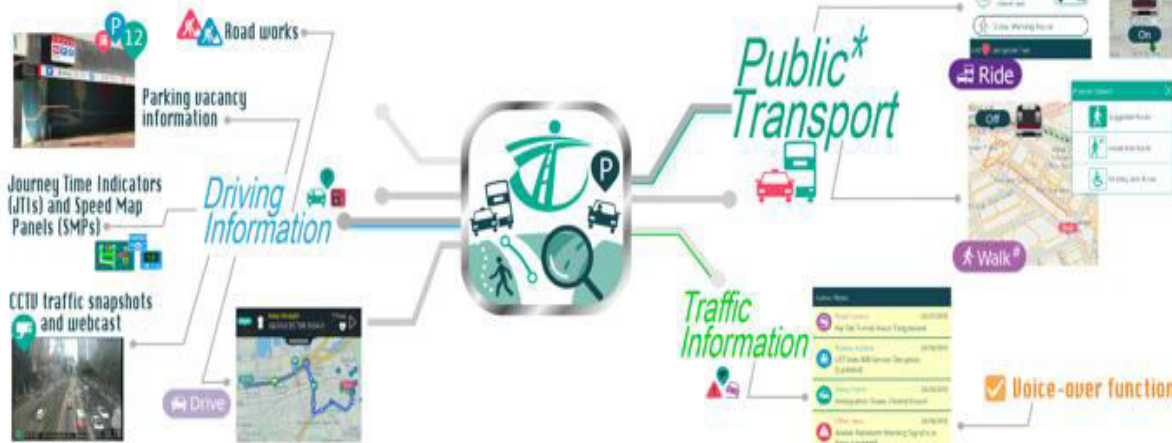
## **(III) OTHER SMART MOBILITY INITIATIVES**

# HKeMobility

It's an all-in-one mobile application integrating TD's 3 previous mobile applications ("**HKeTransport**", "**HKeRouting**" and "**eTraffic News**"). With an enhanced user interface, it facilitates faster and more convenient search for routes of different transportation mode, journey times and fares, and disseminates real-time traffic news to enable the users to plan for the most appropriate travel arrangements.

## One-stop transport and traffic information of Hong Kong:

Public Transport, Driving Information and Traffic Information



An integrated route search for public transport\*, walking and driving



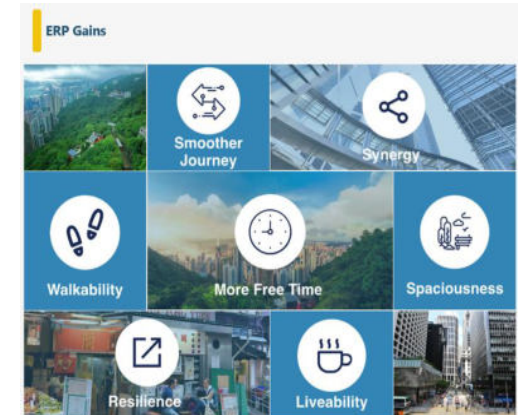
\*Estimated Times of Arrivals (ETA) is accessible

(\*includes Mass Transit Railway, Light Rail Transit, Franchised Bus, Residents' Service, Green Minibus, Ferry, Tram and Peak Tram, Cross Boundary Coach to Huanggang / Lok Ma Chau, Bus to Ma Wan and Discovery Bay)

# Electronic Road Pricing (ERP)



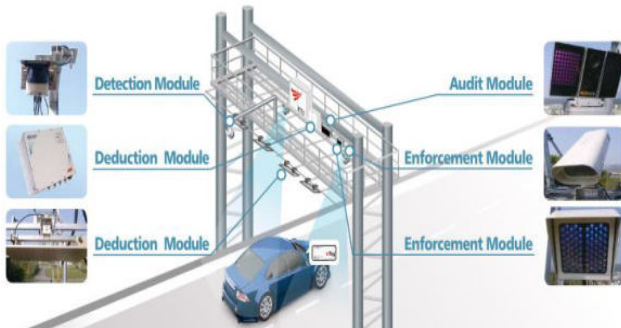
Hong Kong ERP Pilot Scheme (1983-1985)  
Feasibility Study on ERP (1997-2001)  
Congestion Charging Transport Model – Feasibility Study (2006-2009)  
Report on Road Traffic Congestion in Hong Kong (2014)  
**ERP Pilot Scheme in Central & its adjacent area – Feasibility Study (2017- 2022)**





# Multi-Lane Free Flow (MLFF) Tolling

**Multi-Lane Free Flow (MLFF) Tolling** is an electronic toll collection system that allows high-speed free-flow tolling for all road users driving through the toll gantry without the need of toll plaza and toll booths.

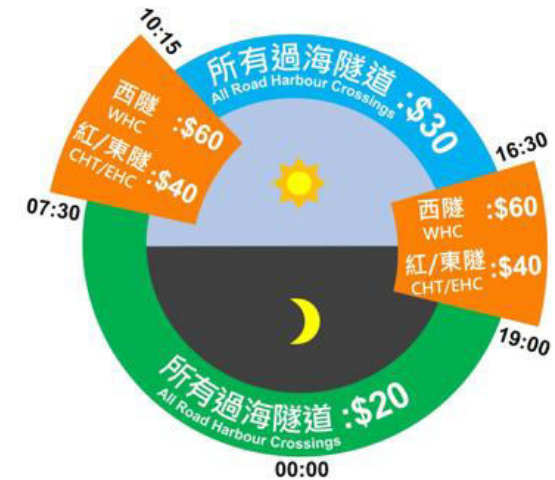
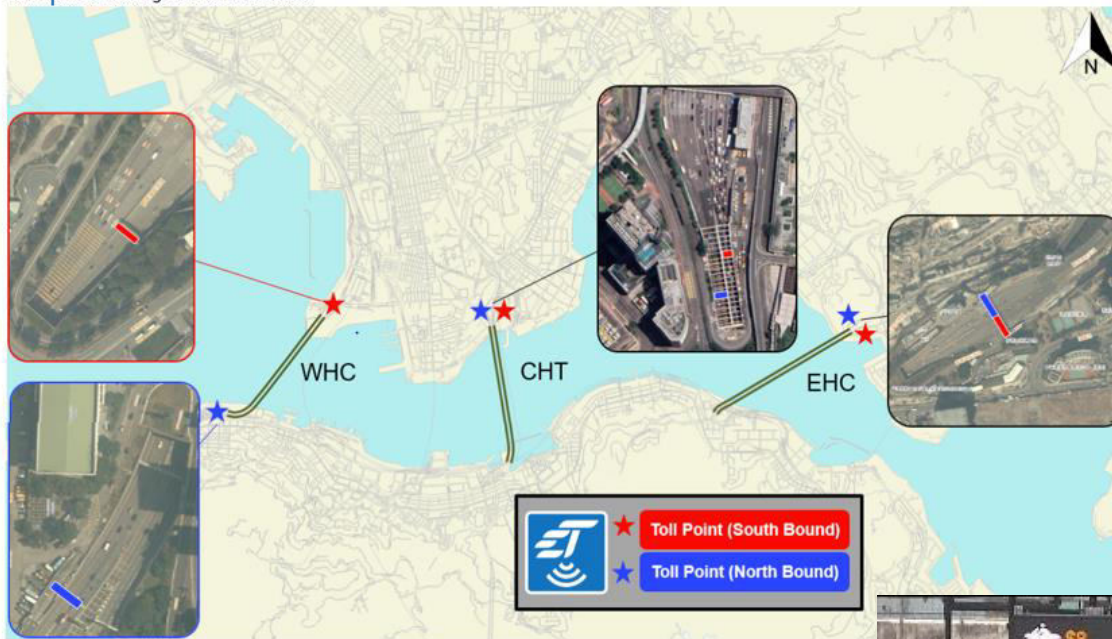


# Time-Varying Toll Plan

**Time-Varying Toll Plan (Dynamic Tolling)** for our 3 Harbour Crossing Tunnels was implemented on 17 December 2023.

The initial observation indicated that the long queues of vehicles for the **Cross-Habour Tunnel (CHT)** and the **Eastern Harbour Crossing (EHC)** at peak hours have been **shortened by over one kilometer and 0.5 kilometer**, respectively. In addition, the nearby tunnel's **non-harbor crossing traffic** has also seen **improvement**.

Locations of Existing Toll Points at RHCs



# Trials of V2X Technology

## Hong Kong Science & Technology Park

- **Hong Kong Applied Science and Technology Research Institute (ASTPI)** started to develop V2X technology in 2016, and conducted road test at the Hong Kong Science & Technology Park for the first time in June 2017.
- In November 2019, through the Innovation and Technology Fund of the Innovation and Technology Commission, ASTRI carried out research and test projects related to the C-V2X technology.
- The site of the latest pilot project was about 14 kms between the Hong Kong Science & Technology Park and the Sha Tin Town Center.
- First 5G Enabled Autonomous Vehicle received the permit to test on public road.
- The test started in March 2021 and lasted for around nine months.





# Automated Parking System



**Puzzle Stacking System**



**Circular Shaft Lifting System**



**Rotary Carousel System**



**Automated Guided Vehicle (AGV) System**



**Vertical Lifting & Horizontal Sliding System (VLHS)**



**Tower Lifting System**

# Automated Parking System

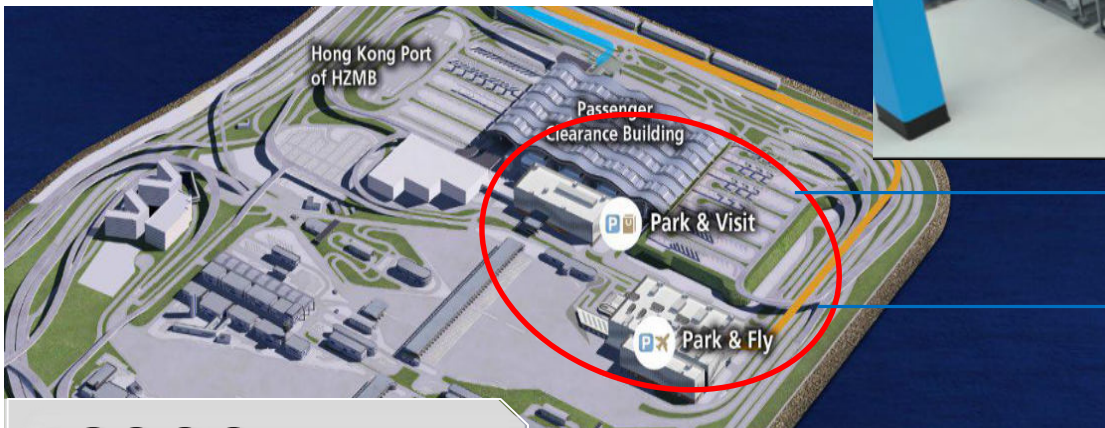


## Automated Guided Vehicle (AGV) Car Parking Solution

Source: <https://www.youtube.com/watch?v=MKu2yEM6Pas>



# Autonomous Parking System at HK Airport



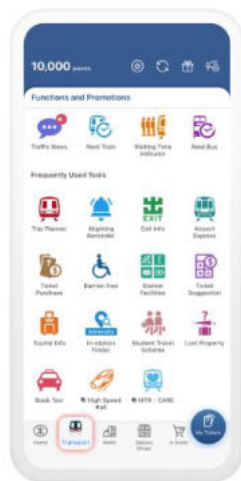
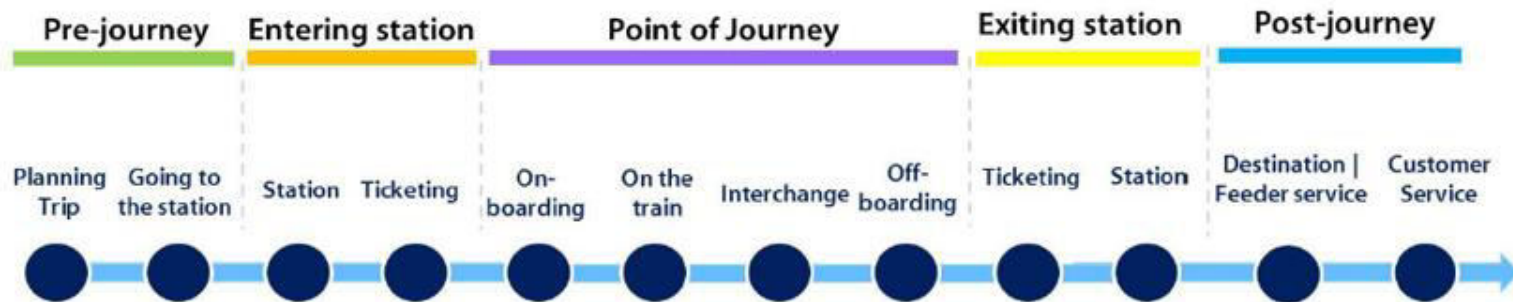
**6000** Parking Spaces

Park & Visit | Park & Fly



# Smart Railway

Provision of more **Seamless, Digitalized & Personalized Services**  
Using Smart Mobility to **enhance Customer Experience & Satisfaction**



The **MTR Mobile** not only helps you enjoy more **personalised and informative journeys**, it also provides lots of **useful information** on MTR Malls and Station Shops. You can also **earn MTR Points** for daily travel, shopping and dining, and **redeem them for free rides** and other rewards.



Other than **Octopus Card & Credit Card**, Passengers can now use **AlipayHK EasyGo**, **UnionPay App MTR Transit QR Code**, **Tencent Transit QR Code** or **MTR Mobile QR Code** for **QR code payment**

Timing train car loading display & next Train information and waiting time indicator using more contextual message



# Smart Vehicle – New Energy



After the pilot eBus trial back in 2013, the 2<sup>nd</sup> generation **single-deck electric buses** with a driving range of 220 km was in operation by **Apr 2022**.



The first batch of KMB's **electric double deckers**, built by mainland automaker BYD, was commenced service in **Jul 2023** with a driving range of close to 300km

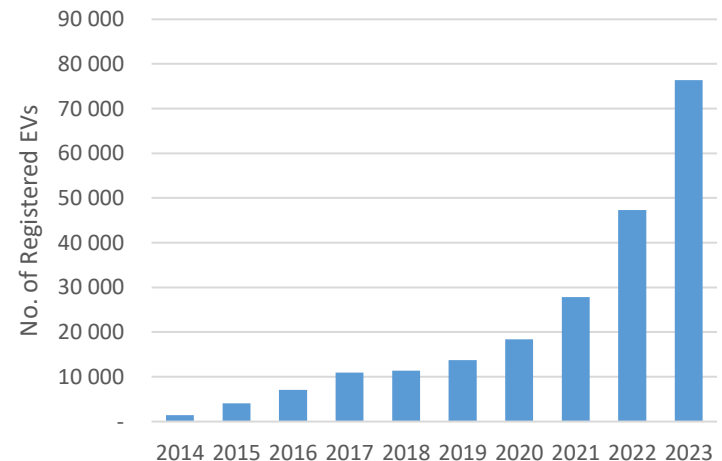


Hong Kong's first **hydrogen buses** commence services in **Feb 2024** alongside the city's first hydrogen refueling station



Various type of **Electric 19-seater minibuses** are currently undergo a 1-year trial as part of a drive towards green transport

*In 2022 Policy Address – 700 public buses & 3000 taxis will be electrified by Year 2027*

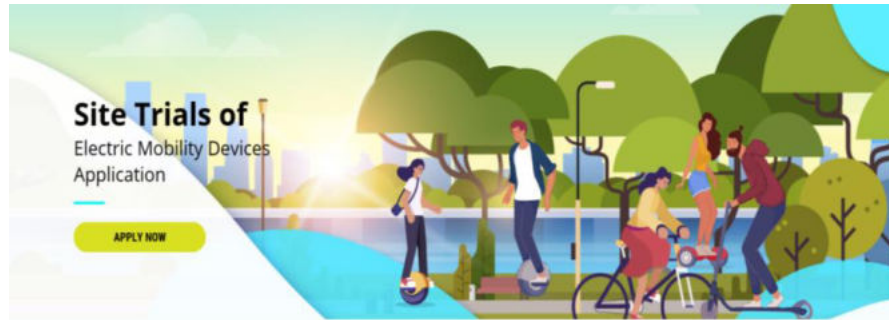


*In the 1<sup>st</sup> half of 2023, 48% of new registered vehicles are electric vehicles*

# Electric Mobility Device (EDM)

**Site Trials of**  
Electric Mobility Devices  
Application

APPLY NOW



The purpose of the site trials is to understand



the public acceptance on the use of motorised PMDs and PAPCs on cycle tracks



the interaction between motorised PMDs, PAPCs and bicycles

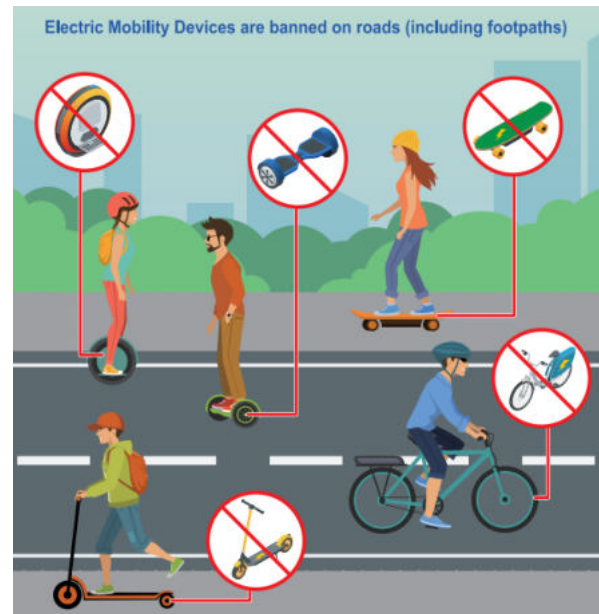


the effectiveness of certain safety requirements to be imposed on users of motorised PMDs and PAPCs



It is the Government's intention to update the legislation by [formulating a proper regulatory framework](#) for EDMs so as to ensure their safe and effective uses and allow more room for the adoption of new technologies and innovation.

TD conducted [site trials on cycle tracks](#) in Tseung Kwan O and Pak Shek Kok in 2021 to examine the interaction [between EDMs and bicycles when sharing cycle tracks](#). Further trial of a 3km cycle section between the University Station and the Science Park was also carried out in 2022. On the other hand, the TD has launched a one-year trial scheme on the [shared use of power assisted pedal cycles \(PAPCs\) on cycle tracks](#) in Pak Shek Kok from March 2023



Proposed Technical and Safety Requirements for  
Motorised Personal Mobility Devices and Power Assisted Pedal Cycles

|                                    | Motorised personal mobility devices (PMDs)                                                                                                                                                                                                                                                                                             | Power assisted pedal cycles (PAPCs) |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Maximum net weight <sup>15</sup>   | 20 kg                                                                                                                                                                                                                                                                                                                                  | 25 kg                               |
| Maximum design speed <sup>16</sup> | 25 km/h                                                                                                                                                                                                                                                                                                                                | Up to 25 km/h with auxiliary power  |
| Maximum width                      | 650 mm                                                                                                                                                                                                                                                                                                                                 |                                     |
| Maximum length                     | 1 250 mm                                                                                                                                                                                                                                                                                                                               | 1 800 mm                            |
| Maximum number of wheels           | 1-2 (wheel set(s)*)                                                                                                                                                                                                                                                                                                                    | 2-3                                 |
| Safety requirements                | <ul style="list-style-type: none"> <li>fitted with a front white lamp and a rear red lamp</li> <li>fitted with a rear red reflector</li> <li>fitted with an effective braking/stopping system</li> <li>fitted with a warning device</li> <li>complying with relevant international standards</li> <li>no passengers allowed</li> </ul> |                                     |

\* If the distance between two centre points of the wheel-to-ground contact areas is less than 300 mm, the two wheels can be regarded as being in one wheel set.

A set of technical and safety requirements was formulated on the [limits on the speed, weight and size of EDMs](#) to set out the conditions required for the safe use of EDMs on cycle tracks.

On implementation, [certification arrangements for EDMs](#) will be proposed to facilitate regulation of their operational as well as electrical and mechanical safety.

Also all EDM users must be [at least 16 years old and wear a helmet](#)



# Multi-Functional Smart Lamppost

The implementation of **Multi-functional Smart Lampposts (Smart Lampposts)** is to promote smart city development with a view to [collecting real-time city data](#) such as [air quality](#) and [traffic flow](#) as well as supporting the development of digital infrastructure for [5G services](#).

The **Pilot Scheme** was successfully completed in [December 2023](#) with over 400 smart lampposts installed in selected locations.

## 1. LED Lighting and Smart Lighting Management System

To provide lighting to the roads and real-time management and control of road lights

## 2. Thermal Detector

To collect real-time traffic data, including vehicle count, average spot speed and road occupancy, for enhancing the efficiency of traffic management

## 3. Meteorological Sensor (Upper Part of Lamppost)

To collect meteorological data at district level, including temperature, relative humidity, wind speed and direction

## 4. Light Detection and Ranging (LiDAR)

To collect vehicle speed and identify some types of vehicles in the traffic

## 5. BATS Code Antenna

To transmit wireless signal for BATS (BATched Sparse) Code Processors for internal data of smart lampposts

## 6. Wi-Fi Antenna

To transmit Wi-Fi signals for providing free public Wi-Fi services

## 7. Bluetooth Beacon

To transmit 2.4 GHz Bluetooth signals for providing accurate position information to users for real-time location-based applications

## 8. Geo-marker

To provide an effective way for devices installed on vehicles to get accurate position information for location-based applications

## 9. Antenna

To provide wireless network connection for smart devices on the lampposts

## 10. Meteorological Sensor (Middle Part of Lamppost)

To collect meteorological data at district level including temperature and relative humidity

## 11. Air Quality Sensor

To collect air quality data including concentration of nitrogen monoxide, nitrogen dioxide and PM 2.5 at district level

## 12. Wi-Fi Label

To indicate availability of free public Wi-Fi services

## 13. Geo-QR Code Tag

To provide pedestrians with accurate position information for location-based applications

## 14. RFID Tag

To provide positioning information via RFID tag that stores corresponding lamppost number and location information



# Contents

1. Background

2. Intelligent Transportation System (ITS)

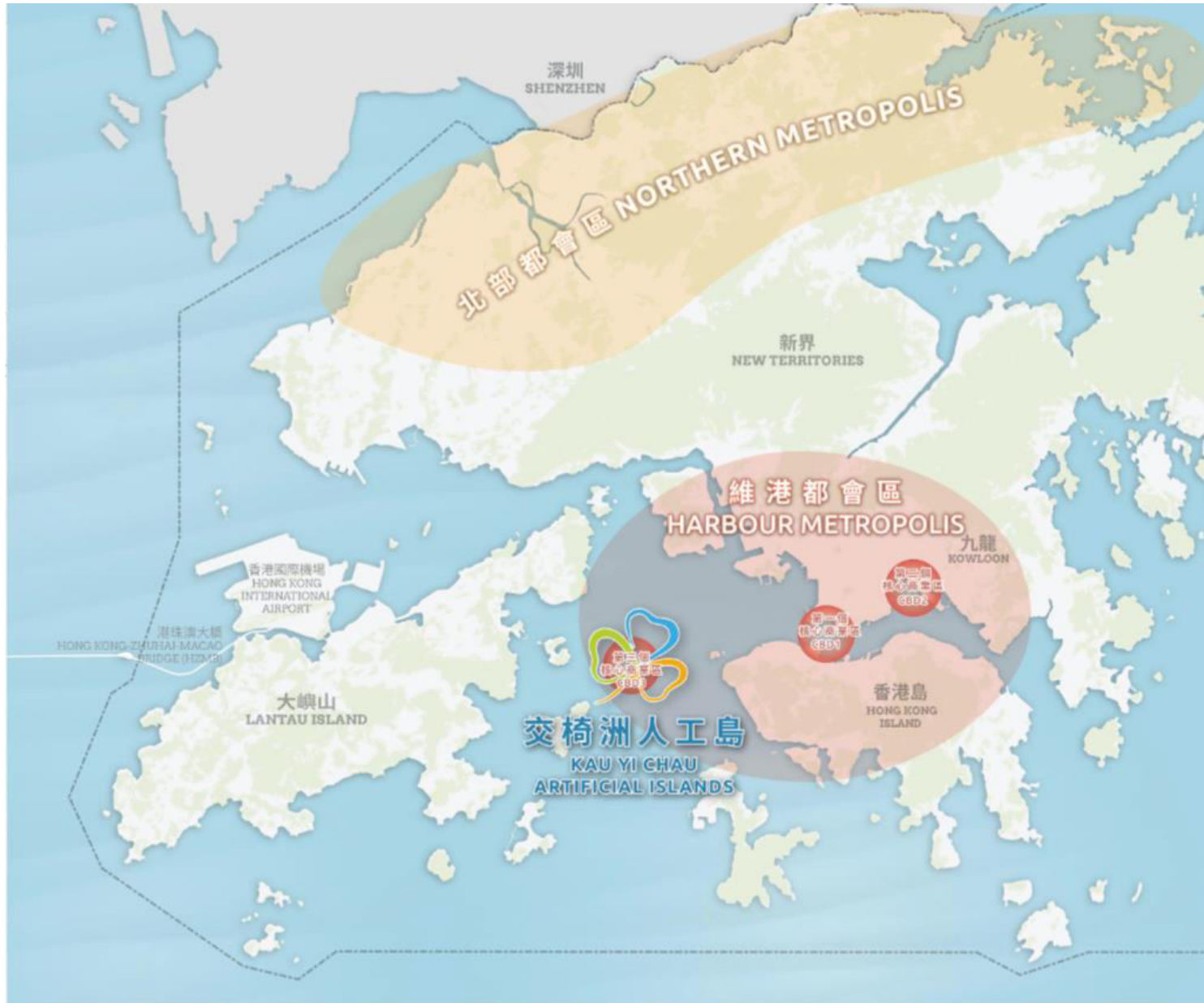
Development in Hong Kong

**3. Strategic Studies (in progress)**



# New Land Supply

## – Northern Metropolis & Kau Yi Chau Artificial Island

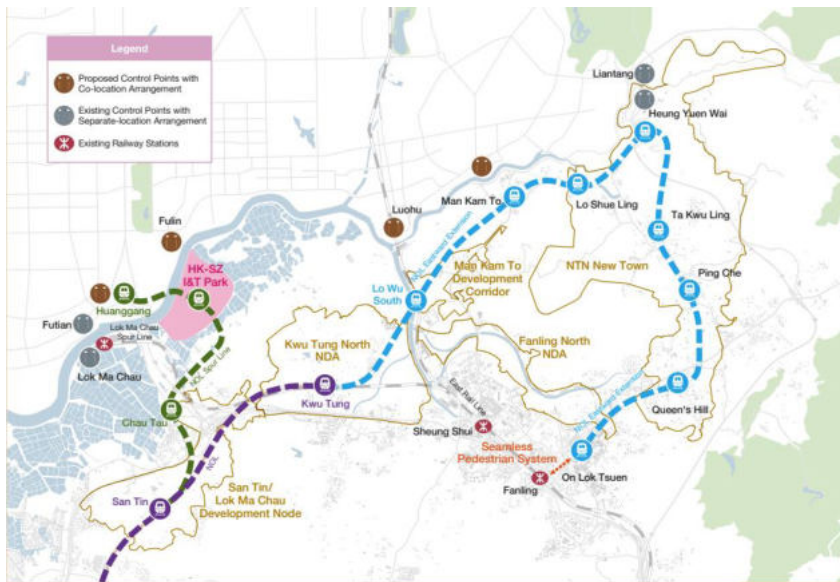




# (i) Northern Metropolis



## 四大區域 Four Major Zones



## 2023 Policy Address:

The Northern Metropolis (NM) is to adopt an “industry-driven and infrastructure-led” approach as its key planning axle, which will forge a major hub for HK to integrate into the overall development of our country

The Northern Metropolis can eventually accommodate a residential population of about **2.5** million and provide about **650 000** jobs, including about **150 000** I&T jobs



**(ii) Kai Yi Chau Artificial Islands – Preliminary Proposal (under study)**



### Major Planning Concept:

- A “Work-Live-Play” CBD 3
- 7 Liveable Living Communities planned with 15-minute neighbourhood concept
- Blue-Green Network for promoting Healthy Living & Biodiversity
- Adopting Smart, Green & Resilient (SGR) Strategy



Source: <https://www.centralwaters.hk/en/study-overview/>



# STUDY FOR MAJOR ROADS & RAILWAYS BEYOND 2030

## Study Objectives:

- The Major Transport Infrastructure Development Blueprint up to and beyond 2046 will be formulated in the Study
- Create development capacity, **connect New Development Areas** to the transport infrastructure network, and increase the coverage of railway and major road network
- Enhance connections between districts, **improve accessibility and resilience of the railway and major road network**, and increase commuting options
- Divert traffic of the existing railways and major roads, and improve traffic conditions

The Study has adopted the **“infrastructure-led” & “capacity-creating” principles** to ensure the planning of major transport infrastructure could cater for or even reserve capacity to meet the transport demand of long-term land development in Hong Kong.





# Smart and Green Mass Transit

The Gov't decided to implement Smart and Green Mass Transit in **Kowloon East, Kai Tak & Hung Shui Kiu / Ha Tsuen** taking into consideration of “SkyShuttle” 「雲巴」, “Autonomous Rail Rapid Transit (ART)” 「智軌」 and “Bus Rapid Transit (BRT)” 「巴士快速公交系統」.

The Gov't will invite suppliers and operators to submit expressions of interest in 2024 to finalize the details

## Features of Green Road-Based Mode



*Operate on Dedicated & Shared Road*



*Passenger-friendly Design*



*Passenger-friendly Design*



*Adopt Low-Floor Design*



**SkyShuttle**  
**雲巴**



**Autonomous Rail  
Rapid Transit  
(ART) 智軌**



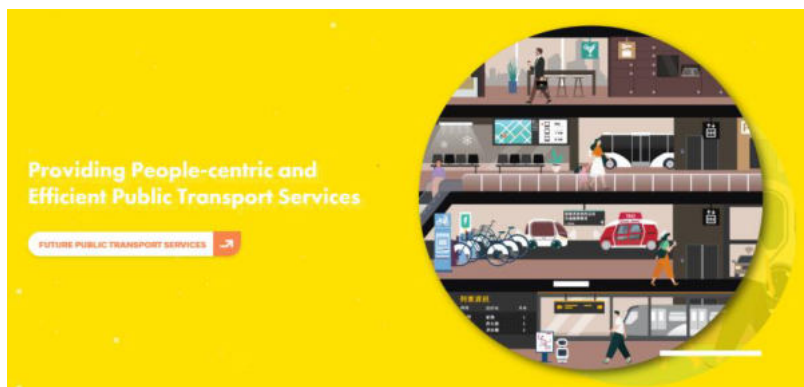
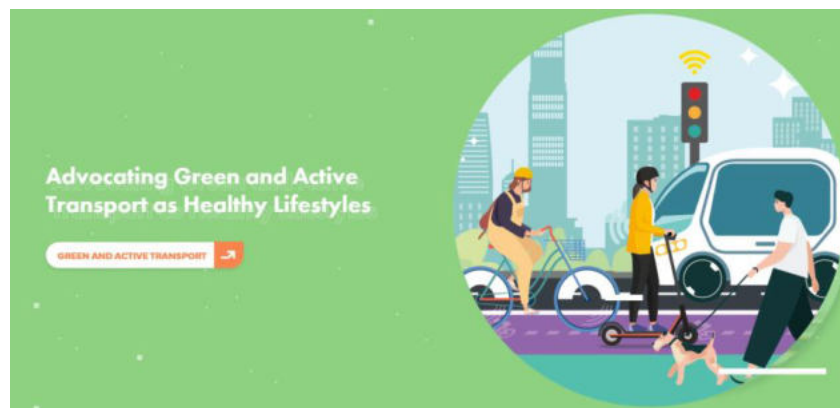
**Bus Rapid Transit (BRT) or  
Green Articulated Buses**

# TRAFFIC & TRANSPORT STRATEGY STUDY (TTSS)

This Study will formulate a **long-term strategy blueprint for Hong Kong** with a view to **building a reliable, safe, smart, environmentally friendly and highly efficient transport system** that can **not only meet the economic, social and leisure travel needs of the public**, but also **support the sustainable development of Hong Kong and facilitate the flow of people and goods in the Greater Bay Area**.

## Study Direction

We will adopt a people-centric approach in formulating strategies for **enhancing passengers' experience** of public transport services, **embracing advanced transport technologies** to develop smart mobility and strengthening the **connectivity between Hong Kong and other cities in the Greater Bay Area** with a view to **developing a liveable and high density city** to support the sustainable development of Hong Kong.



# INITIAL RECOMMENDATIONS OF TTSS

The Initial Recommendations can be summarised under 3 main strategies

## Enjoyable Journey

1. Building a New Generation of Transport Interchange Hubs (TIHs)
2. Exploring the introduction of “On-Demand Public Transport Mode”
3. Making continuous improvements to Cross-Boundary Public Transport services for better connectivity with other cities in the GBA



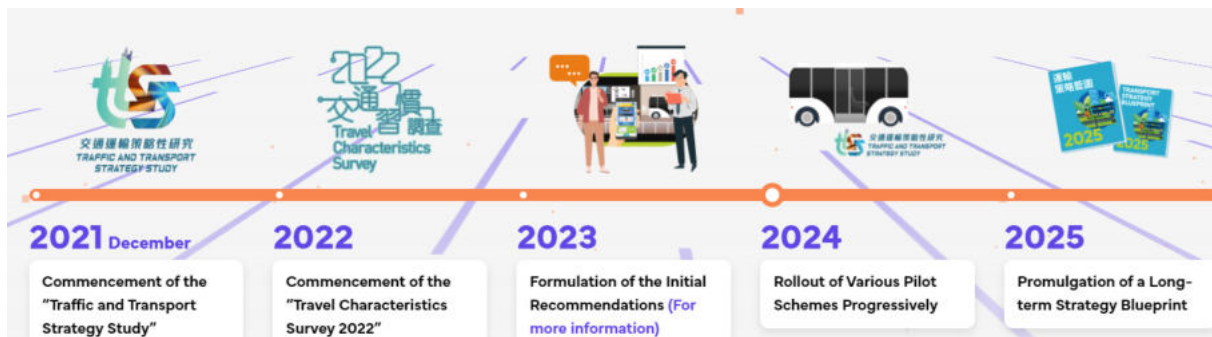
## Well-Connected City

4. Moving Towards the Application of Smart Motorway Management
5. Promoting the Development of Autonomous Vehicles



## Healthy Mobility

6. Continuing to shape HK into a Walkability City
7. Promoting Cycling & supporting the use of Electric Mobility Devices in New Development Areas and New Towns
8. Creating more Sustainable Neighbourhoods by integrating Better Transport and Land Use Planning
9. Cultivating a Culture of Green and Active Transport





# LOOKING AHEAD

## - Smart Mobility Roadmap



**SIGMA Vision** - integrates **five key objectives of smart mobility** for Hong Kong, and shall be adhered to when formulating new smart mobility initiatives

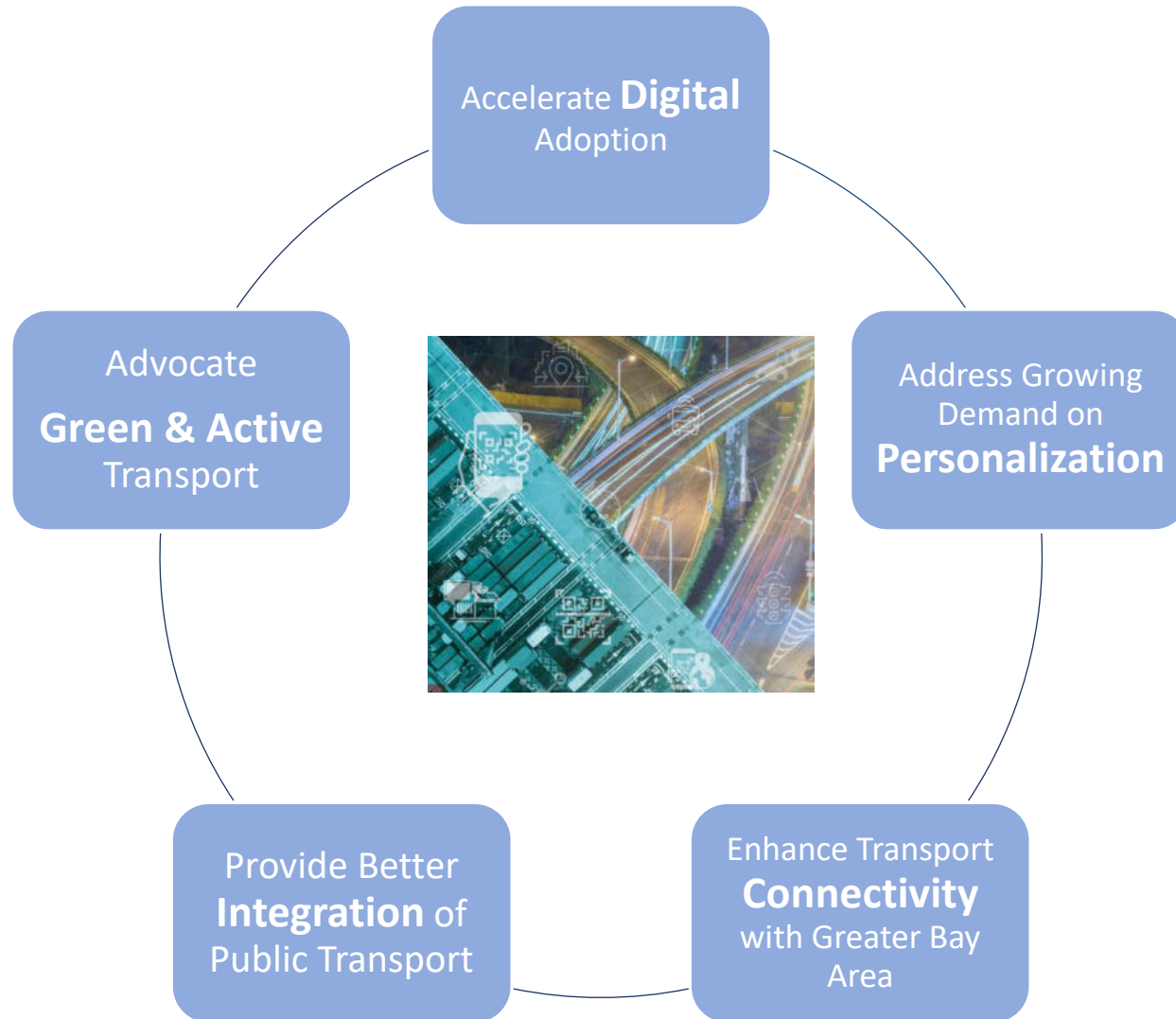
The acronym SIGMA, in mathematical realm, is the symbol of summation (i.e. ). It signifies that the fundamental concept of pursuing smart mobility is to bring overarching benefits to the sustainable development of our transport system.



**Smart Transport Infrastructure, Data Sharing & Analytics and Applications & Services** are envisioned as **moving gears for Smart Mobility Development**. However, they could only drive the entire system forward harmoniously when they are **working together coherently**.

# LOOKING AHEAD

## - Smart Mobility Trends in Hong Kong







# Thank You

[Charless@shkp.com](mailto:Charless@shkp.com)