資料文件

立法會交通事務委員會

與道路運輸有關的智慧出行措施

目的

本文件旨在向委員簡介政府正在推展的各項與道路運輸有關的智慧出行措施。

背景

2. 智能運輸系統是政府運輸政策的重要部分。一直以來，運輸及房屋局和運輸署均致力從三方面發展智能運輸系統，包括向公眾發放交通資訊、應用資訊科技協助管理交通，以及支援交通執法。在2017年12月公布的《香港智慧城市藍圖》中，智慧出行正是打造香港成為智慧城市的重要一環。

3. 鑑於香港的土地資源有限，客觀而言，我們難以不斷興建道路以應付日益增加的交通需求。因此，除了繼續發展以公共交通為本、以鐵路為骨幹的客運系統，我們亦會繼續積極推展各項智慧出行措施，透過善用科技更有效管理交通，紓緩道路交通擠塞，讓有限的路面空間發揮最大效益。

香港智慧出行路線圖

4. 運輸署最近發表了《香港智慧出行路線圖》(下稱「路線圖」)(見**附件**)，當中整合了推行智慧出行措施的以下五個主要目標，即「Σ SIGMA」[1]願景：

(i) 安全(**S**afe)：降低交通傷亡的風險；

(ii) 資訊(**I**nformative)：為道路使用者提供有用的資訊；

[1] 「SIGMA」這個縮寫詞在數學的領域是總和的符號(即Σ)，標誌著推展智慧出行的基本理念是為我們運輸系統的可持續發展帶來整體效益。

(iii) 綠色(**G**reen)：促進使用環保的交通運輸方式；

(iv) 高流通性(**M**obile)：提供高效的客貨運輸、滿足乘客及營運商的需求；及

(v) 便捷(**A**ccessible)：提供便捷及可靠的交通運輸服務。

5. 按照上述指導原則，路線圖從宏觀角度歸納出落實智慧出行策略所不可或缺的三大互動板塊，包括「智能運輸基礎建設」、「數據共享和分析」及「應用和服務」。路線圖所涵蓋的具體落實項目日後會根據最新的科技發展和香港不斷變化的環境而適時作出更新，使香港成為更宜居及可持續發展的城市。下文重點概述路線圖中主要的智慧出行措施。

智能運輸基礎建設

交通探測器

6. 為收集實時交通資訊(包括車流、車速和車輛分類等)，運輸署正進行 1 224 組交通探測器的安裝工程，預計在 2020 年年底前完成，屆時可全面覆蓋所有主要幹線和主要道路。這不但有助運輸署更全面掌握主要道路的交通情況，以提升交通及事故管理的效率，相關資訊亦會透過運輸署的網頁、流動應用程式「香港出行易」和政府的公共資訊網站「資料一線通」向公眾發放。與此同時，運輸署正在各主要幹線和主要道路的主要分流點安裝更多行車時間顯示系統，有關工程亦預計在 2020 年年底前完成。

智能交通燈系統

7. 運輸署將透過在交通燈號控制的路口上安裝感應器，自動偵測實時的車流和人流，從而優化燈號時間的分配，縮短不必要的綠燈時間以減少擠塞和延誤。智能交通燈系統亦可以在交通情況許可下向特定的道路使用者或運輸模式(如專營巴士)安排優先的交通燈號，以鼓勵市民步行和使用公共交通。運輸署已在 2019 年 6 月展開智能交通燈先導計劃，年內會先進行系統測試，其後在 2020 年和 2021 年期間於數個指定路口進行實地安裝。運輸署會適時檢討系統的成效，繼而考慮推廣系統至其他地區。

車內感應器及不停車繳費系統

8. 運輸署計劃由2020年第三季開始，向登記車主免費派發首個車輛的車內感應器，讓駕駛者能在2021年年底將軍澳—藍田隧道(「將藍隧道」)通車時以不停車繳費系統繳付隧道費。運輸署亦將分階段把不停車繳費系統推展至其他政府收費隧道及道路，並爭取在將藍隧道通車後約兩至三年內完成。除了用以繳付隧道費，車內感應器亦有助運輸署蒐集實時交通數據作交通管理和大數據分析用途，以及支援以遙距方式繳付停車場泊車費和配合電子道路收費先導計劃的推行[2]等。此外，運輸署會探討把車內感應器用作電子車輛牌照，以取代現時紙張形式的車輛牌照。

地理圍欄技術

9. 運輸署將於2020年試驗在車輛上應用地理圍欄的技術，以追蹤車輛的位置來檢測該道路的當前速度限制，並在車速超過限制時自動降低車輛速度。試驗結果將有助在專營巴士應用有關技術，以進一步提升營運安全。

自動駕駛車輛

10. 為推動自動駕駛車輛相關技術在本港的發展和應用，運輸署一直與業界保持緊密聯繫，並在現行法例框架下發出許可證，便利自動駕駛車輛在合適地點按特定條件進行測試。自2017年年中至今，已有八款自動駕駛車輛在不同特定地點(例如西九文化區、香港科學園及香港科技大學校園等)進行測試。展望未來，運輸署會與其他相關組織合作，以促成自動駕駛車輛在公共道路上的合適地點進行測試。

數據共享和分析

政府交通數據

11. 在數據共享方面，運輸署一直支持政府的開放數據政策，並於2018年內透過政府資訊科技總監辦公室統籌的「資料一線通」

[2] 運輸署現正參考最新的交通數據、海外經驗、過去有關電子道路收費的研究結果，以及收集到的公眾意見等，優化中環核心區電子道路收費先導計劃的具體方案。待具體方案擬備後，政府會諮詢相關持份者的意見。

向公眾發放了18組以機器可讀格式的交通數據[3]。另一方面，為方便市民選擇最合適的出行安排(例如步行、駕駛或乘搭公共交通工具)，運輸署已於2018年7月將其原有的流動應用程式(即「香港乘車易」、「香港行車易」及「交通快訊」)整合為綜合流動應用程式「香港出行易」，讓市民更便捷地搜尋不同出行方式的路線、行程時間及交通費用等資訊。該綜合流動應用程式自推出以來深受市民歡迎，截至2019年年中，下載次數已超過200萬次。運輸署會繼續豐富該流動應用程式的內容，包括與地政總署合作，於2021年年初或之前把步行路徑資訊擴展至18區，便利市民出行。

公共交通營辦商數據

12. 政府一直積極鼓勵公共交通營辦商響應政府在開放數據方面的整體政策，在「資料一線通」以機器可讀格式開放其所擁有的數據，以實現更廣泛的應用。當中，新世界第一巴士服務有限公司、城巴有限公司及新大嶼山巴士(1973)有限公司已原則上同意開放實時到站資訊，而香港鐵路有限公司亦會將旗下四條鐵路線，即機場快線、東涌線、將軍澳線及西鐵線的實時到站資訊開放。有關數據預期於2019年第三季在政府的「資料一線通」及「香港出行易」開放予公眾及業界免費使用。

13. 此外，政府會出資研發專線小巴實時到站資料收集系統，為全港約3 300部專線小巴安裝定位設備，讓乘客透過運輸署流動應用程式「香港出行易」取得專線小巴實時到站資訊，相關數據亦會透過「資料一線通」發布予公眾免費使用。運輸署已委聘技術專家開展數據收集系統試驗計劃，並已陸續在參與試驗計劃的35條專線小巴路線相關的其中140部小巴上，裝設不同數據收集系統組件以測試並選取合適的技術。試驗預計在2019年年底完成。運輸署會因應試驗結果，由2020年起陸續為所有專線小巴安裝相關裝置，並於2020年年底起分階段推出專線小巴實時到站資訊，以期在隨後兩年全面覆蓋所有544條路線。

實時巴士到站資訊顯示屏

14. 與此同時，為提供更多資訊予在巴士站候車的乘客，政府由2018年上旬起資助專營巴士公司，於約1 300個有蓋及備有電

[3] 直至2018年，運輸署透過「資料一線通」向公眾發放的交通數據包括空置泊車位資訊、行車速度圖、交通情況快拍圖像、設有停車收費錶的路旁泊車位的分佈情況、公共交通路線及收費資料及路口交通黑點列表等。

力供應的巴士站安裝顯示屏，提供實時到站資訊。相關計劃進展良好，現時已完成約 300 個巴士站的安裝工程，並預計於 2020 年完成整個計劃。

空置泊車位資訊

15. 此外，自 2013 年起，運輸署一直致力推動發放公眾停車場的資訊。截至 2019 年 6 月底，運輸署的「香港出行易」流動應用程式發放合共 286 個公眾停車場的空置泊車位資訊，共涉及約 48 000 個泊車位。當中 196 個停車場的空置泊車位數據亦已上載至「資料一線通」，供市民及業界免費使用。運輸署會繼續積極與公眾停車場營辦商聯繫，向他們介紹可行的科技方案，以鼓勵及便利他們採用合適方案收集及發放空置泊車位資訊和數據。運輸署亦會開放路旁泊車收費錶實時空置數據(詳見下文第 16 段)。

應用和服務

智慧泊車

16. 為推動智慧泊車，運輸署計劃由 2020 年上半年開始分階段在全港安裝約 12 000 台新一代路旁停車收費錶，預計安裝工作在 2022 年年初全面完成。新收費錶將接受多種繳費方式，包括支援流動應用程式遙距繳付泊車費。新收費錶亦會配備車輛感應器，以偵測相關的路旁停車位是否已被佔用，提供實時資訊協助駕駛者尋找空置路旁泊車位，有助減少因尋找空置路旁泊車位而產生的交通流量。

17. 在推展智能停車場方面，運輸署正積極進行智能泊車系統[4]先導研究，以評估在香港應用不同類型智能泊車系統的可行性及適用性。運輸署會與相關部門緊密合作，在探討初步技術可行性後，陸續推展六個先導項目(首個為荃灣區短期租約停車場)，並進行相關的地區諮詢工作。鑑於各區議會對智能停車場的訴求，運輸署會繼續積極研究智能泊車系統的具體落實細節，並會因應在荃灣區的先導項目成效，考慮於其他地區的合適短期租約用地加設智能泊車服務。

[4] 智能泊車系統一般配置快速升降機和旋轉/平面移動台等機械裝備運送汽車，並以智能系統控制，自動尋找泊車位置和存取汽車。相對傳統停車場，智能泊車系統可在相同大小空間增加三成至一倍的泊車位數量。

智能公共運輸交匯處

18. 智能公共運輸交匯處的理念是在公共運輸交匯處提供方便乘客的設施及服務，例如發放公共交通服務的預計到站時間、即時交通消息及天氣消息的資訊顯示屏，以及提供座椅、冷氣、無線上網服務、手機充電站及乘客支付等設施。運輸署計劃以試驗形式，翻新及改造馬鞍山市中心公共交通總站，並加入上述大部分元素，預計最快可於 2021 年完工。運輸署會於將來的公共運輸交匯處採用智能公共運輸交匯處的概念，以提升乘客的出行體驗。

利用科技協助交通執法

19. 智慧執法可更有效地確保有限的路面空間得到妥善運用。香港警務處計劃在2019年第三季開展電子定額罰款通知書先導計劃。在先導計劃下，前線執法人員會在違例現場以手提智能裝置處理違泊車輛的資料，並即時以流動便攜列印機列印定額罰款通知書。為配合該計劃，運輸署會在車輛牌照印上二維碼，以便前線執法人員以專用手提智能裝置讀取違例車輛資料，從而減少人手輸入錯誤及節省後端資料處理程序及資源。二維碼經過加密處理[5]，並只包含現有須置於車輛擋風玻璃窗上的牌照所展示的資料[6]。運輸署將會於短期內開始向申領及續領車輛牌照的登記車主簽發印上二維碼的車輛牌照。

20. 由於《定額罰款(交通違例事項)條例》(第 237 章)規定警方須把涉及該條例的交通罪行的定額罰款通知書固定在車輛上，或親自送交掌管車輛的人士，以致警方未能有效地應用科技遙距規管道路使用及以電子方式通知違例人士。就此，我們正研究修訂相關條例[7]，以擴大送達定額罰款通知書的途徑，並容許送達電子定額罰款通知書。

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[5] 由於二維碼經過加密處理，只有警方使用的設備方可讀取有關資料。車主如就二維碼內的資料有任何疑問，亦可在運輸署轄下牌照事務處查閱二維碼的內置資料。

[6] 即車輛牌照到期日、車輛類別、車牌號碼連稽核數碼、廠名、顏色、座位數目及交易編號。

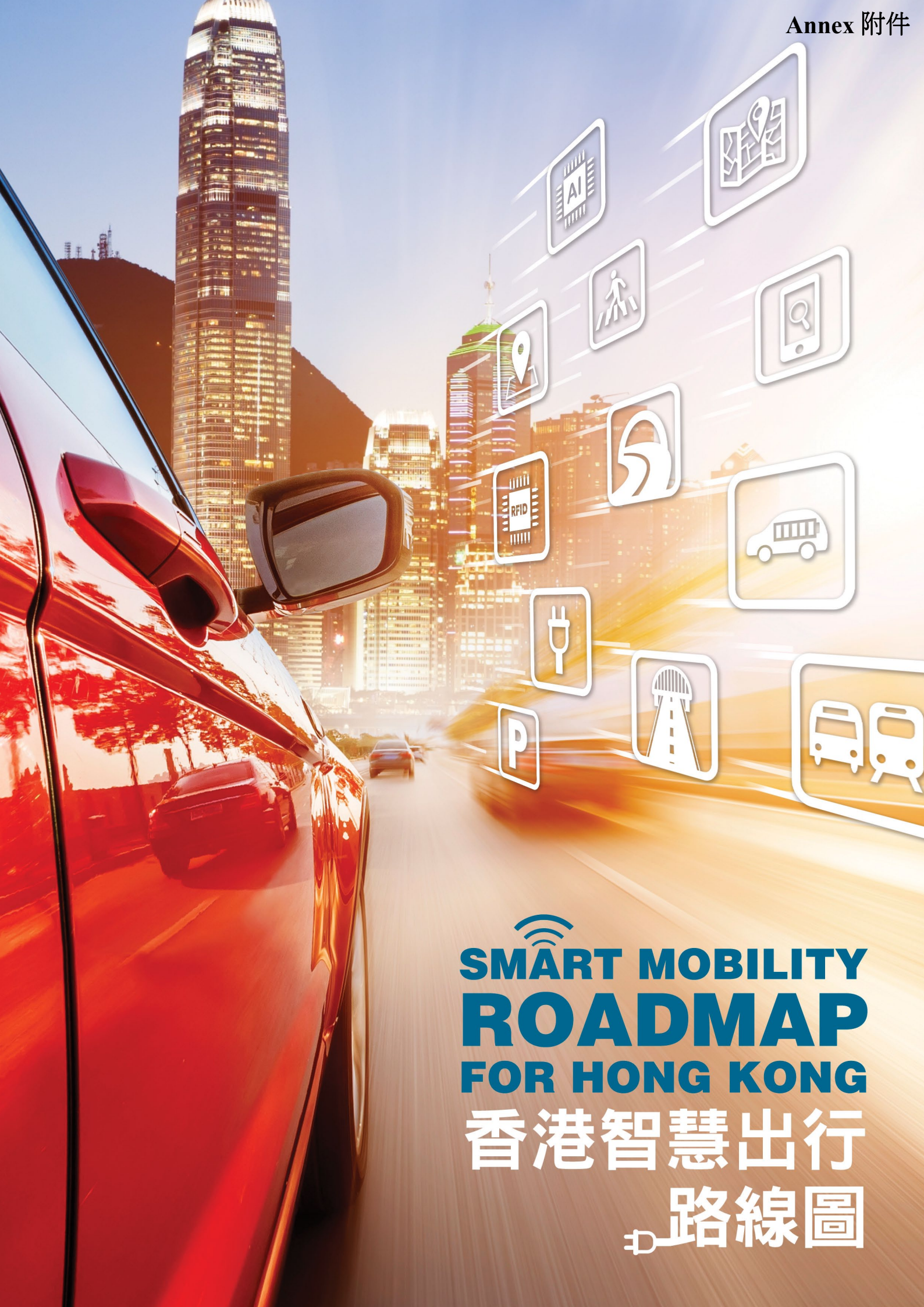
[7] 即《定額罰款(交通違例事項)條例》(第 237 章)和《定額罰款(刑事訴訟)條例》(第 240 章)。

21. 與此同時，警方正與物流及供應鏈多元技術研發中心合作籌劃試驗計劃，選取合適地點設置攝錄機，以影像分析技術協助實際執法，針對部分較為普遍會導致交通阻塞的罪行，包括車輛在巴士站違例停車及在不准停車範圍違例停車等。視乎籌備工作的進展，預計將於 2019 年內諮詢相關區議會，並在年底推行試驗計劃。此外，發展局起動九龍東辦事處正在觀塘和新蒲崗推展兩項利用影像分析技術監察不當使用路旁上落貨區及違例泊車的概念驗證測試，預計分別在 2019 年第四季及 2020 年第三季完成。因應概念驗證的測試結果，政府會在顧及技術可行性和成本效益等因素後，積極研究進一步應用相關技術協助警方打擊違例泊車及其他交通罪行。

徵詢意見

22. 請委員備悉上述各項與道路運輸有關的智慧出行措施。

運輸及房屋局
運輸署
香港警務處
2019 年 7 月



SMART MOBILITY ROADMAP FOR HONG KONG

香港智慧出行路線圖

CONTENTS 目錄

INTRODUCTION
簡介

Capitalise the advent of advanced technology to pursue smart mobility

藉着先進科技的發展以推展智慧出行

The transport system of Hong Kong has been renowned for its excellent infrastructure and efficiency. Every day, it handles over 12 million public transport passenger trips, which account for about 90% of the total passenger trips.

While such success can be attributed to the continuous development of transport infrastructure and the well-established transport policy of according priority to public transport over the years, the use of Intelligent Transport System (ITS) has also played an important role in enhancing the efficiency of our traffic management.

The introduction of the first ITS in Hong Kong dated back to 40 years ago. In the 1970's, Hong Kong launched the first computerised Area Traffic Control (ATC) System in Southeast Asia. Since then, the Transport Department (TD) has progressively established different ITSs to keep up with the times, with examples including the Journey Time Indication System (JTIS) and Speed Map Panels (SMPs), Traffic Control and Surveillance System (TCSS), and recently, the mobile application "HKeMobility".

Looking ahead, to cope with the continuous growth in traffic and transport demand, the conventional approach of expanding our road and railway infrastructure seems no longer an adequate and sustainable solution. Rather, our vision is to capitalise on the advent of advanced technology and to take a giant leap in pursuing smart mobility, an important component of smart city development for achieving a fully integrated, efficient, reliable, sustainable and safe multimodal transport system.

In fact, the concept of Smart Mobility goes beyond the application of ITS. It responds to traffic issues by seeking a variety of novel options which are no longer limited to the scope of transport infrastructure, but could be collating more real-time data to shed light on transport planning and management, or embracing new vehicle technologies to improve road safety and traffic efficiency.

To this end, TD has formulated the "Smart Mobility Roadmap for Hong Kong" to set out a holistic and coherent strategy for implementing a myriad of initiatives in a timely and co-ordinated manner. This Roadmap is not only a recapitulation of responses to various emerging transport-related technologies worldwide, but also a dynamic action plan tailored for Hong Kong, taking into account the unique characteristics, constraints, opportunities and challenges of this city, as well as the valuable comments from the academia, experts and the industry. We envisage that this Roadmap will help us capture the benefits of technology for maintaining the excellence of Hong Kong's transport system and improving people's quality of living.

香港的運輸系統以其卓越的基礎建設和效率而聞名，其公共運輸系統的每日載客量超過1200萬人次，約佔全港總出行人次的九成。

如此成效有賴於持續發展運輸基礎建設，並配合多年來以公共交通為優先的運輸政策。然而，智能運輸系統在提升交通管理效率上亦發揮了重要的作用。

早於40年前，香港已開始發展智能運輸系統。1970年代，香港引入東南亞首個電腦化區域交通控制系統。其後運輸署不斷與時並進，逐步推出不同的智能運輸系統，如行車時間顯示系統和行車速度屏、交通管制及監察系統、以及近期推出的流動應用程式「香港出行易」等。

展望未來，面對持續增加的交通和運輸需求，以傳統的運輸策略如擴建公路和鐵路基建已不足以應付其增長，亦非可持續的解決方案。因此，我們希望藉着先進科技以推展智慧城市發展中一個重要的部分——智慧出行，讓我們的智能運輸系統跨進一大步，以實現綜合、高效、可靠、可持續和安全的多模式運輸系統。

事實上，智慧出行的概念遠超過智能運輸系統的應用。它並不局限於以運輸基礎建設的層面來應對交通問題，而是透過尋求各種新穎的方法，例如通過整理更多實時數據以輔助運輸規劃和管理，或透過引進新的車輛技術來改善道路安全和交通效率。

為此，運輸署編定了「香港智慧出行路線圖」，以制訂一套全面而連貫的整體策略，適時和有序地落實各項智慧出行的措施。本路線圖不僅是對世界各地各種新進運輸相關技術的回應，而是為香港度身訂製並會適時更新的行動計劃。它考慮到香港獨有的特點、限制、機遇和挑戰，以及來自學術界，專家和業界的寶貴意見制訂而成。我們期望本路線圖將有助善用科技，以保持香港運輸系統的優勢，並改善市民的生活質素。

TIMELINE OF INTELLIGENT TRANSPORT SYSTEM (ITS) IN HONG KONG
智能運輸系統在香港的過去與現在

Over the years, the adoption of ITS has brought about real benefits in improving road safety, reducing travelling time, bringing convenience to road users and improving the efficiency of traffic management

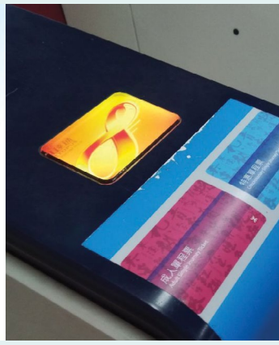
多年來，智能運輸系統的應用帶來了不少效益，包括改善交通安全、縮短行車時間、方便道路使用者及提升交通管理的效率

The ITS has been an important element in our traffic management. Back to the 1970's, Hong Kong launched the first computerised ATC System in Southeast Asia. The ATC system was proven to have significantly reduced travel time by allowing "green wave" movement to minimise stopping of vehicles when passing a series of traffic signals. Red light cameras and speed enforcement cameras were also introduced in 1993 and 1999 respectively with a remarkable reduction of traffic accidents.

智能運輸系統是本港交通管理的重要元素。早於1970年代開始，香港已引入東南亞首個電腦化區域交通控制系統。我們的經驗顯示，通過該系統的應用能允許連續的綠燈，令車輛經過一連串交通燈號時所需停頓的次數大幅減少，總行程時間亦顯著縮短。另外，我們於1993年及1999年分別安裝了衝紅燈攝影機及偵速攝影機，交通意外的數目亦因而顯著減少。

In 1997, a contactless smart card system "Octopus" was launched, which can be used on most of the transport services in Hong Kong including railways, buses, minibuses, coaches, ferries, car parks and parking meters. This has revolutionised the means of transport payment, bringing great convenience to travellers.

於1997年，本港推出無接觸式電子智能卡系統「八達通」，為香港大部分交通服務採用，包括鐵路、巴士、小巴、旅遊巴士、渡輪、停車場及泊車咪錶。「八達通」的出現為交通支付模式帶來了革命性的改變，令市民的出行帶來很大方便。



Amidst the continuous advancement of ITS technology, the TD published the first ITS Strategy and Development Plan in 2001, which mapped out the future development of ITS in Hong Kong for the next 10 years. Under this plan, a Transport Information System (TIS) serving as a centralised data warehouse was set up in 2003. It adopts spatial information and web-based technologies to support real-time updating and retrieval of transport and traffic information.

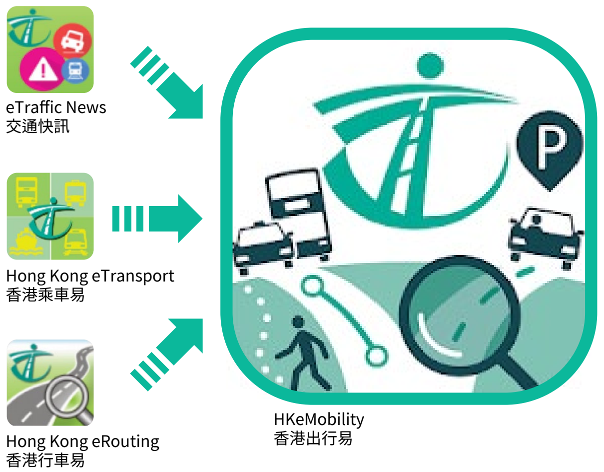
隨著智能運輸技術的不斷發展，運輸署於2001年發佈了首份智能運輸系統策略及發展計劃，規劃香港未來十年在智能運輸系統方面的發展。根據該計劃，運輸署於2003年建立了運輸資訊系統，作為一個中央數據庫。透過空間資訊技術和互聯網技術，運輸資訊系統可以即時更新和檢索交通運輸資料。

Starting from 2003, Hong Kong has been progressively installing JTIS and SMPs to advise motorists of the estimated journey times of the three cross-harbour road tunnels and major roads connecting the New Territories to Kowloon. Besides, with the introduction of TCSS, over 700 Closed Circuit Television Cameras (CCTVs) along strategic routes and major roads are now working round the clock to feed real-time images of road situations to the control centres, strengthening TD's capability in handling incidents and other major traffic events.

Between 2011 and 2016, three mobile applications (namely, "Hong Kong eTransport", "Hong Kong eRouting" and "eTraffic News") were launched to provide public transport information, driving route information and latest traffic news respectively. In July 2018, TD integrated them into the all-in-one mobile application "HKeMobility", with new features including the estimated time of arrival (ETA) for buses and trams, the real-time parking vacancy information, and the walking route search function.

由2003年起，香港逐步安裝行車時間顯示系統和行車速度屏，為駕駛人士提供三條過海隧道及連接新界至九龍的主要道路的預計行車時間。運輸署亦引入了交通管制及監察系統，於主要幹線及主要道路上安裝約700部全天候運作的閉路電視，向控制中心提供實時交通影像，加強運輸署處理交通事故和其他大型交通活動的能力。

於2011年至2016年期間，運輸署推出了三個流動應用程式(即「香港乘車易」、「香港行車易」及「交通快訊」)，分別提供公共交通資訊，駕駛路線和最新交通消息。其後於2018年7月，運輸署將該三個流動應用程式整合為一站式流動應用程式——「香港出行易」，並新增了不同的功能包括巴士和電車的實時到站資訊、實時泊車位空置資訊、以及步行路線搜尋功能。



With regard to traffic incident management, the Traffic and Incident Management System (TIMS) was officially put into service in 2017 to enhance both the traffic incident management efficiency and the dissemination of traffic and transport information to the public. The TIMS has several functions including automatic incident detection, identification of alternative traffic routes using the Geographic Information System, consolidation of traffic and transport contingency plans, provision of traffic information to stakeholders, etc.

In 2017, TD introduced the "stop-and-go" e-Payment System, with the first location at Shing Mun Tunnels. Motorists are now able to pay tolls at eight government tolled tunnels and roads by "Octopus" or contactless credit cards, saving time otherwise spent on cash counting and receiving changes at toll booths.

Over the years, the adoption of ITS has brought about real benefits in improving road safety, reducing travelling time, bringing convenience to road users and improving the efficiency of traffic management. In future, the ever-advancing technology will, on one hand, empower ITS to play a more pivotal role in supporting the transport system, and on the other hand, open up new opportunities in developing novel smart mobility initiatives to meet our needs.

在交通事故管理方面，交通及事故管理系統於2017年正式投入服務，以提高交通事故管理效率，並向市民發放交通運輸資訊。交通及事故管理系統具備多項功能，包括自動偵測事故、利用地理信息系統識別交通替代路線、整合交通運輸應變計劃，為持份者提供交通資訊等。

運輸署於2017年率先在城門隧道推出「停車拍卡」式電子繳費系統。駕駛人士現時可以於八條政府收費隧道和道路透過「八達通」或非接觸式信用卡繳付隧道費，從而減少於收費亭點算現金及找贖的時間。

多年來，智能運輸系統的應用帶來了不少效益，包括改善交通安全、縮短行車時間、方便道路使用者及提升交通管理的效率。展望未來，不斷進步的新科技將一方面使智能運輸系統於輔助整體運輸系統上發揮更加關鍵的作用；另一方面，能提供更多機遇以研發創新的智慧出行方案來滿足我們的需求。

SIGMA VISION
SIGMA 願景

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

SIGMA 願景 – 整合了香港智慧出行的五個主要目標，於計劃新的智慧出行方案時必須予以考慮

Being one of the world's most urbanised cities with a high usage of public transport, Hong Kong needs to take its unique path to be smart for its commuters. While introducing the concept of smart mobility has the capability to improve the way people commute, it needs to be spearheaded carefully to avoid any undesirable consequences, such as inducing more unsustainable growth in the use of private cars. A set of clear objectives is therefore essential to guide the smart mobility strategy both today and tomorrow, such that embracing innovation and technology will help achieve a more sustainable and smarter transport system for Hong Kong.

We have developed the overarching **SIGMA** Vision which integrates five key objectives of smart mobility for Hong Kong, and shall be adhered to when formulating any new smart mobility initiatives.

香港作為全球最城市化的地方之一，高度依賴着公共交通作運輸工具，因此香港必需因應其獨特之處為市民提供最便利的出行方法。引入智慧出行這概念一方面能改善市民的出行，但我們亦需小心規劃以避免產生副作用，例如在使用私家車方面引致更多不可持續的增長。因此，為了引領我們制訂適用於現在以及未來的智慧出行策略，一套明確的目標是非常重要。這樣才可利用創新和技術為香港實現更可持續和更智能的運輸系統。

為此，我們設計了**SIGMA**願景，整合了香港智慧出行的五個主要目標，這些目標於計劃新的智慧出行方案時必須予以考慮。

Safe
安全
Reduces the risk of traffic fatality or injury.
降低交通傷亡的風險。

Green
綠色
Promotes the use of environmentally-friendly modes of transport.
促進使用環保的交通運輸方式。

Accessible
便捷
Delivers easily-reachable and reliable transport services.
提供便捷及可靠的交通運輸服務。

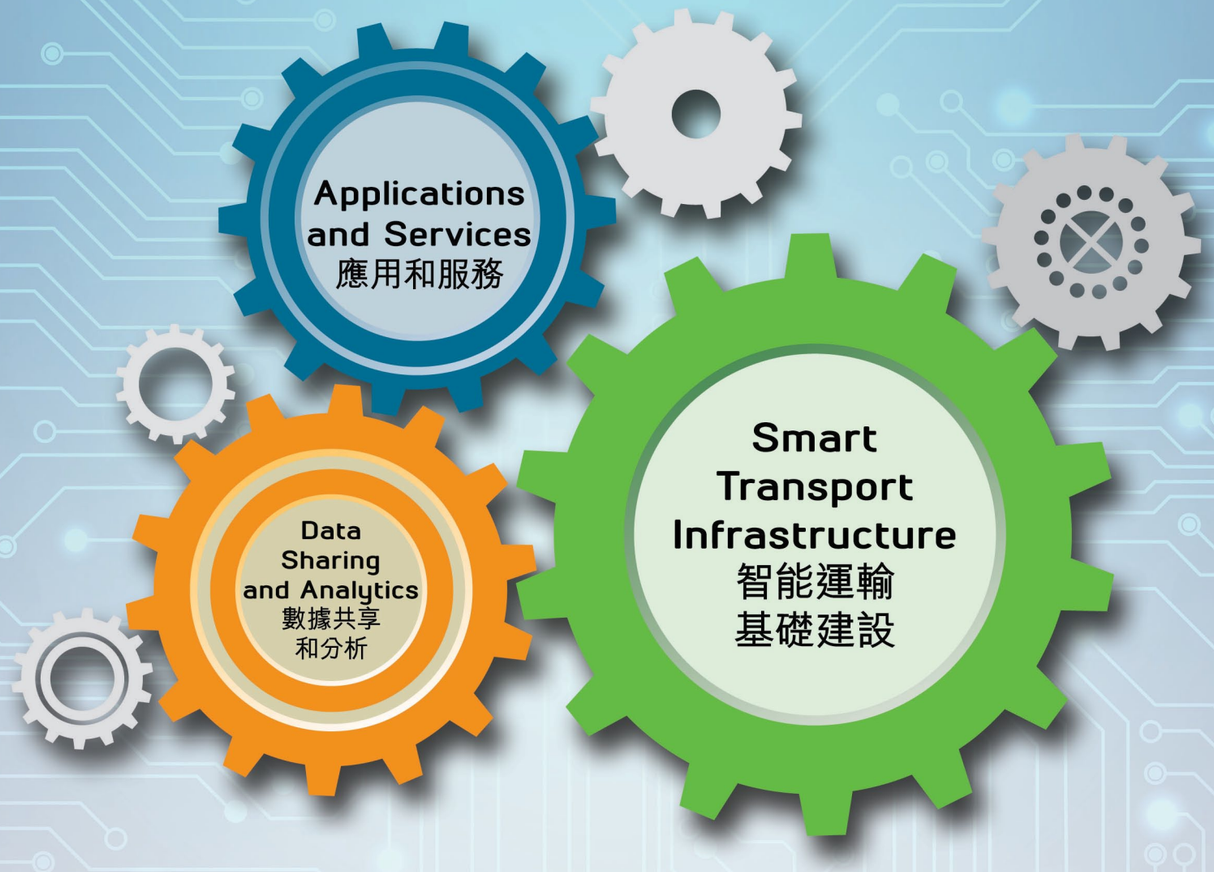
Informative
資訊
Provides useful information to road users.
為道路使用者提供有用的資訊。

Mobile
高流通性
Moves people and goods expeditiously and efficiently, satisfying both users and operators.
提供高效的客貨運輸，滿足乘客及營運商的需求。

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

"SIGMA"這個縮寫詞用於數學上是總和的符號（即 Σ）。這正代表着推展智慧出行的基本理念是為我們運輸系統的可持續發展帶來整體效益。

SMART MOBILITY STRATEGY
智慧出行策略



"Smart Transport Infrastructure", "Data Sharing and Analytics" and "Applications and Services" are envisioned as three moving gears underpinned by a number of actionable initiatives. They could only drive the entire system forward when working together coherently.

「智能運輸基礎建設」，「數據共享和分析」及「應用和服務」，這三大齒輪代表着許多實質措施，它們需互相協調、一起運轉時才能驅動整個系統。

Smart transport infrastructure with the adoption of advanced technology lays the foundation of smart mobility. Building upon it is the voluminous amount of data so collected which could be analysed and disseminated to assist in traffic management and planning, and meeting road users' expectations and diverse needs. With the smart transport infrastructure and a rich source of useful data, a number of smart mobility applications and services could be devised to tackle individual traffic problems or improve particular areas of transport services.

These three key dimensions, namely **"Smart Transport Infrastructure"**, **"Data Sharing and Analytics"** and **"Applications and Services"** are envisioned as moving gears which are discrete but inter-related. Each gear is underpinned by a number of actionable initiatives. There are priorities over one another, but the gears could only drive the entire system forward when they are working together coherently.

SMART TRANSPORT INFRASTRUCTURE

Smart transport infrastructure acts as the driving gear of smart mobility. It comprises devices, installations as well as software infrastructure which could collect, analyse and process real-time traffic data, disseminate useful information including safety alerts to road users automatically, and enable road users to make smart decisions.

智能運輸基礎建設配合先進的科技是推展智慧出行的基石。在此基石上，我們將所收集到的大量數據經分析及發放後，可協助交通管理和規劃、滿足道路使用者的期望和不同的需求。另外，當配合智能運輸基礎建設和豐富的數據資源，便可研發一系列的智能出行應用和服務，以解決個別交通問題或改善特定地區的運輸服務。

「智能運輸基礎建設」，「數據共享和分析」及「應用和服務」，這三大關鍵元素可形像化成三個獨立但又互相緊扣的齒輪。每個齒輪都代表着許多實質措施。雖然它們彼此之間有推行的優先次序之分，但只有當齒輪一起運轉時才能驅動整個系統。

智能運輸基礎建設

智能運輸基礎建設是智慧出行的驅動齒輪。它包括裝置、設備、軟件基礎設施等，讓我們可以收集，分析和處理實時交通數據，再向道路使用者自動發放有用的交通資訊包括安全警示，使他們可作出精明的選擇。

Sensing and analytic technology

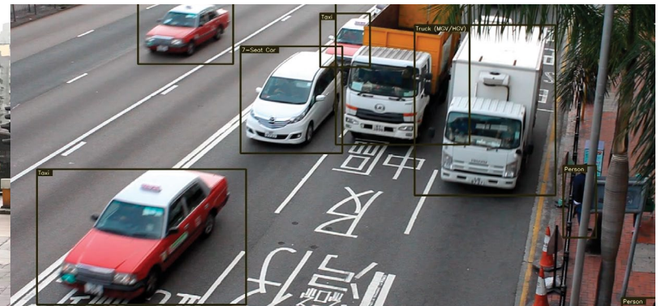
As a key component of the smart transport infrastructure, sensing and analytic technology allows automatic data collection and detection of any anomalies and their precise geographical locations using pre-defined algorithms or data analytic technique. To leverage the capability of the sensing and analytic technology for monitoring real-time traffic conditions and automatically detecting incidents, TD is installing about **1200 sets of traffic detectors along strategic routes and major roads** for completion by 2020. With such large coverage of real-time traffic data, it will facilitate expedient identification and resolution of traffic incidents, effective traffic management and journey planning by the public. In particular, TD has already started making use of the automatic incident detection functions of those installed detectors (such as on North Lantau Highway and Fanling Highway) to monitor and manage traffic in the Traffic Control Centre, and to disseminate traffic snapshots to the Public Sector Information (PSI) Portal (data.gov.hk). Moreover, for better dissemination of the collected traffic data to facilitate motorists' route planning, at major diversion points along strategic routes and major roads, **more sets of JTIS will be installed and an existing SMP will be enhanced** by end 2020.

With the ever-sophisticated analytic technologies, it becomes possible to install sensors at signalised junctions to automatically detect the real-time volume of vehicles and pedestrians and optimise the signal time allocation. Apart from minimising "wasted" green time for reducing congestion and delay, the application of intelligent traffic signal systems could also support promoting walkability and use of public transport by according priorities of traffic signals to particular groups of road users or modes of transport, facilitate traffic management and the development of Vehicle-to-everything (V2X) technology. To demonstrate the applicability and effectiveness, TD commenced the **pilot intelligent traffic signal system project** in 2019, with a target of installing the system at a few signalised junctions with irregular traffic patterns and room for optimising the traffic signals between 2020 and 2021. We will then review the need to update our design guidelines and plan for the wider roll out of the system.

感應和分析技術

感應和分析技術是智能運輸基礎建設的關鍵組成部分。透過這技術能自動收集數據並使用預設的算法或數據分析技術去偵測任何異常情況及其準確位置。為充分利用感應和分析技術的能力以實時監察交通情況和自動偵測事故，運輸署將於2020年前完成**在主要幹線和主要道路上安裝約1200組交通探測器**。完成安裝後，大覆蓋面的實時交通數據將有助加快交通事故的識別和處理，令交通管理更有效和方便市民的出行規劃。就已完成安裝的交通探測器(例如位於北大嶼山公路及粉嶺公路)，運輸署已開始利用其自動偵測事故功能，於交通控制中心內進行交通監察及管理。同時，運輸署亦透過「資料一線通」網站(data.gov.hk)發放交通快拍圖像。為了更有效地發放收集到的交通數據以方便駕駛人士的路線規劃，運輸署將於主要幹線和主要道路的主分流點**安裝更多行車時間顯示系統和改善現時一組行車速度屏**，預計2020年年底前完成。

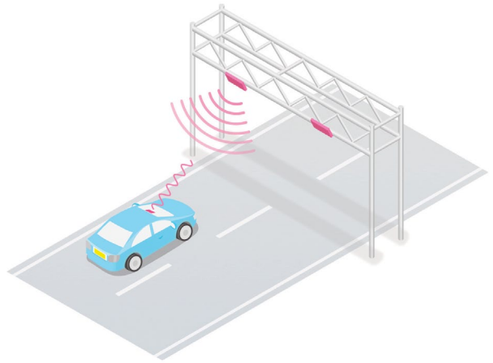
隨著分析技術的不斷完善，我們希望透過在交通燈號控制的路口上安裝感應器，自動偵測實時的車流和人流，從而優化燈號時間的分配。除了盡量縮短"浪費"了的綠燈時間以減少擠塞和延誤外，智能交通燈系統還可以向特定的道路使用者或運輸模式安排優先的交通燈號，以鼓勵市民步行和使用公共交通；更可輔助交通管理和配合車聯網技術(V2X)的發展。為探討智能交通燈系統的應用和成效，運輸署已於2019年展開**智能交通燈系統先導計劃**，以期於2020年至2021年間於數個交通流量變化較大並有空間優化交通燈號的燈號控制路口安裝該系統。屆時我們會檢討是否需要更新我們的設計標準，並計劃更廣泛地推展此系統。



Meanwhile, with the scarcity of land, congested street furniture and public utilities in Hong Kong, identifying feasible locations for installing more traffic detectors and sensing infrastructure especially in urban areas is extremely difficult. It therefore prompts the idea of making use of the existing street furniture for mounting such detectors and sensing infrastructure, particularly street lampposts, which are indispensable street furniture with the availability of power supply and closely-packed in urban areas. Towards this, TD is actually taking part in the **"Multi-functional Smart Lampposts" pilot scheme** led by the Office of the Government Chief Information Officer and Highways Department, for installing traffic devices on selected smart lampposts by 2021-22. The traffic devices, comprising detectors and surveillance cameras, will progressively expand our coverage of real-time traffic data collection and automatic incident detection to urban roads.

On-board technology

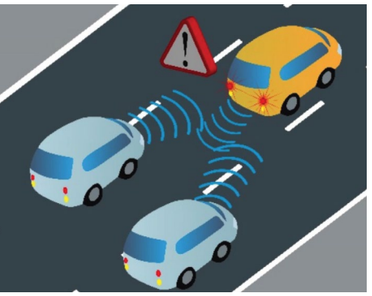
The importance of enabling seamless exchange of information between infrastructure and vehicles is increasingly recognised. Such could only happen when vehicles are fitted with **in-vehicle units (IVUs)**. An IVU, which shall be a unique identity of a vehicle, could receive real-time traffic information. As a start for swift implementation, the IVU will adopt the Radio Frequency Identification technology to facilitate the free flow tolling at Tseung Kwan O – Lam Tin Tunnel (TKO-LTT) upon its commissioning in 2021. Free flow tolling system (FFTS) will also be implemented by phases at 11 other government tolled tunnels and roads within two to three years after the commissioning of TKO-LTT. The remaining Tai Lam Tunnel will have FFTS in place in 2025 upon the expiry of its Build-Operate-Transfer Franchise in the same year. The application of IVUs could also be progressively expanded, ranging from vehicle detection and identification, payment of parking charges without stopping the vehicles and by remote means, vehicle e-licensing and electronic road pricing. In the long run, with the technology advancement of IVU and the connection with cellular network or the like, IVUs could also enable V2X technology.

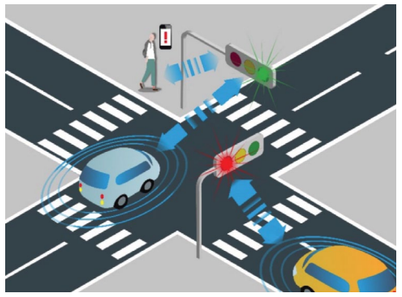


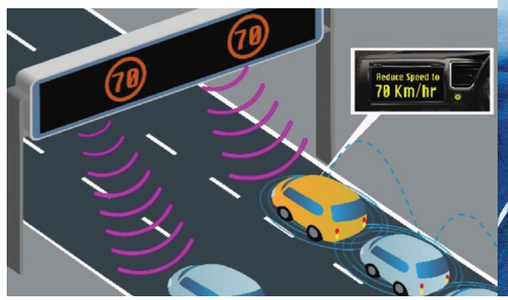
由於香港的土地短缺，街道設備和公共設施密集，要於市區內物色合適地點安裝更多交通探測器和感應基礎設施是非常困難。因此利用現有街道設施安裝探測器和感應基礎設施的想法便應運而生，尤其是於路燈燈柱。因為路燈是街道上必不可少的設施，置有電力供應並密集地安裝於市區。有見及此，運輸署正參與由政府資訊科技總監辦公室及路政署負責的**「多功能智慧燈柱」試驗計劃**，於2021-22年度前在選定的智慧燈柱上安裝交通裝置。這些交通裝置包括探測器及監察攝影機，會逐步將收集實時交通數據和自動偵測事故的範圍擴大至市區道路。

車內裝置技術

實現車輛和基礎建設之間的信息無縫交接已日益重要。但要建立這種溝通方式，必需配備**車內感應器**。車內感應器是車輛一個獨有的標識，可以接收實時交通資訊。要走出第一步並盡快推行，我們會採用「無線射頻辨識」技術的車內感應器，以配合將於2021年投入服務並設有「不停車繳費系統」的將軍澳 - 藍田隧道。於將軍澳 - 藍田隧道啟用後約兩至三年內，「不停車繳費系統」亦將分階段實施在另外11條政府收費隧道及道路上。至於餘下的大欖隧道，「不停車繳費系統」將會在其「建造、營運及移交」專營權於2025年屆滿後同年實施。車內感應器的應用也可逐步擴展至其他相關方面，包括車輛探測和識別、以遙距和無需停車的情況下繳付停車場收費、電子行車證和電子道路收費。長遠來看，隨著車內感應器技術的進一步發展和與互聯網等網絡連接，車聯網的技術亦可得以推展。







Vehicle technology

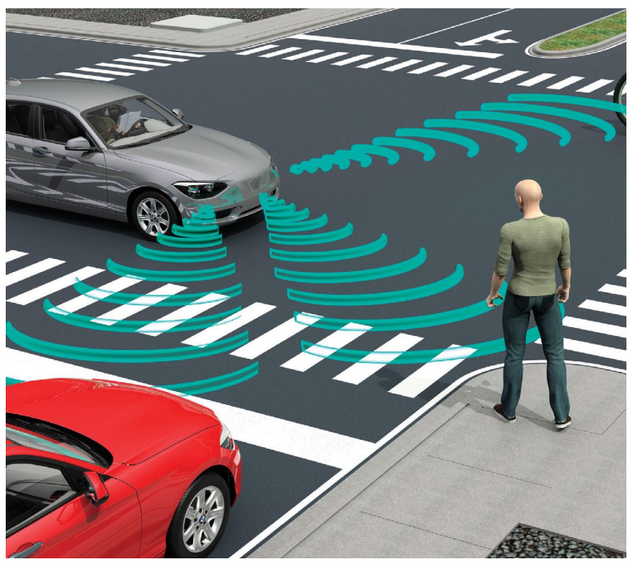
TD has been taking heed of vehicle technological advancements in particular to those relating to vehicle safety. For example, the **application of geo-fencing technology on vehicles** will be piloted by 2020 to track the location of a vehicle and detect the prevailing speed limit of the road so as to automatically reduce the speed of the vehicle if exceeding the limit.

A more visionary concept is to achieve a connected transport network system allowing automatic data transmission and communications among vehicles and between vehicles and pedestrians, roadside infrastructure and cloud network. The preceding sensing and analytic technology and IVUs would enable such **V2X technology** that the real-time data collected from road infrastructure (such as traffic signals) and potential hazards detected from sensors (such as approaching pedestrians intending to cross the road ahead) could be automatically transmitted to nearby vehicles to alert the drivers. Likewise, vehicles fitted with V2X technology will also serve as data transmitter sharing information of the location, speed, direction, brake operation, etc. with other vehicles, as well as communicating with roadside equipment and other infrastructures within the V2X network. All these data could also be fed back to the backend system to assist in implementing real-time strategies to alleviate local traffic congestion or special traffic arrangements. While V2X technology is still in its infancy, to seize the benefits on improving road safety, TD is examining the V2X technology and will explore having V2X trials on public roads of Hong Kong to facilitate technology deployment and standardisation.

車輛技術

運輸署一直留意車輛科技的發展，特別是與車輛安全有關方面。其中例子是運輸署將於2020年試驗在**車輛上應用地理圍欄**的技術。此技術是以追踪車輛的位置來檢測該道路的當前速度限制；若車速超過限制，則自動降低車輛的速度。

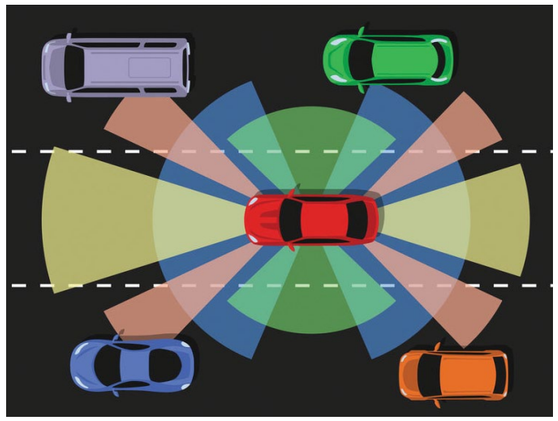
更長遠的概念是實現相連的運輸網絡系統，即允許車輛與車輛之間以及車輛與行人、路邊基礎設施和雲端網絡之間的自動數據傳輸和通訊。上文提及的感應和分析技術以及車內裝置能配合**車聯網技術**，使來自道路基礎建設的實時數據（如交通燈號的信息）和由感應器探測到的潛在危險（如前方準備橫過馬路的行人）能夠自動傳輸到鄰近的車輛以提醒駕駛者。同樣，配備車聯網技術的車輛亦可作數據發射器與其他車輛分享其位置、速度、方向，煞車操作等資訊；更可與路邊設備和其他運輸網絡內的設施溝通。以上數據還可以傳送到後端系統，以協助策劃實時措施來紓緩地區性的交通擠塞或進行特別的交通安排。雖然車聯網的技術仍處於起步階段，但考慮到有利於改善道路安全，運輸署正檢視車聯網技術，並研究在香港的道路上展開車聯網技術的試驗，以配合科技的發展和訂立標準。



With the promising advantages of enhancing road safety by eliminating human errors, increasing mobility, reducing congestion and emissions, development of technologies associated with **autonomous vehicles (AV)** have soared in recent years and trials of AVs are being tested worldwide. In a densely-populated city of Hong Kong where the majority of passenger trips are made of public transport, introducing AVs on public roads should first address the inevitable interaction with conventional vehicles, pedestrians and facilities on roads and secondly how it could be deployed in form of road-based public transport with high carrying capacity. Since 2017, TD has been facilitating a number of AV trials through the

issuance of Movement Permits. So far, these trials were operated within restricted areas without interfacing with normal traffic. Looking ahead, to materialise AV trials on public roads or even to introduce autonomous driving in form of public transport in Hong Kong, apart from overcoming the legislation and regulatory barriers, we need to consider the integration with other smart mobility initiatives including the intelligent traffic signal system and the V2X technology for having AVs to be introduced in the congested urban road network of Hong Kong safely and efficiently, as well as to assess how AVs will impact on the travel behaviour and traffic patterns of the society. TD will collaborate with various organisations and government departments to take a step forward of having trials of AVs at suitable locations of public roads in Hong Kong.

近年來，與**自動駕駛車輛**相關的技術發展蓬勃，自動駕駛車輛的測試亦於全球多地進行。自動駕駛車輛有著排除人為失誤以改善道路安全、增加出行流動性，減少擠塞和排放等優點。然而，香港是一個人口密集的地方，大部分市民的出行方式也依賴公共交通工具，要於香港的道路上引入自動駕駛車輛必須首先解決它如何與傳統車輛，行人及道路設施無可避免的互動，其次是處理如何令自動駕駛車輛成為高載客量的公共交通工具。自2017年起，運輸署一直透過發出車輛行駛許可證配合自動駕駛車輛的測試。直至目前為止，這些測試均於限制區域內進行，並沒有在一般交通環境下行駛。展望未來，要實現於香港



的公共道路上進行自動駕駛車輛測試，甚至引入自動駕駛的公共交通工具，除了要解決現時法例和監管的限制，我們還需要考慮與其他智慧出行計劃的配合，包括智能交通燈系統和車聯網的技術，以便安全有效地於香港這個繁忙擠擁的城市道路網絡中引入自動駕駛車輛。另外，我們亦要評估自動駕駛車輛將如何影響大眾的出行習慣和交通模式。運輸署會聯同其他組織及政府部門合作，於香港公共道路上合適的地點進行自動駕駛車輛的測試。

DATA SHARING AND ANALYTICS

With the progressive rollout of various smart transport infrastructures, there will be a vast amount of data generated. The collection, storage, analysis and dissemination of traffic data thus have an increasingly essential role in assisting the planning, management and operation of our transport system. Besides, a good quality of open data is necessary to facilitate trip planning for travellers, as well as other uses by different sectors in the community.

Data Sharing

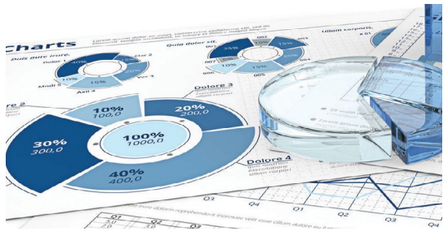
TD has been supporting the Government's initiative of **open data** by releasing a wide range of traffic data and ensuring a good quality of open data with respect to the variety, volume, timeliness and format. In 2018, 18 sets of traffic data have been released for public access via the PSI Portal. In the coming 3 years, TD plans to further release 14 new datasets to the public and improve 7 existing datasets. Above all, the data owned by the public transport and transport facilities operators, such as ETA and real-time vacancy information of car parks are considered utterly useful for travellers.

數據共享和分析

隨著各種智能運輸基礎建設逐步推出，大量的數據將會隨之而產生。因此，交通數據的收集、儲存、分析和發佈對於協助我們規劃、管理和營運運輸系統變得更為重要。此外，必須提供高質素的開放數據，才有助市民規劃行程，以及方便社會上不同界別所運用。

數據共享

運輸署一直支持政府**開放數據**政策，包括公開多種交通數據，並確保數據的質量在種類、數量、及時性和格式方面達到高水平。於2018年，運輸署已透過「資料一線通」網站向公眾發放了18組交通數據。在未來三年，運輸署計劃進一步開放14個新數據集及優化7個現有數據集。然而，眾多交通數據中，公共交通和運輸設施營運商所擁有的數據，如預計到站時間及停車場的實時空置資訊對市民的出行規劃是非常重要。



At present, all franchised bus companies are providing real-time bus arrival information for all regular routes through their websites and mobile applications. To facilitate the public to access such information, the Government subsidises franchised bus companies to install **real-time arrival information display panels** at about 1300 covered bus stops (including government public transport interchanges (PTIs)) by 2020.

TD has reached agreement with a number of franchised bus companies and MTR Corporation Limited for the operators to open their data on real-time arrival information to the PSI Portal within 2019, and will continue to actively encourage other transport operators to open up their data.

On the green minibus (GMB) side, the operators are mostly small-scale and scattered. To enable the **provision of real-time arrival information for GMBs**, TD will develop a data collection system with mobile application, as well as install relevant devices on GMBs starting from 2020 and for completion by 2022. The system could enable passengers to access the real-time arrival information of GMBs, while GMB operators can make use of these data for fleet management with a view to improving the operational efficiency.

With the all-in-one mobile application "HKeMobility" providing a wide range of transport information including the real-time traffic conditions, public transport routes, driving routes, walking routes, incident locations as well as vacancy information of car parks, TD will continue to enrich its functions including disseminating location-specific and personalised push notification to users.

目前，所有專營巴士公司均透過其網站及流動應用程式，提供所有常規路線的實時巴士到站資訊。為方便市民獲取這方面的資訊，政府會資助專營巴士公司於2020年前約一千三百個有蓋巴士站(包括政府公共運輸交匯處)安裝**實時巴士到站資訊顯示屏**。

運輸署已分別和多間專營巴士公司和香港鐵路有限公司達成協議，於2019年內將其實時到站資訊開放到「資料一線通」網站。同時，運輸署會繼續積極鼓勵其他交通營運商開放數據。

在綠色專線小巴方面，其營運商大多規模小而且分散。為了能夠提供**綠色專線小巴實時到站資訊**，運輸署將開發一個數據收集系統配合流動應用程式，於2020年在專線小巴上安裝相關設備並預期於2022年完成。該系統可讓乘客獲得綠色專線小巴的實時到站資訊，而專線小巴營運商亦可以利用這些數據管理其車隊，提高營運效率。

運輸署的一站式流動應用程式「香港出行易」，現提供多種交通資訊，包括實時交通狀況、公共交通路線、行車路線、步行路線、交通事故地點以及停車場的泊車位空置資訊等。運輸署將繼續豐富其功能，包括向用戶發放就特定位置及個人化的推送訊息。

On the other hand, the widespread use of smartphones and mobile devices nowadays provides a rich source of **human-based transport data** which could not be collected automatically or extensively in the past. These data could allow in-depth analysis of the travel characteristics and transport trends of the public such that better public transport routes and road infrastructures could be planned. TD will examine the possibility of collecting these transport data through "HKeMobility" for future transport planning and traffic management.

An important remark of data sharing and open data is that, apart from opening up data owned by TD, developing mobile applications and enhancing their functionality by TD, the opening up of data owned by transport operators is crucial in enabling more innovative and user-oriented services or integrated mobile applications to be developed. It can also encourage evidence-based research by the public or academics, which could generate further insights for transport planning in future.

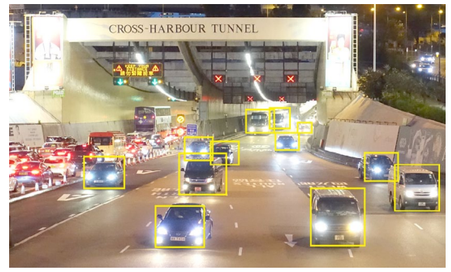
另一方面，現今智能手機和移動設備的廣泛應用提供了大量**以人為中心的出行數據**，而這些數據在過去並未能自動或廣泛收集。深入分析這些數據有助了解市民的出行習慣和運輸模式的趨勢，從而可以規劃更好的公共交通路線和道路基礎設施。運輸署會研究通過「香港出行易」收集這些運輸數據的可行性，為方便未來進行運輸規劃和交通管理。

除了由運輸署開放數據、開發及優化流動應用程式外，數據共享和開放數據的另一個關鍵，是由公共交通營運商開放其擁有的數據，讓更多創新及個人化的服務得以發展或開發整合的應用程式。全面的數據共享還可以鼓勵公眾或學者進行實證研究，或可為未來的交通規劃帶來進一步的啟發。

Data Analytic technologies

Conventional data collection method using CCTVs and detectors are limited by the data transfer technologies and lack of analytic capability in the previous decades, making real-time data collection and analysis not truly available. In near future, with advances in information communications technologies and Internet of Things (IoT), devices will be equipped with wireless-based technologies and connected to a centralised cloud network. Coupled with the impending 5th generation wireless systems (5G) system, real-time traffic data transmission will be made easier and faster between IoT, transfer hubs and the public.

With the proficiency in the data transfer technology, it is essential that the conventional data collection devices are revamped to equip with automated ability and enable analytics on the edge. Currently, TD controls numerous conventional CCTVs and traffic detectors which allow real-time response to traffic situations of the city. In future, deploying Artificial Intelligence (AI) functions can utilise the data collected in a more proactive manner, such that the AI machines can work and react like humans, but in greater processing power and free of human errors. The deep learning of the AI functions could help identify traffic incidents, resolve complex traffic situations, and forewarn potential safety risks.



數據分析技術

受傳統數據傳輸技術所限，以往使用閉路電視和探測器只能有限度地收集交通數據，而且缺乏分析能力，令實時數據的收集及分析並未能實現。在不久的將來，隨著通訊科技及物聯網的演進，很多設備能以無線技術透過雲端網絡互相連接。加上即將來臨的第5代流動通訊網絡系統，物聯網、傳輸器及市民大眾之間的實時交通數據傳輸將更簡單及快捷。

隨著數據傳輸技術的成熟，現時的數據收集設備必須進行改造，以配備自動化及邊緣分析的能力。目前，運輸署的控制人員借助傳統的閉路電視和交通探測器，針對不同的交通狀況作出即時調動。將來，配備人工智能的機器可以更加主動地利用收集到的數據，一方面能模仿人類般工作和反應，另一方面卻有更強的運算能力，亦能避免人為錯誤。具深度學習能力的人工智能有助於識別交通事故、解決複雜的交通狀況、以及針對潛在的安全風險發出預警。

In the long run, the voluminous data so collected and generated will become impossible for a human being to manage. In this regard, we have embarked on collecting different sources of traffic data in machine-readable format so as to facilitate the development of a **big data platform**, which is necessary to enable different sources of traffic data to be linked, correlated, combined and analysed. Through big data analytics, TD can uncover, for example, patterns and trends of demand for public transport services, and prediction of the impacts of traffic incidents, providing insights for better transport planning and swifter response to possible traffic disruption on the transport network.

長遠來看，產生和收集得來的海量數據將無法由一般人處理。因此，我們已著手收集不同交通數據，並以機器可讀格式儲存，以便配合開發**大數據平台**來連接、聯繫、組合和分析不同來源的交通數據。通過大數據分析，運輸署可以預測公共交通服務需求的模式和趨勢，以及預測交通事故的影響，為運輸規劃提供前瞻性的建議，並迅速地對運輸網絡可能出現的混亂作出應變。

APPLICATIONS AND SERVICES

The last component of the roadmap is the application of smart mobility infrastructure and collected data into individual traffic management intervention and policy, which could bring in new perspectives and alternatives to address some of the acute traffic problems and improve the transport services.

New generation of parking meters

Provision of real-time parking vacancy information could help reduce traffic congestion by avoiding cars circulating on the roads and looking for parking spaces. To this end, TD will commence the installation of **new generation of parking meters** in phases from early 2020 and for completion by early 2022. The new generation of parking meters will support payment of parking fees through multiple means (including remote payment through mobile application) and be equipped with vehicle sensors to detect whether a parking space is occupied. The real-time parking vacancy information will be disseminated to motorists via our mobile application "HKeMobility" and the PSI Portal, hence facilitating motorists in search of vacant parking spaces and reducing the need for circulating in congested roads.

With the growing popularity of mobile payment in future, TD will timely prepare for implementing trials of a "meterless system" with suitable upgrade of the new parking meter system.

應用和服務

智慧出行路線圖的最後一個組成部分是將智能運輸基礎建設及收集到的數據應用到個別的交通管理措施和政策上，為解決一些嚴峻的交通問題和改善運輸服務帶來嶄新的視角和替代方案。

新一代停車收費錶

提供實時泊車位空置資訊可以避免車輛尋找泊車位時在道路上徘徊，從而減少交通擠塞。為此，運輸署將由2020年年初開始分階段安裝**新一代停車收費錶**，並於2022年年初完成。新一代停車收費錶能支援多種付費方式繳付泊車費(包括流動應用程式遙距繳費)，以及配備感應器以偵測停車位是否已被佔用。實時空置泊車位資訊會透過流動應用程式「香港出行易」及「資料一線通」網站發放予駕駛人士，方便他們尋找空置泊車位和避免車輛在擠塞的道路上徘徊。

隨著將來流動繳費日漸普及，運輸署會適時準備利用新一代停車收費錶系統作適當更新，以試行「無錶系統」。

Automated parking system (APS)

The scarcity of land and shortage of car parking spaces in Hong Kong have prompted the instigation of maximising the spatial efficiency of car parks by increasing the number of vehicles that can be parked in a given floor area with reduced headroom. It results in the idea of **APS** as an evolution of traditional car parks. The APS makes use of a mechanical system to allow automated parking, and therefore obviates the need to construct driveways and ramps nor the provision of passenger lifts. Motorists are also spared the need to drive and walk inside the automated car park. To promote automated parking, TD is exploring the possibility of introducing APSs in "Government, Institution or Community" facilities and "Public Open Spaces" sites as well as requiring private operators of selected Short Term Tenancy sites to install, operate and manage APSs. TD is now examining the technical feasibility and business viability of adopting different types of APS at several suitable sites in Hong Kong with a view to taking forward the implementation of APS projects in batches starting from 2021.

自動泊車系統（APS）

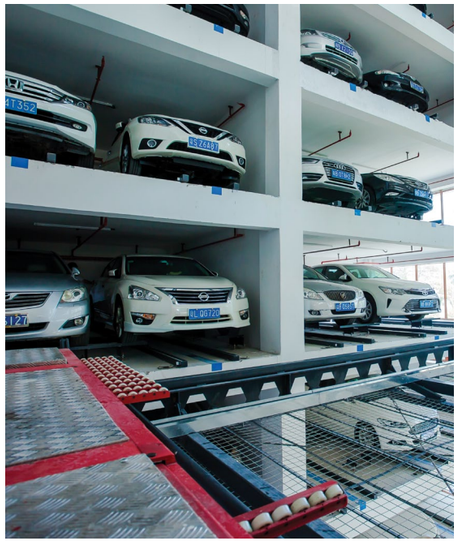
香港的土地短缺及泊車位不足的問題，促使我們考慮如何善用停車場的空間效率，即藉著增加泊車密度及減少淨空高度來騰出更多空間。由傳統停車場演化出**自動泊車系統**的概念由此而來。自動泊車系統使用機械設備自動泊車，因此省卻建造車道和坡道，也不需要提供乘客升降機。駕駛人士也不必在自動化停車場內駕駛和行走。為了推廣自動泊車系統，運輸署正研究於「政府、機構或社區用地」和「公眾休憩用地」引入自動泊車系統，以及要求短期租約停車場的的營運商安裝、營運及管理自動泊車系統。運輸署現正檢視於數個合適地點建造不同類型的自動泊車系統的技術及業務可行性，以期在2021年開始分批推行自動泊車系統。

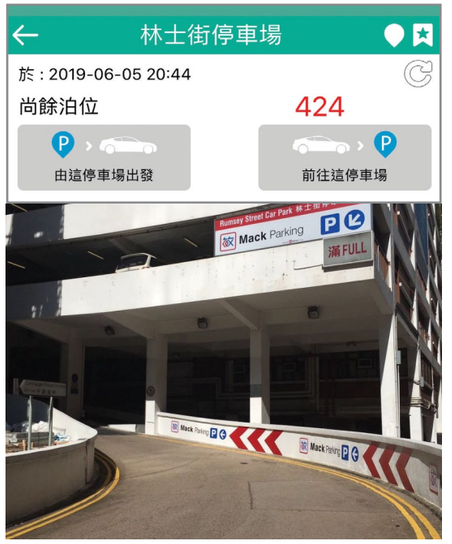
Smart PTI

Maximising the use of public transport is the key to the sustainable development of our transport system. And a convenient and comfortable experience of travelling on public transport could be conducive in encouraging modal shift from driving. The idea of a **smart PTI** is to provide convenient services and facilities in a public transport hub, ranging from display panels of the ETA of public transport services, instant traffic news, weather information and venue directory and guides, to the provision of seats, air-conditioning, Wi-Fi services, mobile phone charging stations and payment facilities for passengers. TD is planning to renovate the Ma On Shan Town Centre Public Transport Terminus as a trial scheme for completion in 2021 to incorporate most of these elements. We will adopt this smart PTI concept in other future PTIs so as to assist passengers to reach their destinations in a faster way, and enhancing the quality of travel experience.

智能公共運輸交匯處

提升公共交通的使用率是運輸系統可持續發展的關鍵。而提供一個方便和舒適的乘搭公共交通工具的體驗可鼓勵駕駛者轉乘公共交通工具。**智能公共運輸交匯處**的理念是在公共運輸交匯處提供方便的服務和設施，包括發放公共交通服務的預計到站時間、即時交通消息、天氣信息和場地指南的顯示屏；以及提供座位、冷氣、Wi-Fi服務、手機充電站和乘客支付的設施。運輸署計劃以試驗計劃形式翻新及改造馬鞍山市中心公共交通總站，預計最快可於2021年完工，並加入上述大部分的元素。我們會在將來的公共運輸交匯處採用智能公共運輸交匯處這概念，以協助乘客更快到達目的地，並提升出行體驗質素。





Franchised Taxis

The Government has been encouraging the use of new technology for enhancing public transport services. In recent years, the use of car-hailing mobile applications is gaining popularity and there is a strong and growing public demand to enhance personalised and point-to-point public services in Hong Kong.

To this end, apart from enhancing the service quality of ordinary taxis, the Government proposes to introduce 600 **franchised taxis** to meet the new demand in the community for personalised and point-to-point public transport services of higher quality and with online hailing features. The bill for franchised taxis has been introduced into the Legislative Council in 2019. Under the proposal, operators of franchised taxis will be required to meet the service levels or standards prescribed under the franchise granted by the Government.

To leverage technology for optimising taxi service, operators of franchised taxis will have to provide mobile application for hailing, lodging complaints, expressing opinions and rating drivers, etc. Besides, all franchised taxis will be equipped with GPS devices. Real-time operating data of each franchised taxi, including hires for services, charges, routes and drivers' information, will be recorded by devices for the Government's inspection. Operators of franchised taxis will also be required to open up their data such as real-time taxi locations and availability status, etc. in machine-readable format on the PSI portal.

專營的士

政府一直鼓勵應用新科技去提升公共交通服務。近年，透過手機應用程式召喚汽車日漸普及，公眾對提升個人化點對點公共交通服務的需求日見殷切。

就此，除了提升普通的士的服務質素，政府建議推出600輛**專營的士**，以回應社會上對服務質素較佳和具備「網約」特色的個人化點對點公共交通服務的新需求。專營的士的條例草案已於2019年提交予立法會審議。根據建議，專營的士的營辦商須達到政府批出的專營權下所訂的服務水平或標準。

為了利用科技以優化的士服務，專營的士的營辦商必須提供召喚服務的手機應用程式，並須設有投訴、提供意見及司機評分等功能。此外，所有專營的士須配備全球定位系統的裝置，每輛專營的士的實時營運數據，包括載客情況、收費、行車路線、司機資料，均會被記錄，以供政府查閱。專營的士的營辦商亦須於「資料一線通」網站以機器可讀格式開放實時車輛位置及服務狀況等資料。

WAY FORWARD
展望未來

This Smart Mobility Roadmap sets out the vision and specific initiatives to be pursued in the next five years, and beyond. It also echoes the Smart City Blueprint for Hong Kong promulgated by Innovation and Technology Bureau in 2017 in developing Hong Kong into a smart city with the efficient use of innovation and technology.

A number of smart mobility initiatives in this Roadmap are already hitting the road, driving the cogwheel of smart mobility to move forward. With the committed efforts of embracing innovative and advanced technology, we are working towards providing safer, greener and more efficient transport and traffic infrastructure. To illustrate, during the pre-trip planning, travellers will be well informed of the available route choices covering both mechanised modes and walking, taking into account the real-time traffic conditions and users' preferences. Any unnecessary delay during the journey will be minimised with the intelligent traffic signals and free flow tolling system. On the busy traffic network of Hong Kong, potential road safety hazards, ranging from an approaching vehicle from one's blind spot to an unexpected object on the road, could be promptly alerted to drivers with the V2X technology. In the event of incidents, they could be detected instantly for swift incident handling and dissemination of such information to the public. Towards the end of a journey, motorists could park their vehicles with ease by knowing the vacancy of nearby parking spaces or entering a car park with an APS. For pedestrians, they will be advised of the most convenient walking path taking into account their level of mobility.

Apart from travellers, operators of public transport, car parks or tunnel and bridge infrastructures could also benefit with increased productivity and better customers' satisfaction arising from more real-time traffic and transport information for swift response to incidents and changes in their service demand.

For TD who is responsible for managing the transport system, with the availability of a wide range of data collected from road users, vehicles and roadside traffic installations on a real-time and automatic basis, and the big data analysis platform to systematically analyse and predict traffic patterns, we could disseminate more useful transport and traffic information to the public. Besides, we would continue to enhance our capability to better plan the required infrastructure and traffic management measures, and ultimately leading to a paradigm shift of "from detecting to predicting" and "from responding to preventing".

Yet it should be remarked that, to achieve the SIGMA vision of smart mobility, efforts of and collaboration with academic institutions, research & development centres and the industry will be instrumental in carrying out academic and scientific research, introducing more advanced and innovative solutions, enhancing the technological competencies and skillsets in the transport field, supporting the open data initiative and testing out some novel initiatives in Hong Kong. In the long run, establishing a transport research centre assembling multi-disciplinary experts in transport technologies and providing the necessary facilities to serve as a research hub and test-bed shall be explored.

While TD will continue to play a key role in piloting and implementing various smart mobility initiatives documented in this Roadmap, there are initiatives, including further AV trials with mixed traffic, which warrant further examination and discussion with various parties concerned, given the prematurity of technology deployment and their policy-wide impact on the transport system of Hong Kong.

Last but not the least, this Roadmap is not an exhaustive list of items to be undertaken in the near future, but a dynamic one with the SIGMA vision being the guiding principle to meet the evolving technology and ever-changing environment of Hong Kong. TD will ensure timely deployment of technology and the associated complementary measures to achieve smart mobility for leading towards a more liveable and sustainable city of Hong Kong.

本《智慧出行路線圖》確立了香港未來五年及以後的願景和具體執行項目。此外，亦回應了創新科技局於2017年發佈的《香港智慧城市藍圖》內提及有效地利用創新科技將香港發展成為智慧城市。

為推動智慧出行的發展，我們已經開始了部份在路線圖提及的智慧出行項目。隨着創新科技和先進技術的應用，我們正朝著提供更安全、更環保和更有效率的運輸及交通基建。例如，在計劃行程時，市民可根據實時的交通狀況和個人喜好獲悉不同交通工具和步行路線的選擇。配合智能交通燈系統和不停車繳費系統，行程中不必要的延誤可以有效地減少。車聯網技術的應用亦可協助在繁忙的道路網絡中，解決潛在的道路安全問題，例如有關系統可以向聯網車的駕駛者發出交通提示，提醒駛近盲點的車輛和道路上的不明物體。另外，車聯網技術還可即時偵測到事故的發生，有助迅速處理事故和向公眾發放有關的信息。當行程將近完結時，駕駛者可輕易根據泊車位空置資訊泊車或到設有自動泊車系統的停車場泊車。對於行人而言，我們可按著他們的行動能力建議最方便快捷的步行路線。

除市民外，公共交通、停車場、隧道和橋樑基礎設施的營運商也可以通過更多實時的交通和運輸資訊來應付突發事故和服務需求的改變，從而提高效率和市民的滿意度。

對於負責管理運輸系統的運輸署來說，從道路使用者、車輛及路旁交通設備實時和自動收集到的數據，及利用大數據平台有系統地分析和預計交通模式，令我們可以向市民發放更多有用的交通資訊。此外，我們可更完善地規劃所需的基礎建設和提升交通管理的能力，以至最終引領我們轉變固有模式「由偵測到預測」和「由反應到預防」。

我們希望強調，要實現SIGMA這智慧出行的願景，學術機構、研究中心和業界的支持和合作將有助於開展學術和科學研究、引入更先進和創新的科技、提升運輸領域的技能、支持數據的開放，並在香港測試一些嶄新的項目。從長遠而言，香港可探討成立一個交通運輸科技研究中心，匯集跨界別的運輸科技專家，並提供作為試驗中心必要的設施。

運輸署將繼續在試行和落實推行本路線圖提出各個智慧出行項目中擔任重要的角色。然而，部分項目尤其是在現有道路試驗自動駕駛車輛，在技術的成熟程度及其對香港運輸系統的政策影響方面，還需要進一步的考慮和與不同持份者討論。

最後，本路線圖並不只是一份執行項目的詳盡清單，而是會根據SIGMA願景、日新月異的科技和香港不斷變化的環境與時並進，適時作出更新。運輸署將確保適時引入科技和相關的輔助措施以實現智慧出行，從而帶領香港成為更宜居及可持續發展的城市。

SMART MOBILITY ROADMAP
智慧出行路線圖

- Transport research centre
- 交通運輸科技研究中心

- V2X technology and AV
- 車聯網技術和自動駕駛車輛

- Franchised taxis
- 專營的士

- Automated parking system
- 自動泊車系統

- Smart public transport interchange
- 智能公共運輸交匯處

- New generation of parking meters
- 新一代停車收費錶

- Big data platform
- 大數據平台

- Smart lampposts pilot scheme
- 智慧燈柱先導計劃

- In-vehicle units
- 車內裝置

- Pilot intelligent traffic signal system
- 智能交通燈系統先導計劃

- Geo-fencing on vehicles
- 車輛上應用地理圍欄

- Additional sets of JTIS and enhancement of an existing SMP
- 更多行車時間顯示系統和改善現時一組行車速度屏

- Traffic detectors
- 交通探測器

- Real-time arrrival information of Green Minibuses
- 綠色專線小巴實時到站資訊

- HKeMobility
- 香港出行易

- Real-time bus arrival information display panels
- 實時巴士到站資訊顯示屏

運輸署
Transport Department

網站 web site: www.td.gov.hk

July 2019
二零一九年七月