

**For discussion  
on 11 July 2022**

**Legislative Council  
Subcommittee on Matters Relating to the Development of Smart City**

**Update on the Implementation of Smart Mobility Initiatives**

**PURPOSE**

This paper updates Members on the progress of various smart mobility initiatives in enhancing transport planning, traffic management, traffic enforcement and airport operations.

**BACKGROUND**

2. Hong Kong is a small and densely-populated city. To cope with the ever-increasing transport and traffic demand, in addition to further developing the public transport-oriented passenger transport system with the railway as the backbone and expanding the road network, the then Transport and Housing Bureau, the Transport and Logistics Bureau and the Transport Department (“TD”) have been sparing no effort in implementing various smart mobility initiatives under the Smart Mobility Roadmap for Hong Kong<sup>1</sup> and the Smart City Blueprint for Hong Kong 2.0 which were published in July 2019 and December 2020 respectively. By leveraging on technology and making reference to the experience of the Mainland and overseas cities, these initiatives enable more effective traffic management, alleviate traffic congestion, and optimise the use of our limited road space. As part of the Smart City Blueprint for Hong Kong 2.0, the Airport Authority Hong Kong (“AAHK”) has also been striving to develop Hong Kong International Airport (“HKIA”) into a smart airport to

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<sup>1</sup> The Smart Mobility Roadmap for Hong Kong integrates the following five key objectives of smart mobility into the “SIGMA” vision, viz. (a) Safe: reduces the risk of traffic fatality or injury; (b) Informative: provides useful information to road users; (c) Green: promotes the use of environmentally-friendly modes of transport; (d) Mobile: moves people and goods expeditiously and efficiently, meeting the needs of both users and operators; and (e) Accessible: delivers easily-reachable and reliable transport services.

improve the airport services and operational efficiency.

## **UPDATE ON SMART MOBILITY INITIATIVES**

3. “Smart Transport Infrastructure”, “Data Sharing and Analytics” and “Applications and Services” are three indispensable key elements which are discrete yet interrelated for the implementation of the smart mobility strategy. Smart transport infrastructure with the adoption of advanced technology lays the foundation of smart mobility. Building upon it is the data collected which could be analysed and disseminated to assist in traffic management and planning, and meet road users’ expectations and diverse needs. Besides, with the smart transport infrastructure and rich data, various service providers could develop smart mobility applications and services to tackle individual traffic problems and improve transport services to enhance the efficiency and effectiveness of traffic management, thereby enhancing the efficient use of road space, alleviating traffic congestion and reducing carbon emissions, with a view to achieving the objectives of modern city management, environmental protection, and promoting sustainable development. The latest position and work plan of the various key initiatives under the above-mentioned three elements are set out in the ensuing paragraphs.

### **(I) Smart Transport Infrastructure**

4. Smart transport infrastructure comprises devices, installations, software infrastructure, etc. which could collect, analyse and process real-time traffic data, and disseminate useful information to road users automatically.

#### Installation of Traffic Detectors

5. The Legislative Council (“LegCo”) Finance Committee approved funding of \$194.0 million and \$262.7 million in June 2016 and June 2018 respectively for the installation of traffic detectors along strategic routes and major roads. The installation of 1 200 traffic detectors on all strategic routes and major roads to collect real-time traffic information was completed in end 2020. With these traffic detectors, TD could monitor traffic conditions more

comprehensively, further strengthening its capability in handling traffic incidents as well as traffic management. Relevant traffic information is disseminated to key stakeholders in handling traffic incidents including public transport operators, the Hong Kong Police Force (“HKPF”) and the Fire Services Department. The traffic data collected are disseminated through “HKeMobility” and the Public Sector Information (“PSI”) Portal (data.gov.hk).

### Implementation of Free-Flow Tolling System

6. The Free-Flow Tolling System (“FFTS”) enables motorists to pay tolls of government-tolled tunnels and Tsing Sha Control Area (“TSCA”) remotely using toll tags. This allows more efficient and convenient payment and minimises disruption to traffic flow at toll plazas arising from the need to stop for toll payment. Relevant legislative amendments were passed by LegCo in June 2021 to provide legal backing for the implementation of FFTS.

7. The TD and relevant government departments are actively preparing for the gradual roll-out of FFTS at each of the government-tolled tunnels and TSCA from end 2022. The tasks involved include developing and testing a unified backend toll collection system which supports charging of time-varying tolls, modifying the toll plaza areas and adjoining roads, installing boothless tolling facilities (including the Radio Frequency Identification system complemented by Automatic Number Plate Recognition system) and carrying out gearing-up work with a toll service provider. The TD plans to start issuing toll tags to vehicle owners from September/October 2022.

8. Implementing FFTS will provide the essential infrastructure for Congestion Charging, the objective of which is to charge different tolls at different time periods based on the prevailing traffic condition of the tolled tunnels and TSCA with a view to regulating traffic flows and alleviating traffic congestion during peak hours. TD consulted the LegCo Panel on Transport on the proposed principles of Congestion Charging on 17 June 2022 and will formulate the toll adjustment proposals for Member’s advice later.

## Pilot Real-time Adaptive Traffic Signal Systems

9. Since June 2019, TD has commenced a pilot project of implementing real-time adaptive traffic signal systems at five selected junctions<sup>2</sup>. By installing sensors at the signalised junctions to detect real-time traffic and pedestrian volume, the allocation of green time could be optimised, thereby reducing congestion and unnecessary delay. The systems were completed in March 2021, producing satisfactory results with a noticeable improvement in the efficient use of road space by vehicles and pedestrians. In view of this, TD is selecting suitable signalised junctions for further implementation. At the same time, TD is in the progress of conducting a trial of an area-wide real-time adaptive traffic signal system to cover multiple linked signalised junctions in Tung Chung town centre. In the long run, TD will apply the relevant experience of developing the real-time adaptive traffic signal system to develop a smart traffic management system, so as to assist TD in comprehensively obtaining real-time traffic information and managing traffic.

## Trial and Use of Autonomous Vehicles

10. Autonomous vehicle (“AV”) technology has developed rapidly in recent years and trials have been carried out around the world. It is considered that such a new mode of transport could promote road safety, avoid traffic congestion, enhance the mobility of citizens, increase productivity and reduce exhaust emissions caused by traffic congestion. TD has been facilitating the trials of AVs by using Movement Permits. By the end of June 2022, Movement Permits were issued to 12 autonomous vehicles to conduct trials in eight different locations, covering university campus, air cargo terminal, cultural district, private roads and public roads. To allow wider and more flexible trial and use of AV in Hong Kong, TD has been working on a legislative amendment exercise with a view to developing a regulatory framework that is flexible enough to embrace the changing AV technologies and allow the adoption of AVs as a new mode of transportation, while at the same time ensuring public safety, paving the way for the long-term development of AVs in Hong Kong. To this end, TD plans to introduce an amendment bill into LegCo by end 2022.

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<sup>2</sup> Junctions of Victoria Road/Sandy Bay Road, King Cho Road/Lim Cho Street, Yen Chow Street/Cheung Sha Wan Road, Castle Peak Road/So Kwun Wat Road and Castle Peak Road/Ka Wo Li Hill Road.

11. Under the new regulatory framework for AV, AAHK plans to deploy an autonomous transportation system for trial and pilot use for its Airport City Link (“ACL”). The ACL will first connect the Airport Island and the Hong Kong Port (“HKP”) Island. As the next step, the AAHK plans to extend the autonomous transportation system of the ACL to Tung Chung town centre.

## **(II) Data Sharing and Analytics**

12. With the progressive generation of a vast amount of data from various smart transport infrastructures, the collection, storage, analysis and dissemination of traffic data become more essential. Besides, TD aims to provide good quality open data to cultivate more innovative data applications by the industry to facilitate commuting by the public.

### New Version of the “HKeMobility” Mobile App

13. In March 2021, TD launched a new version<sup>3</sup> of “HKeMobility”. Apart from continuing to provide real-time traffic and transport information (such as travel route advice and journey time, traffic snapshots, and real-time arrival time of public transport), its new user interface can be customised by users for quick access to traffic and transport information to cater for their needs. It provides information of nearby public transport services automatically according to the users’ locations. Its walking route search function comes with options for general users, persons with visual impairment, and persons with mobility impairment.

14. As at end-June 2022, “HKeMobility” recorded over 2.6 million cumulative downloads with an average daily hit rate of about 50 000. TD will continue to bring in new functions and enhance existing functions of “HKeMobility” to address the need of users.

15. Apart from providing the public with personalised traffic and public transport information to facilitate their commuting and route planning, the “HKeMobility” also helps cultivate more innovative applications by the industry through data sharing. Most of the data in “HKeMobility” has also been

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<sup>3</sup> The first version of the HKeMobility was launched in July 2018.

disseminated via the PSI Portal “data.gov.hk”, which involves information from over 30 datasets.

### Opening Up of Estimated Time of Arrival (“ETA”) Data by Public Transport Operators

16. At present, the public can access the ETA data of all regular franchised bus routes and five railway lines (viz. Tung Chung Line, Airport Express Line, Tuen Ma Line, Tseung Kwan O Line and East Rail Line) via “HKeMobility”. These data have also been disseminated via the PSI Portal.

17. For green minibuses (“GMBs”), as at end June this year, TD has disseminated the ETA data of 453 routes through “HKeMobility” and the PSI Portal, with a view to covering all GMB routes by the end of this year.

### Parking Vacancy Information

18. On the other hand, TD has been encouraging government departments<sup>4</sup> and private developers to release their real-time parking vacancy information to the public. As at end-June 2022, “HKeMobility” has released real-time parking vacancy information of more than 18 900 and 82 500 on-street and off-street parking spaces respectively, which account for about 48% of the total hourly parking spaces in Hong Kong. Meanwhile, TD has completed installing sensors at about 250 non-metered on-street parking spaces to detect whether the parking spaces are occupied. This real-time information has been disseminated through “HKeMobility” and the PSI Portal since June 2022. TD is planning to install sensors at other suitable non-metered on-street parking spaces.

### Traffic Data Analytics System

19. To enhance traffic management and transport efficiency, the Office of the Government Chief Information Officer and TD jointly developed the Traffic Data Analytics System through the application of big data. Through the Government’s “Big Data Analytics Platform”, the system provides real-time and the next 15 to 90 minutes estimated journey time, by analysing the historical and

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<sup>4</sup> Real-time parking vacancy information of all car parks under TD’s management has been released since mid-2019. As at end-June 2022, about 80% of car parks managed by other government departments are releasing parking vacancy information via HKeMobility and data.gov.hk.

real-time traffic and transport data and weather data, as well as the forecast weather data from the Hong Kong Observatory. The related information has been disseminated via “HKeMobility” and the PSI Portal starting from end April 2022.

### **(III) Applications and Services**

20. The last key element of smart mobility is the application of smart mobility infrastructure and collected data for traffic management measures and policy, which could address some of the acute traffic problems and improve the transport services with new alternatives.

#### New Generation of On-street Parking Meters

21. All on-street parking meters have been replaced with new ones. There are about 10 300 new generation parking meters in operation. The new parking meters support payment of parking fees through multiple means including the “HKeMeter” mobile application, allow remote payment of fees for up to twice the longest parking period, and are equipped with sensors to provide real-time vacancy information.

#### Automated Parking Systems

22. To further increase the number of parking spaces and spatial efficiency, TD is actively implementing Automated Parking Systems (“APS”) in suitable short-term tenancy (“STT”) car parks and public works projects. The first APS taken forward by the Government at the STT site on Hoi Shing Road in Tsuen Wan was commissioned in November 2021, while the second APS at the STT site at Pak Shek Kok in Tai Po is expected to be commissioned in the fourth quarter of 2022. For the public works projects that provide APS, the construction works for the Joint-user Government Office Building in Area 67 in Tseung Kwan O and the District Open Space, Sports Centre cum Public Vehicle Park project at Sze Mei Street in San Po Kong have commenced, and are expected to be completed in 2025 and 2026 respectively. For the APS project at the junction of Yen Chow Street and Tung Chau Street in Sham Shui Po, the works are being tendered, and construction works are expected to commence in

2023. For the Joint-user Complex at the junction of Shing Tai Road and Sheung Mau Street in Chai Wan, the planning is underway. In addition, the AAHK is building two automated car parks on the HKP Island by phases, with a view to providing around 6 000 parking spaces in the long term. The car parks will cater for air transfer passengers or visitors arriving via the Hong Kong-Zhuhai-Macao Bridge from Guangdong or Macao. The first phase is expected to be completed in 2024 for commissioning in the same year.

### Electronic Licensing

23. TD has all along been striving for innovation in licence management through streamlining procedures and implementing e-initiatives, and has planned to use technology to improve public services. TD will implement electronic permits<sup>5</sup> (“ePermits”), electronic vehicle licence<sup>6</sup> (“eVL”), electronic driving licence<sup>7</sup> (“eDL”) and extend online services to over 20 types of services<sup>8</sup>, etc. by phases to further enhance the operational efficiency and bring convenience to the public during the application process. TD will submit the legislative amendment proposals for relevant e-licensing initiatives to the Legislative Council. After the completion of relevant system enhancements, TD expects to implement ePermits in Q4 this year, eVL in 2023 and eDL in 2024.

24. Adopting e-licensing and extending online services would not only respond to the increasing demand for licensing services from the public, but would also improve the public’s experience when using them. Meanwhile, TD will continue to step up publicity for online services in order to encourage more applicants to submit licensing applications online to enjoy the convenience of e-licensing services and avoid the need to visit Licensing Offices to process their applications.

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<sup>5</sup> Under the ePermits initiative, the TD will launch electronic forms for the concerned permits by issuing them in ‘portable document format’ and sending them to applicants by email.

<sup>6</sup> Under the eVL initiative, the expiry date will no longer appear on the paper-form vehicle licence. Although vehicle owners will still need to renew their VL every year, they do not need to replace the paper-form VL with a new one after each renewal as the expiry date will not be printed on the VLs issued to them.

<sup>7</sup> eDL will be used as a supplementary and additional form of DL. It will be presented via a mobile application with the authentication by “iAM Smart”. eDL will provide the same information recorded in the physical DL and will be accepted in lieu of the physical DL. DL holders can choose to bring along either the physical DL or the eDL when driving.

<sup>8</sup> Riding on the launch of “iAM Smart”, TD has already upgraded 12 types of its existing online licensing application services by phases since December 2020.



## Traffic e-Enforcement System

25. The Government is preparing to serve Fixed Penalty Notices (“FPNs”) on parking-related contraventions and traffic offences by electronic means, with an aim to enhance the accuracy and efficiency of enforcement actions; and, in the long run, to foster better driving attitude among drivers, which is conducive to reducing traffic accidents and illegal parking, thereby enhancing road safety and alleviating traffic congestion. To replace the existing manual-based operation for traffic enforcement, with the funding approval by LegCo Finance Committee in June 2021, HKPF is now working full steam ahead in developing a new Traffic e-Enforcement System to facilitate the serving of FPNs by electronic means. The System will digitalise the existing enforcement processes, including the collection of details and evidence of traffic contraventions by frontline officers, data processing as well as storage. Electronic FPNs (“e-FPNs”) may then be issued to the vehicle owners or drivers concerned. Frontline law enforcement officers can also utilise dedicated mobile devices to take photographs or videos to record the details of contravention as evidence. All captured data will be uploaded to a centralised internal platform in real-time using a mobile connection.

26. The HKPF will also develop a citizen-centric Traffic e-Enforcement thematic portal, through which members of the public can view their traffic contravention/offence records and handle related matters online. HKPF has commenced the detailed design of the System with a view to rolling it out by phases starting from the first quarter of 2023. To facilitate the implementation of traffic e-enforcement, the Government consulted the Panel on Transport on the relevant legislative proposal on 17 June 2022, and plan to introduce a Bill into the LegCo by the end of this year to make relevant legislative amendments to enable the issuance of e-FPNs.

## **Promotion of Vehicle-related Innovation and Technology**

### Smart Traffic Fund

27. To further motivate different sectors of the community to participate in the promotion of smart mobility, the Government announced in the 2019

Policy Address Supplement that it would set up a fund to promote research and application of vehicle-related innovation and technology. The Smart Traffic Fund (“the Fund”) was launched and started accepting applications on 31 March 2021 to provide funding support to local organisations and enterprises for conducting research and application on vehicle-related innovation and technology with the objectives of enhancing commuting convenience, enhancing efficiency of the road network or road space, and improving driving safety. The Management Committee (“MC”) comprising relevant stakeholders<sup>9</sup> has been set up to vet applications and monitor the general operation of the Fund. The Fund has approved 17 projects, involving a total grant of around \$94 million to date.

28. The approved projects cover road safety, driving behaviours, traffic forecast, accessible transport, parking, vehicle safety devices, charging management for electric vehicles and autonomous vehicles/vehicle-to-everything technologies. By funding the approved projects, the Government aims to foster a positive research and application environment for the industry, with a view to promoting a new era of transportation and building Hong Kong into a liveable and sustainable city.

## **UPDATE ON SMART AIRPORT INITIATIVES**

29. HKIA is known for its efficiency and excellent services. In addition to the application of AV and automated parking technologies in airport operations as mentioned in the preceding paragraphs, AAHK has also adopted a number of key technologies and innovations, with a view to making airport operations even more efficient, offering a unique passenger experience and developing HKIA into a smart airport. Relevant measures include:

### Flight Token

30. To create a smoother airport experience, AAHK has launched Flight Token, a self-service biometric system that enables departing passengers to use their faces as identification and navigate more conveniently for check-in, bag drop, security check and aircraft boarding processes. With e-security gates and

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<sup>9</sup> The MC is chaired by the Deputy Commissioner for Transport / Planning and Technical Services, comprising five official members and five non-official members from relevant trades, professions and stakeholders.

e-boarding gates equipped with face recognition technology installed at HKIA, passengers with a flight token will not need to show their travel documents and boarding passes at every checkpoint, thereby increasing passenger convenience and improving passenger handling efficiency, enhancing the accuracy of identity checks. Flight Token is named “Best Innovation in Airport Passenger-related Processes” at the Amadeus and ACI World Technology Innovation Awards.

### Smartlane

31. Apart from e-security gates and e-boarding gates, AAHK will also introduce “Smartlane” at HKIA to speed up the security screening process. “Smartlane” has a computed tomography X-ray system that provides enhanced screening of passengers’ hand baggage and an automatic tray return system that is integrated with the X-ray machine. Passengers will not need to remove liquids, aerosols or gels, or electronic devices such as laptops from their hand baggage during the screening process, thereby making security screening more efficient. The trial of “Smartlane” has been completed and will be rolled out at an appropriate time.

### 5G network

32. The application of 5G technologies provides an independent and reliable wireless network to enhance service and passenger experience by creating fast, agile and reliable connectivity among people, devices and facilities at HKIA. Since April 2020, the public 5G network service has been available at HKIA for 5G users. The coverage of enterprise 5G network for airport operators has also been extended to all terminals, and all other indoor and outdoor areas at HKIA, allowing the airport community to increase the use of automation, robotics and video analytics. AAHK’s enterprise 5G project was recognised by the Communications Association of Hong Kong (“CAHK”) and received a gold prize in the “Best Innovation for Future Enterprise” category of the CAHK STAR Awards 2021.

### Digital Twin

33. AAHK created a digital twin of Terminal 1 (“T1”) Building of HKIA. This three-dimensional, computer-generated replica of T1’s physical

infrastructure and systems collects real-time data from Internet of Things sensors throughout the airport. Using past, current and predictive data, the digital twin creates virtual reality models that help AAHK visualise potential problems and make better decisions about design, construction, operations and maintenance.

## **EXPERIENCE AROUND THE WORLD**

34. In recent years, a number of cities in the Mainland and around the world have been striving to develop smart mobility by using information and communications technology to enhance traffic management. Their key initiatives are set out in the ensuing paragraphs. While promoting smart mobility, TD makes reference to the experience of other cities and keeps abreast of the latest technology.

### In-vehicle Unit

35. With the advancement of technology, In-vehicle Unit (“IVU”) has been widely adopted worldwide, including the Mainland and Taiwan, Japan, Singapore, Malaysia, the United States, and European Union, and replaced the manual method for automatic toll collection. The IVU has also been widely used for access management and parking fee collection of car parks. After the implementation of FFTS, TD will consider gradually expanding the application of IVU (Toll Tag), to other applications, such as paying parking fees of government car parks, Electronic Vehicle Licence, Congestion Charging and Electronic Road Pricing.

### Smart Traffic Management System

36. Many Mainland cities have been actively developing smart traffic management systems to relieve traffic congestion in their urban areas. They installed high-definition video cameras at junctions to collect real-time traffic data and images, and employ artificial intelligence to analyse the traffic conditions and adjust the traffic signals in real-time. The systems can also analyse the images captured by high-definition video cameras and adjust the priorities of the traffic signals according to the vehicle types (such as buses and ambulances), conduct detailed traffic surveys, and manage traffic incidents more

efficiently. The trial of an area-wide real-time adaptive traffic signal system in Tung Chung town centre as mentioned in paragraph 9 above adopts a similar arrangement and will assess the effectiveness of different artificial intelligence systems in traffic management.

### Autonomous Vehicles

37. Autonomous vehicle technology around the world is still in the testing phase while the relevant regulations are also under development. Taking the Mainland as an example, policies and regulations related to autonomous driving have been introduced successively in recent years, and various provinces and cities have also formulated test plans for autonomous vehicles to facilitate their development. Separately, Singapore continues to adopt a “regulatory sandbox” approach to set regulations to allow autonomous vehicles to be tested and used on the road; while the United Kingdom has been using a “Code of Practice” to support and facilitate the testing and use of autonomous vehicle technology on public roads, and they are planning to develop a legal framework to implement the widespread deployment of autonomous vehicle technology. Apart from the legislative amendment exercise as mentioned in paragraph 10 above, TD aims to simplify the approval process. If the autonomous vehicle has been tested or examined in other regions, TD will consider the testing or examination results together with the application.

### Smart Motorway

38. The TD is making reference to the experience of other areas and studying the establishment of smart motorway facilities (e.g. traffic control and surveillance systems, and traffic detectors) so as to better utilise the limited road space and enhance road network carrying efficiency. TD is also using big data for real-time traffic analysis of the road network in order to provide more pertinent traffic information, suitably divert road traffic, and respond to contingencies. This will also provide a basis for the future application of autonomous driving and “vehicle-to-everything” technologies. In the technical standard and application aspects, TD will place emphasis on the connectivity with other cities in the Greater Bay Area.

## Vehicle-to-everything Technology

39. TD is also exploring the application of V2X (Vehicle-to-everything) technology. V2X means the technology of automatic data transmission and communications among vehicles and between vehicles and pedestrians, roadside infrastructures and cloud networks. V2X enables the real-time data collection from traffic signals or potential hazards detected from sensors (such as approaching pedestrians intending to cross the road ahead) could simultaneously alert the nearby drivers for improving road safety. The data collected from vehicles and road infrastructures could also assist in implementing real-time traffic measures or suggesting driving routes, in order to alleviate traffic congestion, enhance road network carrying efficiency and facilitate route planning by the public.

## **WAY FORWARD**

40. Looking forward, TD will continue to promote smart mobility along three key dimensions, viz. the active provision of smart transport infrastructure, facilitation of data sharing and analytics, as well as the launch of user-friendly applications and services. In this connection, TD commenced the Traffic and Transport Strategy Study (“TTSS”) in December 2021, which will map out a forward-looking Transport Strategy Blueprint with a planning horizon up to 2050 to provide a safe, reliable, environmentally friendly and efficient traffic and transport system. One of the major study directions is to optimise the use of limited road space in Hong Kong through harnessing smart transport technologies and big data analytics. TD will also explore the feasibility of promoting smart motorways in Hong Kong, which will ride on the “vehicle-to-everything” (“V2X”) technology to facilitate autonomous driving and the interaction and information transfer between vehicles and road facilities, thereby paving the way for the implementation of more flexible and intelligent traffic management in the future. TTSS will coordinate, complement and consolidate the findings and recommendations of related studies on smart mobility initiatives, incorporating them into the final Transport Strategy Blueprint.

41. In respect of the development of HKIA into a smart airport, HKIA is one of the early movers in the international aviation industry in applying

innovative and advanced technologies to airport services. To further strengthen HKIA's international leadership in this strategic area, AAHK will continue to work closely with international aviation organisations to spearhead technology development.

### **ADVICE SOUGHT**

42. Members are invited to note the above updates on the smart mobility initiatives.

**Transport Department  
Airport Authority Hong Kong**

**July 2022**