For discussion on
23 May 2022

Legislative Council
Panel on Environmental Affairs

Hong Kong air quality and progress of improvement measures

Purpose

This paper sets out an overview of the air quality in Hong Kong, and the progress and future targets of the government's air quality improvement measures.

Overview of air quality improvement

2. Over the past decade, the Government has implemented a wide range of measures that significantly reduced air pollutant emissions from major sources such as vehicles, vessels and power plants, and collaborated with the Guangdong Provincial Government to implement policies that reduce air pollutant emissions. The measures have been increasingly effective, significantly enhancing the ambient and roadside air quality of Hong Kong. In 2021, the concentrations of Hong Kong's major air pollutants (i.e. respirable suspended particulates (PM_{10}), fine suspended particulates ($PM_{2.5}$), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2)) in the ambient air have dropped by 32% to 62% as compared with 2011, while their concentrations at the roadside have also reduced by 43% to 58% (details are set out in **Annex 1**).

3. Visibility has also improved immensely with better air quality. The hours of reduced visibility[1] recorded by the Hong Kong Observatory have reduced by 84% from its peak of 1 570 hours in 2004 to only 258 hours in 2021.

[1] Reduced visibility refers to visibility below 8 kilometres when the relative humidity is below 95% and there is no fog, mist, or precipitation.

4. For the Air Quality Health Index (AQHI)[2], the number of hours and days with high health risk or above recorded at the general monitoring stations in 2021 were 429 hours and 69 days respectively, representing a reduction of 338 hours (44%) and 28 days (29%) as compared with 2014. The number of hours and days with high health risk or above recorded at the roadside monitoring stations in 2021 were 172 hours and 33 days respectively, representing a significant reduction of 935 hours (84%) and 115 days (78 %) compared with 2014. These reflect the short-term health risks caused by air pollution have been decreasing. The relevant AQHI statistics are set out in **Annex 2**.

Challenges

5. Although the air quality in Hong Kong has enhanced significantly, the relatively high roadside NO_2 level and the rising trend of ozone concentration are both challenges to hinder further air quality improvement.

Roadside nitrogen dioxide

6. Roadside NO_2 mainly comes from vehicular emissions. With the implementation of various policies and measures targeting vehicular emissions, the roadside NO_2 level has significantly decreased in recent years. However, in 2021, the annual average concentration (70 $\mu g/m^3$) still exceeded the limit of Hong Kong's relevant Air Quality Objective (40 $\mu g/m^3$).

Regional ozone

7. Ozone is a complicated air pollution issue. It is not emitted directly from pollution sources, but formed by the photochemical reactions between nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the presence of sunlight. Ozone formed at adjacent areas in the region can also be transported by wind to Hong Kong. Therefore, ozone reduction is a regional problem, calling for cooperation and concerted effort by different stakeholders in the entire region.

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[2] The Environmental Protection Department launched the AQHI in late December 2013 to inform the public of the short-term health risks posed by air pollution. There are 5 levels of health risks, namely, low (AQHI between 1-3), moderate (AQHI between 4-6), high (AQHI at 7), very high (AQHI between 8-10) and serious (AQHI at 10+).

8. On the other hand, ozone can be consumed through chemical reactions by other gases (including nitric oxide (NO) from vehicular emissions), contributing to the reduction in ozone level. However, NO emissions from the local vehicles have been reducing progressively in recent years, thus reducing chemical reactions between ozone and NO. According to the experience of various major international cities, the increase in ozone level at the roadside and in the urban areas is foreseeable and transitional in the course of overall air quality improvement.

9. With reference to the experience of containing air pollution in Europe and the United States, it is common to have the delay in improvement as described above in the reduction of ozone that is formed by photochemical reactions. Hence, resembling many other major international cities in tackling the ozone problem, the ozone level in Hong Kong will first increase slightly, and then begin to decline after reaching the peak. Nevertheless, continuously reducing the emissions of ozone precursors (i.e. NOx and VOCs) will help reduce the overall ozone levels in the long run.

Air quality improvement measures and progress

10. The Government has implemented a number of measures to progressively enhance the air quality. Key measures and progress are set out below.

Vehicular emissions reduction

11. The Government has progressively tightened the emission standards for first registered vehicles and provided first registration tax (FRT) concessions to environmentally friendly commercial vehicles. For vehicles in-use, the Government had implemented an ex-gratia payment scheme to phase out about 80 000 pre-Euro IV diesel commercial vehicles (DCVs) between 2014 and 2020, and launched a new ex-gratia payment scheme in October 2020 to phase out some 40 000 Euro IV DCVs. We also subsidised the installation of emission reduction devices for franchised buses, liquefied petroleum gas (LPG) taxis and LPG light

buses, as well as set up Franchised Bus Low Emission Zones in 3 busy corridors at Causeway Bay, Central and Mong Kok to improve roadside air quality.

New energy vehicles

12. In addition, the Government has been promoting the adoption of new energy vehicles, such as providing FRT concessions for electric vehicles (EVs), introducing the "One-for-One Replacement" Scheme[3], and launching the EV-charging at Home Subsidy Scheme (EHSS) to subsidise the installation of EV charging-enabling infrastructure in car parks of existing private residential buildings. With the various initiatives, the penetration of electric private cars has reached a record high in recent years. In 2021, there were nearly 9 600 newly registered electric private cars, which made up almost 25% of all newly registered private cars of the year. This represents that 1 out of every 4 new private cars sold was electric, a ratio that increased significantly as compared with the 1:16 and 1:8 in 2019 and 2020 respectively. Such ratio also compares well with other economies such as Germany, Japan, the United Kingdom, and the United States. Furthermore, in the first quarter of 2022, nearly half of the new private cars sold were EVs. The number of electric private cars has exceeded 30 000, accounting for 4.6% of the total number of private cars in Hong Kong.

13. In view of the positive responses to the EHSS, the Financial Secretary proposed in his 2022-23 Budget and the Legislative Council approved the injection of an additional funding of $1.5 billion to extend the EHSS for 4 years to the 2027-28 financial year. With the additional funding, we anticipate that the whole EHSS will support the installation of EV charging-enabling infrastructure for about half of the eligible parking spaces in Hong Kong.

14. As regards public charging facilities, with the completion of the 1 000 additional medium chargers at government car parks in mid-2022, Hong Kong can achieve at least 3 years earlier the target of having at least 5 000 public chargers provided by both public and private sectors by 2025, as set out in the *Hong Kong Roadmap on Popularisation of Electric Vehicles*. The Government

[3] Private car owners who replace their old private cars with an electric private car can enjoy a higher FRT concession under the "One-for-One Replacement" Scheme.

is about to launch a mobile application by mid-2022 to disseminate real-time information of the government public chargers to the general public.

15. Besides, the Government has put in place the New Energy Transport Fund since 2011 to subsidise trials and applications of various green innovative commercial transport technologies. Merely from 2021 to the first quarter of 2022, we have already allocated more than $70 million for almost 80 trials for various electric transport modes, including light goods vehicles, medium goods vehicles (tractors), single-deck and double-deck buses (including applications from operators providing transport service for students), light buses, taxis, motorcycles, as well as electric vessels.

Vessel emissions reduction

16. The Government imposed a statutory cap of 0.05% on the sulphur content of locally supplied marine light diesel under the Air Pollution Control (Marine Light Diesel) Regulation (Cap. 311Y) in 2014. The Governments of Hong Kong and the Guangdong Province then jointly established a Domestic Emission Control Area in the waters of the Pearl River Delta Region in 2019, further tightening the requirements for all vessels to use compliant fuel (i.e. fuel with sulphur content not exceeding 0.5% or liquefied natural gas (LNG)), irrespective of whether they are sailing or berthing. Since 2020, we have made use of drones to monitor vessel emissions in real time. Together with computer analysis of sulphur content of vessel fuel, enforcement officers can take effective actions against vessels that are suspected of breaching relevant regulation. The measures concerned have brought considerable improvement to coastal air quality.

Public electricity generation

17. The proportion of coal in the fuel mix has decreased from about half in 2015 to around a quarter. The Government has regularly issued technical memoranda (TMs) since 2008 to progressively tighten the emission caps of SO_2, NOx and PM_{10} for power plants. As compared with the first TM (effective in 2010), the emission caps of SO_2, NOx and PM_{10} set out in the latest TM for 2026 have reduced by 89%, 74% and 71% respectively. The two power companies are also jointly constructing an offshore liquefied natural gas (LNG) terminal to receive and supply natural gas to the power plants in Lung Kwu Tan and Lamma

Island, enhancing the diversity and security of gas supply. The Government has also been liaising with the relevant stakeholders including the power companies and the marine trade to explore the use of the offshore LNG terminal mentioned above as a bunkering facility for ocean-going vessels, so as to promote the adoption of LNG in vessels.

Other measures

18. Products containing VOC, such as air fresheners, hairsprays, insecticides, printing inks and paints, are also Hong Kong's major emission sources of air pollutants. In this connection, the Government has been regulating the VOC content of 172 types of products in phases since 2007. As regards the indoor air quality (IAQ), the Government updated the IAQ Objectives under the IAQ Certification Scheme for Offices and Public Places in 2019, to further enhance IAQ standards.

19. Furthermore, in order to enhance air quality monitoring, the Government set up in Cape D'Aguilar the first air quality monitoring supersite in 2017. In addition to major air pollutants measured by general monitoring stations, the supersite also measures real-time data of VOCs, particulates smaller than one micron (i.e. PM_1), black carbon (a component of $PM_{2.5}$), etc.. A light detection and ranging (LIDAR) system has also been set up to collect high-altitude ozone concentration data for regional joint research studies. Moreover, the Government has supported a local university to develop a system for analysing and forecasting air quality in Hong Kong at the street level, and to provide personalised real-time air pollution information to the public through a mobile application.

Regional cooperation

20. Since 2000, the Governments of Guangdong and Hong Kong have worked together to improve the air quality in the Pearl River Delta region through various cross-boundary cooperation activities and agreements under the Hong Kong-Guangdong Joint Working Group on Sustainable Development and Environmental Protection formed under the Hong Kong/Guangdong Co-operation Joint Conference. A number of emission reduction measures targeting major pollution sources have been implemented continuously under the

cooperation framework in the Pearl River Delta Regional Air Quality Management Plan signed in 2003. Guangdong and Hong Kong have set emission reduction targets for SO_2, NOx, PM_{10} and VOCs for 2010, 2015 and 2020 (the emission reduction targets and attainment positions are set out in **Annex 3**), and are now assessing the attainment of the 2020 targets.

21. Effort to reduce air pollutant emissions by Guangdong and Hong Kong has borne fruit. The regional air quality has significantly improved. Although the regional ozone level shows a mild increasing trend, the average annual concentrations of SO_2, NO_2 and PM_{10} recorded by the Pearl River Delta Regional Air Quality Monitoring Network in 2020 have decreased by 86%, 43% and 49% respectively, compared with the 2006 levels. The average annual concentration of $PM_{2.5}$ also decreased by 31% compared with the 2015 level[4] (detailed data recorded by the regional monitoring network are set out in **Annex 4**).

22. Since 2008, the Hong Kong and Guangdong Governments have been jointly implementing the Cleaner Production Partnership Programme to encourage and facilitate Hong Kong-owned factories to adopt cleaner production technologies and practices through funding support and technology promotion activities, thereby contributing to the improvement of the regional environment, in particular air quality. A total of $293 million has been invested in the first 3 phases of the Programme (from 2008 to 2020). In view of the sustained improvement to the regional environment brought by the Programme, the Government allocated another $311 million in 2020 to extend the Programme to March 2025. From June 2020 to March this year, the new phase of the Programme has approved over 370 projects, involving over $72 million of funding support. The Programme has contributed to an annual air pollutant emissions reduction of over 38 000 tonnes, including nearly 14 000 tonnes of VOCs, 10 000 tonnes of SO_2 and over 14 000 tonnes of NOx.

Policy directions and future targets

23. To further enhance air quality in Hong Kong and combat climate change, the Government has announced the *Hong Kong Roadmap on Popularisation of Electric Vehicles* (the EV Roadmap), *Clean Air Plan for Hong Kong 2035*, and

[4] The regional air quality monitoring network has begun to measure $PM_{2.5}$ since September 2014.

Hong Kong's Climate Action Plan 2050 in March, June and October 2021 respectively, elaborating policy directions and future targets in different areas.

Hong Kong Roadmap on Popularisation of Electric Vehicles

24. Development of green transport is an important policy to improve air quality and mitigate climate change. Measures under the EV Roadmap cover various aspects, including ceasing the new registration of fuel-propelled private cars in 2035 or earlier; promoting the use of electric private cars and commercial vehicles; expanding the EV charging network, training of EV technical and maintenance practitioners; formulating a Producer Responsibility Scheme (PRS) for retired EV batteries; creating a conducive environment for the popularisation of EVs, etc.. The above initiatives will guide Hong Kong to attain zero vehicular emissions before 2050. As mentioned in the EV Roadmap, we are on schedule to explore the introduction of a PRS to ensure the proper collection and handling of retired EV batteries. A number of engagement meetings have been held with the trade and relevant stakeholders (including EV suppliers, EV repairing workshops, vehicle owner associations, EV battery collectors, etc.) to elaborate the PRS policy direction and collect their views for collaboratively exploring the suitable approach for Hong Kong, with a view to legislating the PRS for retired EV batteries in the future.

25. To demonstrate the commitment in pushing forward Hong Kong's adoption of EVs, the Government has updated its circular on green procurement to set EVs as the standard for small and medium private cars to be procured or replaced, unless there are special circumstances such as operational needs that render the use of EVs technically infeasible. The Government plans to procure about 142 cars for various departments in 2022, including 55 (i.e. almost 40%) EVs. For the remaining cars, there are yet suitable electric models to meet the requirements of emergency or rescue functions.

26. Besides, the Government will proactively promote the development of other new energy public transport and commercial vehicles, including collaborating with the franchised bus companies to test hydrogen fuel cell electric buses, with a view to formulating a more concrete way forward and timetable in around 2025 for adopting new energy public transport. The Government will continue to implement measures along the policy directions promulgated in the

EV Roadmap to promote the use of new energy vehicles. Details are set out in **Annex 5**.

Clean Air Plan for Hong Kong 2035

27. The *Clean Air Plan for Hong Kong 2035* outlines the long-term goals and specific policies to continuously improve air quality from now until 2035, facilitating Hong Kong to become a more liveable city with air quality on a par with major international cities by 2035. The ultimate goal is to have Hong Kong's air quality fully meeting the ultimate targets under the World Health Organization's global air quality guidelines. The Plan also sets out 6 major areas of action to improve air quality, including green transport, liveable environment, comprehensive emissions reduction, clean energy, scientific management and regional collaboration. The implementation timetable of the relevant measures is in **Annex 6**.

28. While enhancing the air quality, the Environmental Protection Department is developing a smart air quality monitoring system. We aim at launching a pilot project in 2023 to install compact air quality monitoring devices at different locations in a district, thereby expanding the coverage of monitoring and integrating the measurement data from the existing monitoring stations, Internet of Things, artificial intelligence and numerical models, so as to provide the public with more detailed real-time district-based air quality information.

29. To tackle the regional ozone problem, as mentioned in the Plan, the Governments of Guangdong, Hong Kong and Macao have launched a 3-year joint study on *Characterisation of Photochemical Ozone Formation, Regional and Super-Regional Transportation in the Greater Bay Area* in 2021. The study aims at acquiring in-depth understanding on the formation, regional and super-regional transportation characteristics of ozone in the Greater Bay Area to assist the formulation of effective control policies. Besides, Guangdong and Hong Kong are also conducting a joint study on *Post-2020 Regional Air Pollutants Emission Reduction Targets and Concentration Levels*. Based on the scientific information gathered from the study, we will work with the Guangdong Provincial Government this year to formulate regional air pollutant emission reduction plans and targets for 2025 and 2030, so as to further improve the regional air quality.

30. In addition, the Government has set out Hong Kong's Air Quality Objectives (AQOs) in the Air Pollution Control Ordinance (Cap. 311), and is required to review the AQOs at least once every 5 years for continuous air quality improvements, thus safeguarding public health. Following the completion of the previous round of review at the end of 2018, the Government has tightened 3 AQOs according to the review outcome, namely, the 24-hour AQO for SO_2 and the annual and 24-hour AQO for $PM_{2.5}$. The 3 new AQOs took effect on 1 January 2022. The Environment Bureau has embarked on a new round of review to assess the scope for further tightening the AQOs, with an aim of completing the review by 2023.

Hong Kong's Climate Action Plan 2050

31. The *Hong Kong's Climate Action Plan 2050* advocates policies comprehensively promoting deep decarbonisation, including the four major decarbonisation strategies, namely net-zero electricity generation, energy saving and green buildings, green transport and waste reduction, leading Hong Kong to strive for carbon neutrality before 2050.

32. Policies under the *Climate Action Plan* will create synergies in promoting carbon reduction while improving air quality. In addition to the green transport policies set out earlier, on "net-zero electricity generation", to promote low-carbon transformation of the electricity generation sector, the Government has pledged to cease using coal for daily electricity generation by 2035, and replace it with low-carbon and zero-carbon energy. Also, the Government will grapple with Hong Kong's geographical and environmental constraints, and strive to increase the share of renewable energy in the fuel mix for electricity generation to 7.5%-10% by 2035 and to 15% gradually thereafter. Meanwhile, the Government will also actively study the development and application of new energy such as hydrogen with a view to adopting them in Hong Kong when the technologies become relatively mature. The Government will explore strengthening energy cooperation with neighbouring regions, seeking investment and development opportunities to participate in and operate zero-carbon energy projects near Hong Kong, with a view to increasing Hong Kong's zero-carbon electricity supply and reducing the reliance on fossil fuels for electricity generation to move towards deep decarbonisation. Apart from the above, the promotion of "energy saving and green buildings" can reduce energy demand.

Our goal is to reduce the electricity consumption of commercial buildings by 30% to 40% and that of residential buildings by 20% to 30% from the 2015 level by 2050; and to achieve half of the above targets by 2035. To this end, we will continue to improve energy efficiency standards of building services installations, strengthen the promotion of energy audit and retro-commissioning, and study the feasibility of incorporating district cooling system in more new development areas. We will also keep the Mandatory Energy Efficiency Labelling Scheme under review and make full use of the energy saving opportunities arising from green innovation and technology.

Way forward

33. Members are invited to note the strategies and progress in enhancing air quality. We will continue to actively push forward the relevant policies and closely collaborate with the other cities in the Greater Bay Area to enhance air quality and promote decarbonisation, acting in concert with the target to achieve carbon neutrality and creating a healthier and more liveable living environment.

Environment Bureau
May 2022

Annex 1

Annual average concentrations of major air pollutants in Hong Kong from 2011 to 2021

Air pollutants		Annual average concentrations ($\mu g/m^3$)											Change between 2011 and 2021
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Respirable suspended particulates (PM_{10})	General stations	48	42	47	43	39	34	35	33	32	27	27	-44%
	Roadside stations	61	53	57	50	45	38	39	39	38	31	33	-46%
Fine suspended particulates ($PM_{2.5}$)	General stations	33	28	31	29	25	22	22	20	19	15	15	-55%
	Roadside stations	38	36	37	32	30	26	26	25	25	19	20	-47%
Nitrogen dioxide (NO_2)	General stations	53	51	54	49	49	47	40	39	38	33	36	-32%
	Roadside stations	122	118	120	102	99	82	86	82	80	70	70	-43%
Sulphur dioxide (SO_2)	General stations	13	11	13	11	10	9	8	6	5	5	5	-62%
	Roadside stations	12	10	11	9	8	7	7	7	5	5	5	-58%

Annex 2

Air Quality Health Index (AQHI)
Number of hours and days from 2014 to 2021
with high health risk or above (i.e. AQHI at "7" or above)

Number of hours with high health risk or above

	2014	2015	2016	2017	2018	2019	2020	2021	Change between 2014 and 2021
General stations	767	632	359	577	405	623	304	429	-338
Roadside stations	1107	918	259	520	345	485	197	172	-935

Number of days with high health risk or above

	2014	2015	2016	2017	2018	2019	2020	2021	Change between 2014 and 2021
General stations	97	80	67	82	60	92	55	69	-28
Roadside stations	148	105	50	73	52	64	33	33	-115

Annex 3

Air pollutants emission reduction targets and attainment positions for Guangdong and Hong Kong in 2010, 2015 and 2020

Pollutant	Region[1]	2010 Emission reduction targets[2]	2010 Target attainment	2015 Emission reduction targets[3]	2015 Target attainment	2020 Emission reduction targets[3, 4]
Sulpur dioxide (SO_2)	Hong Kong	-40%	**Target met**	-25%	**Target met**	-55%
	PRDEZ			-16%		-28%
Nitrogen oxides (NOx)	Hong Kong	-20%	**Target met**	-10%	**Target met**	-20%
	PRDEZ			-18%		-25%
Respirable suspended particulates (PM_{10})	Hong Kong	-55%	**Target met**	-10%	**Target met**	-25%
	PRDEZ			-10%		-17%
Volatile organic compounds (VOCs)	Hong Kong	-55%	**Target met**	-5%	**Target met**	-15%
	PRDEZ		**Target not met[5]**	-10%		-20%

[1] The Pearl River Delta Economic Zone (PRDEZ) includes Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Foshan, Jiangmen, Huizhou and Zhaoqing.

[2] Reductions compared with 1997 emission levels.

[3] Reductions compared with 2010 emission levels.

[4] The Guangdong and Hong Kong Governments are assessing the attainment of the 2020 emission reduction targets.

[5] PRDEZ's VOCs emissions had reduced by 26%, which did not fully meet the agreed target (55%). This is mainly because the socio-economic development of the PRDEZ had far outpaced the originally anticipated growth rate.

Annex 4

Annual average concentrations of major air pollutants recorded by the Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network (in μg/m^3)

Year	Sulphur dioxide (SO_2)	Nitrogen dioxide (NO_2)	Respirable suspended particulates (PM_{10})	Fine suspended particulates ($PM_{2.5}$)	Ozone (O_3)
2006	43	42	67	-	44
2007	44	41	72	-	46
2008	36	40	65	-	46
2009	26	38	64	-	51
2010	23	39	59	-	49
2011	21	37	59	-	53
2012	17	35	52	-	49
2013	17	37	59	-	49
2014	14	34	50	-	52
2015	12	30	44	29	47
2016	11	32	41	26	44
2017	10	31	45	28	52
2018	9	29	42	25	53
2019	7	30	42	25	60
2020	6	24	34	20	56
Change between 2006 and 2020	-86%	-43%	-49%	-31%[Note]	+27%

Note: The change between 2015 and 2020 is provided for $PM_{2.5}$.

Annex 5

Follow up actions for
the *Hong Kong Roadmap on Popularisation of Electric Vehicles*

Area	Follow up actions
Electric private cars	• Policies around the globe have been shifting to the development of electric vehicles (EVs) and new energy vehicles. Many car manufacturers have already announced plans to focus their production on EVs and other new energy vehicles in the coming years. Hong Kong has also set out the target to cease new registration of fuel-propelled private cars (including hybrids) in 2035 or earlier. Other than acting in tandem with the global trend to phase out fuel-propelled vehicles progressively, our target will provide stakeholders with sufficient time to prepare for the transition to EVs. • Depending on the global technological development, local EV uptake, development of supporting facilities, etc., the Government will consider if there is any room to promulgate more progressive targets in the review of the *Hong Kong Roadmap on Popularisation of Electric Vehicles* (the EV Roadmap). In the meantime, the Government will continue to make use of the existing first registration tax concessions arrangements for EVs and the "One-for-One Replacement" Scheme to promote the transition to EVs without stimulating vehicular growth.
Electric commercial vehicles	• According to the policy directions set out in the EV Roadmap, the Government is conducting trials together with the trades to test the technical and commercial viability of different types of electric commercial vehicles for use in the local environment, so as to identify the best option for Hong Kong: ➢ <u>Taxis</u> With the rapid development of EV technologies in recent years, a number of vehicle suppliers have introduced EV models with long driving range and quick charging capability that have the potential for use as taxis. The Government is working with the

	taxi trade on the trial of e-taxis under the New Energy Transport Fund, and has approved the trial for 4 e-taxis early this year. We will install by phases no less than 10 dedicated quick chargers for taxis in Lantau Island and Sai Kung this year, as well as identify suitable locations (such as taxi stands) across the territory for setting up dedicated charging facilities to promote wider use of e-taxis. In addition, we have been actively liaising with vehicle suppliers to encourage them to introduce suitable e-taxi models for use in Hong Kong. We are monitoring closely the latest market development and the views of the trade in order to enhance the trial and application, and the charging network of e-taxis. ➢ <u>Public light buses (PLBs)</u> The Government has set aside $80 million for a one-year trial of electric public light buses (e-PLBs), covering 40 e-PLBs serving different routes. Having selected in 2021 routes for the trial tentatively, the Government is further exploring the feasibility of individual routes and will soon discuss the arrangements for the trial with relevant PLB operators. Also, we have invited proposals from EV suppliers interested in supplying e-PLBs at the end of 2021. After vetting the proposals received, a total of 8 compliant models have been selected. Given the lead time to develop and manufacture e-PLBs that are suitable for adoption in Hong Kong, it is anticipated that the trial will commence in 2023. ➢ <u>Buses</u> The Government has subsidised franchised bus companies (FBCs) in full to purchase 36 single-deck electric buses and the ancillary charging facilities for trial on a number of routes, with a view to assessing their operational performance under local circumstances. The Government has also been working with the FBCs to install new charging facilities at suitable bus termini and depots for single-deck electric buses to conduct top-up charging during their daytime operation. Besides, since the promulgation of the EV Roadmap, response from the community has been positive. There are already FBCs announcing detailed plans on procuring electric buses and

	installing charging facilities in new bus depots in the next few years, or setting a target of attaining a full zero-emission bus fleet by 2045. These FBCs have introduced their single- and double-deck electric buses for daily services in the past month. ➢ <u>New Energy Transport Fund</u> The Government has put in place the New Energy Transport Fund (NET Fund, previously named Pilot Green Transport Fund) since 2011 to subsidise the transport trade and charitable/non-profit making organisations to try out and promote wider use of new energy transport technologies. As of the first quarter of 2022, the NET Fund has approved a total of 256 trial applications, including 178 for electric commercial vehicles and vessels, 70 for hybrid commercial vehicles and 8 for technologies applicable to conventional buses or ferries. The total subsidy amounted to over $200 million. After the promulgation of the EV Roadmap, we have also introduced the NET Fund to representatives of schools and school bus operators, and shared the experience of adopting electric buses. Subsequent to the sharing sessions, the NET Fund Steering Committee has received 8 trial applications for single-deck electric buses from the school bus operators. The Committee approved the applications in January 2022, an important first step for the trade to switch to EVs.
Trial of hydrogen fuel cell electric buses and heavy vehicles	• As set out in the *Hong Kong's Climate Action Plan 2050*, the Government would collaborate with FBCs and other stakeholders within the next 3 years to test out hydrogen fuel cell electric buses and heavy vehicles. The Government has started liaising with different FBCs and other operators to work out the details of the trials, and one of the FBCs has announced the plan to introduce hydrogen fuel cell double-deck electric buses. To cope with the development trend of hydrogen fuel cell electric vehicles and the demand for supporting facilities, the Environment Bureau is leading an inter-departmental working group to consider various implementation issues, including the supply of hydrogen energy, necessary supporting facilities, safety considerations, training of technical personnel

	and regulation and legislation required, taking into account local requirements in an orderly manner.
Expanding the EV charging network	• To prepare for a larger-scale application of EVs in the future, the EV Roadmap sets out the target of having at least 5 000 public chargers provided by 2025, and planning to double the number in future. In this regard, the Government allocated $120 million in 2019 to install over 1 000 medium chargers at 70 government car parks open to the public. The installation works for all these chargers are expected to complete by mid-2022. In addition, the promulgation of the EV Roadmap has accelerated the development of private charging facilities over the past year. At the end of 2021, there were already about 4 700 public chargers provided by both the public and private sectors in the 18 districts across the territory, representing a 40% increase compared with the about 3 350 public chargers at the end of 2020. With the completion of all 1 000 additional medium chargers at the government car parks by mid-2022, we will be able to achieve the abovementioned EV Roadmap target at least 3 years in advance. • Meanwhile, the Government will spare no effort to expand the charging network and supporting facilities on various fronts. In particular, the Government is preparing to gradually convert some existing petrol or liquefied petroleum gas filling stations into quick charging stations, so as to support a more diversified EV charging infrastructure to cope with different needs. We obtained the approval from the Town Planning Board in December 2021 to include EV charging in the planned uses of the petrol filling station (PFS) sites. At present, we are in the process of revising the *Hong Kong Planning Standards and Guidelines* and locating suitable PFS sites for conducting trials. We plan to invite tenders in 2023 for the conversion of the first few PFS sites to quick charging stations. The Government will also continue to incorporate requirements for developers to provide EV charging facilities into the land sale conditions for new sites in Kowloon East, with a view to developing the area into a green and smart central business district.

	• Furthermore, the Government has engaged a system contractor to develop a mobile application to disseminate real-time information of public chargers to the general public, so as to facilitate EV drivers to locate available public chargers when needed. The mobile application is expected to be launched by mid-2022. When the mobile application is ready, we will explore inviting other private organisations to also provide similar information of their chargers, so as to widen the coverage of the mobile application. • As regards private charging network, the EV-charging at Home Subsidy Scheme (EHSS) was launched in October 2020. As at the end of April 2022, the Environmental Protection Department has received more than 570 applications involving over 120 000 parking spaces, double of the original target of 60 000 parking spaces. In view of the positive feedback and that different stakeholders have urged for additional funding injection to the EHSS, the Financial Secretary proposed in his 2022-23 Budget and the Legislative Council has approved further injection of $1.5 billion to extend the EHSS for 4 years to the 2027-28 financial year. With the additional funding, we anticipate the whole EHSS will support installation of EV charging-enabling infrastructure for a total of about 140 000 parking spaces in about 700 car parks of the existing private residential buildings and estates, accounting for about half of the eligible parking spaces in Hong Kong. This will allow car owners to install EV chargers of their choice at their residence in a simple and easy manner in future. • Apart from the existing buildings, the Government has been granting gross floor area (GFA) concessions for underground car parks of new private buildings equipped with EV charging-enabling infrastructure since 2011. As at end-December 2021, over 70 000 parking spaces have been approved under such conditions.
Government fleet	• To demonstrate the commitment in pushing forward Hong Kong's adoption of EVs, the Government has updated its circular on green procurement in July 2021 to set EV as standard

	for small and medium private cars to be procured or replaced, unless there are special circumstances such as operational needs that render the use of EVs technically infeasible. For other types of vehicles, EVs and other more environmentally friendly vehicles will be accorded priority for use. EVs are also the procurement standard when the cars for senior government officials are required to be replaced. • Besides, the Government has approached more than 40 quasi-government organisations to encourage them to follow the abovementioned new government green procurement policy. Responses from the organisations are positive. For example, the Hong Kong Housing Society is planning to introduce EVs to its corporate fleet in the 2022-23 financial year and the Airport Authority Hong Kong has also announced to increase the number of EVs operating at the airport from 720 to more than 3 000 by end-2030[1].
Maintenance services and training of mechanics	• The Government and stakeholders, including the trades, academic/training institutes, professional bodies and vehicle owner associations, are jointly promoting and supporting the training of EV technicians and mechanics. For instance, the Vocational Training Council (VTC) offers full-time training programmes on automobile maintenance, covering professional knowledge and maintenance techniques relating to EVs. The programmes with structured pedagogical practice enables students to learn the latest EV technologies directly from actual work experience. Furthermore, the VTC is planning to establish a dedicated EV training workshop to tie in with the growth of the EV industry and attract more young people to enter the trade of EV maintenance.
Batteries recycling and handling	• Since the announcement of the EV Roadmap, 2 licensed chemical waste disposal facilities have altered their licences to treat retired EV batteries. These disposal facilities conduct preliminary treatment (e.g. sorting, discharging and insulating) and re-package the retired EV batteries before exporting for

[1] The final number of EVs will be subject to the market availability of some types of vehicle and equipment.

	recycling in overseas facilities. Besides, a licensed disposal facility has altered its licence to develop second life applications of retired EV batteries. Currently, there are 4 licensed waste disposal facilities for treatment of retired EV batteries in Hong Kong. • To encourage the development of second life applications of retired EV batteries, 3 projects related to second life applications and recycling of retired EV batteries have been subsidised under the Green Tech Fund and the Recycling Fund, with a total subsidy amount of about $10 million. Their scopes of work include the development of a system for testing and evaluating the performance of different types of retired EV batteries, applications of retired EV batteries on power-grid stabilisation, recycling of the precious heavy metals from retired EV batteries, etc..

Annex 6

Implementation timetable for the six major areas of action under the *Clean Air Plan for Hong Kong 2035*

Six major areas of action	Short-term (Until 2025)	Medium- to long-term (Including continuous work)
Green Transport	• Conduct trials for electric and hybrid ferries • Test out hydrogen fuel cell electric buses and heavy vehicles • Implement Free-flow Tolling System at government toll tunnels and Tsing Sha Control Area	• Take forward measures set forth in the *Hong Kong Roadmap on Popularisation of Electric Vehicles* to attain zero vehicular emissions before 2050 • Continue to expand railway network • Adopt environmentally friendly transport mode in new development areas
Liveable Environment	• Update the *Practice Note for Professional Persons– Control of Air Pollution in Semi-Confined Public Transport Interchanges* • Update Air Quality Health Index • Embark on a research for the long term health impact of air pollution on the Hong Kong population	• Continue to implement pedestrian-friendly and bicycle-friendly policies
Comprehen-sive Emissions Reduction	• Subsidise franchised bus companies to conduct trials for emission reduction devices • Tighten the volatile organic compound content limits of architectural paints and extend the control to cleaning products	• Continue to phase out old diesel commercial vehicles • Explore to further tighten the sulphur content limit of locally supplied marine fuels to 0.001% • Impose emission standards for new petrol-powered outboard engines
Clean Energy	• Continue to tighten emission limits of power plants	• Implement the "net-zero electricity generation" strategy set forth in the *Hong Kong's*

Six major areas of action	Short-term (Until 2025)	Medium- to long-term (Including continuous work)
	• Set up an inter-departmental working group to handle the work relating to the application of hydrogen energy in Hong Kong	*Climate Action Plan 2050* • Explore means to take forward the use of liquefied natural gas (LNG) in ocean-going vessels, and formulate technical requirements and related safety regulations and specifications for LNG bunkering
Scientific Management	• Adopt innovative instruments to monitor and analyse air pollutants in real time • Conduct district-based air quality monitoring to identify pollution distributions	• Apply mini-sensors to monitor ambient and indoor air quality • Develop a smart air quality monitoring system to provide more detailed district-based air quality information to the public
Regional Collabora-tion	• Formulate regional emissions reduction targets for 2025 and 2030 with the Guangdong Province • Set up 5 monitoring sites for 3D air quality monitoring with light detection and ranging technology • Integrate real-time volatile organic compound monitoring in the regional air monitoring network and conduct ozone pollution research	• Continue to encourage exchanges among academics and talents in the Greater Bay Area