For discussion on
27 April 2015

LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS

Progress of Air Quality Improvement Measures

PURPOSE

This paper informs Members of the latest progress of air quality improvement measures for attaining the Air Quality Objectives (AQOs).

AIR QUALITY TREND

2. The prevailing AQOs came into effect on 1 January 2014. Our target is to broadly attain the AQOs by 2020.

3. Our air quality has been improving. From 2006 to 2014, the ambient concentrations of sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and respirable suspended particulates (RSP) reduced by 50%, 6% and 20% respectively. Ozone was the only pollutant having an increase of 28% due to the regional photochemical smog problem. During the same period, the roadside concentrations of SO_2 and RSP fell significantly by 57% and 33% respectively. However the roadside NO_2 increased by 6% due to excessive emissions from aged vehicles and the increase in regional ozone concentrations. The concentration levels of four key air pollutants at the ambient level and roadsides from 2006 to 2014 are set out in **Annex A**.

4. With the rolling out of more new air quality improvement measures and the collaboration with the Guangdong authorities, we will continue to improve the air quality in Hong Kong.

AIR QUALITY IMPROVEMENT MEASURES

5. In March 2013, we released the "Clean Air Plan for Hong Kong" setting out the policies, measures and plans to tackle local air pollution, as well as collaboration between Guangdong and Hong Kong to deal with regional pollution. The latest progress of key air quality improvement measures and an update on the

regional collaboration with Guangdong are set out in the following paragraphs.

Vehicles

6. Tailpipe emissions are the key source of air pollution at the roadside though regional ozone also has a bearing. To improve roadside air quality, we have introduced a number of measures targeting at pre-Euro IV diesel commercial vehicles (DCVs), petrol and liquefied petroleum gas (LPG) vehicles, and franchised buses. We have also been encouraging the transport sector to test out green innovative transport technologies with the aid of the Pilot Green Transport Fund.

Phasing out pre-Euro IV Diesel Commercial Vehicles

7. Since March 2014, we have been operating an incentive-cum-regulatory scheme to phase out progressively some 82,000 pre-Euro IV DCVs including goods vehicles, light buses and non-franchised buses before 2020. $11.4 billion have been set aside as ex-gratia allowance to help the affected vehicle owners. The application deadlines for ex-gratia payment in respect of the four categories of DCVs are as follows:-

Emission Design Standard of DCVs	**Application deadlines**
Pre-Euro	December 31, 2015
Euro I	December 31, 2016
Euro II	December 31, 2017
Euro III	December 31, 2019

To facilitate timely replacement of DCVs in the long run, we have also introduced a mandatory cap of 15 years on the service life limit for all DCVs that are first-registered on or after 1 February 2014.

8. The response to the scheme has been very encouraging. As at 31 March 2015, about 25 200 DCVs (about 31% of eligible vehicles) were scrapped with an approved ex-gratia payment amounting to about $3.13 billion. Detailed information of DCVs scrapped under the scheme is at **Annex B**.

Strengthened Emission Control of LPG and Petrol Vehicles

9. Poorly maintained petrol and LPG vehicles could emit carbon monoxide (CO), hydrocarbons and nitrogen oxides (NOx) up to tenfold of their normal levels, the latter two are indeed key contributions to roadside air pollution. Since

September 2014, we have strengthened the emission control of petrol and LPG vehicles by deploying roadside remote sensing equipment to screen out those emitting excessively. Before that, we provided a one-off subsidy of $80 million to assist some 17 000 LPG and petrol taxi, and public light bus owners to replace worn-out catalytic converters of their vehicles. The concerned vehicle owners need to fix their vehicles and pass a dynamometer-based emission test within 12 working days.

10. As at 31 March 2015, EPD had checked some 333 000 vehicles and issued about 2 400 Emission Testing Notices to owners of petrol and LPG vehicles, including taxis, light buses, light goods vehicles and private cars. Vehicles that fail the emission test will have their licences cancelled. Between September 2014 and March 2015, 84 vehicles had their licences cancelled by the Transport Department while 138 vehicles were voluntarily scrapped by their owners.

Retrofitting Euro II and III franchised buses with selective catalytic reduction devices

11. The Government is fully subsidizing the franchised bus companies to retrofit some 1 400 Euro II and III franchised buses with selective catalytic reduction devices (SCRs) to upgrade their emission performance to that of Euro IV or above level. To ensure that SCRs are of the right design for individual bus models which is critical to their satisfactory performance, franchised bus companies will identify qualified SCRs suppliers through a pre-qualification trial on the selected bus models before inviting tenders for the large-scale retrofit. The franchised bus companies are carrying out the pre-qualification trial and they will invite tenders for the large-scale retrofit after that. The entire retrofit programme is expected to complete by the end of 2016.

Setting up Low Emission Zones

12. Franchised buses account for up to 40% of the traffic at busy corridors in Central, Causeway Bay and Mong Kok. The setting up of low emission zones (LEZs) for franchised buses in these districts helps improve roadside air quality and better protect public health. Our target is to have only low emission franchised buses, i.e. buses of Euro IV emission standard or above or Euro II or III buses retrofitted with SCRs and diesel particulate filters, running through these zones by the end of 2015.

13. To achieve this target, the franchised bus companies are deploying low emission buses to ply those routes passing the LEZs as far as practicable. By the end of 2014, the ratio reached 52%. According to the latest information, The Kowloon Motor Bus Company (1933) Limited and New World First Bus Services Limited will fully attain the target by end of 2015. As for Citybus Limited, it has estimated that about 93% of its buses in the LEZs being low emission buses by the end of 2015, and will be able to fully meet the target by the first quarter of 2016. We reported the progress of setting up of LEZs to this Panel on 23 March 2015, and will continue to monitor the implementation of LEZs by the franchised bus companies.

Promoting the use of electric/hybrid vehicles and green transport technologies

14. The Government has been promoting the use of electric vehicles (EVs) which have no tailpipe emissions. The First Registration Tax for EVs has been waived since 1994 and the current exemption will last until 31 March 2017. To encourage wider use of EVs, the Government has been taking the lead in using EVs and working with the private sector in expanding the charging network. As at 31 March 2015, there were 1 984 EVs in Hong Kong, up from 96 in end 2010. 226 EVs are in the Government fleet. There are currently more than 1 100 public chargers across the territory, including over 150 medium chargers, 12 CHAdeMO and 19 quick chargers.

15. The Government is fully subsidizing the franchised bus companies to purchase six double deck hybrid buses and 36 single deck electric buses for trial. The six hybrid buses commenced their trial in late 2014. In addition, the franchised bus companies are procuring electric buses and the related charging facilities. We expect the trial of electric buses will commence progressively starting from mid 2015. These trials will last for two years, with an interim review to be conducted about one year after the commencement of trial. We will report the trial findings to this Panel in due course.

16. To encourage the transport sector to test out green innovative transport technology, the Government set up the $300 million Pilot Green Transport Fund (the Fund) in March 2011. Recipients of the Fund will collect performance data of the trial product, and share their findings with other operators so as to promote the use of these new technologies. Up to 31 March 2015, 86 trials were approved involving EVs (including buses, goods vehicles, light buses and taxis), hybrid vehicles (including light buses and goods vehicles), a solar air-conditioning system

for buses, replacement of old bus engines with environment-friendly ones, and retrofitting a ferry with a diesel-electric propulsion system and an exhaust gas scrubber. These projects amount to a total subsidy of about $100 million. As at 31 March 2015, eight trials have been completed involving four electric vans and 14 hybrid goods vehicles. 25 trial reports (including 24 interim reports) have been uploaded to the dedicated website of the Fund for public information. In general, the vehicles under the trial have better fuel economy than their conventional counterparts under similar utilization rates. Experience sharing sessions and test rides have been organized to encourage more applications for the Fund.

Vessels

17. After our intensive efforts to reduce the emissions from power plants and vehicles, vessels has become the largest contributor of local emissions, accounting for 50% and 37% of the SO_2 and RSP emissions respectively in 2012. To reduce their emissions, we have introduced cleaner fuels for the marine sector.

Capping the sulphur content of locally supplied marine light diesel

18. Starting from 1 April 2014, we have imposed a statutory cap of 0.05% on the sulphur content of locally supplied marine diesel via the newly enacted Air Pollution Control (Marine Light Diesel) Regulation (Cap. 311Y). The cap helps reduce the sulphur content of marine diesel locally supplied by 90%.

Reducing Ocean Going Vessels' Emissions

19. Ocean-going vessels (OGVs) at berth emit about 40% of their total SO_2 emission in Hong Kong. To reduce their emissions, we launched a 3-year Port Facilities and Light Dues Incentive Scheme (Incentive Scheme) in September 2012 to encourage OGVs to switch to low sulphur fuel (with a sulphur content not exceeding 0.5%) while berthing in Hong Kong. As compared with the sulphur limit (3.5%) set by the International Maritime Organisation, the low sulphur fuel contains 86% less sulphur. OGVs participating in the Incentive Scheme would have their port facilities and light dues reduced by half.

20. Starting from 1 July 2015, the fuel switch will become mandatory as the LegCo approved the Air Pollution Control (Ocean Going Vessels) (Fuel at Berth) Regulation (Cap. 311AA) on 15 April 2015. Hong Kong will be the first port in Asia to mandate the fuel switch at berth. To maintain our port competitiveness, the 2015-16 Budget announced the extension of the Incentive Scheme by 30

months up to March 2018.

Onshore Power Supply

21. We have commissioned a study on the feasibility of providing onshore power supply at Kai Tak Cruise Terminal. We are finalizing the findings of the study and working out a way forward in consideration of all relevant factors. We will report our findings and recommendations to this Panel this May.

Non-road Mobile Machinery

22. Non-road Mobile Machinery (NRMMs) include a wide range of mobile or transportable machines or vehicles powered by internal combustion engines used primarily off-road. They include crawler cranes, gantry cranes, air compressors, excavators, internal vans and trucks in the airport and port facilities. In 2012, NRMMs accounted for about 6% and 8% of the local emissions of NOx and RSP respectively. Starting from 1 June 2015, all NRMMs newly supplied for use in Hong Kong will have to comply with the emission standards stipulated in the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation (Cap. 311Z).

23. The emission standards for regulated machines are set at European Union Stage IIIA level, while those for non-road vehicles are the same as the prevailing statutory emission standards for vehicles seeking first registration (currently at Euro V emission standards). Only approved or exempted NRMMs with proper labels shall be used in specified activities such as the airport, port facilities, construction sites, designated waste disposal facilities and specified processes as stipulated in Schedule 1 of the Air Pollution Control Ordinance. We have conducted briefing sessions for the trades so that they can understand the requirements under the new regulation. We will also publicize the requirements via press release, television and radio announcements, leaflets and posters. An enquiry hotline is available to address any queries.

Power Plants

24. Electricity generation is one of the major local sources of air pollution. We have been progressively tightening up the statutory emission caps via the promulgation of Technical Memorandum (TM) issued under the Air Pollution Control Ordinance. To comply with the emission caps, the power companies have retrofitted their major coal-fired electricity generation units with advanced emission reduction devices. Subsequent to the promulgation of the first

three TMs in 2008, 2010 and 2012 respectively, we issued the Fourth TM in December 2014 to further tighten the emission caps for the power sector from 2019 onwards. Compared to the emission caps in the Third TM, the emission caps for SO_2, NOx and RSP in the Fourth TM will be further reduced by 11%, 2% and 7% respectively.

25. Having considered the views received during the public consultation on future fuel mix for electricity generation conducted in 2014, we plan to increase the proportion of natural gas generation to around 50% by 2020, and maintain the current interim measure of importing 80% of nuclear output from the Daya Bay Nuclear Power Station such that nuclear import would account for around 25% of the total fuel mix. Subject to public views on the tariff implications, we are prepared to develop more renewable energy and will also enhance efforts to promote energy saving. The remaining demand will be met by coal-fired generation. This will help Hong Kong achieve the environmental targets for 2020 and we are going to review the Fourth TM for setting the emissions caps for the power sector for 2020. We will report to this Panel the outcome of the review later this year.

Regional Collaboration

26. In addition to reducing emissions from local sources, we have been working closely with Guangdong Provincial Government to improve the air quality of the Pearl River Delta (PRD) region. In November 2012, both Governments agreed to a set of emission reduction targets for 2015 and 2020. The details are at **Annex C**. Both governments have been implementing emission reduction measures for achieving the 2015 emission reduction targets and will embark a mid-term review. The review will also finalize the emission reduction targets for 2020, which will further improve regional air quality. Both sides will also continue to have dialogues on measures to control land and marine emissions, as well as air quality monitoring and forecasting technologies.

27. In September 2014, we signed with Guangdong and Macao a "Cooperation Agreement on Regional Air Pollution Control and Prevention among Hong Kong, Guangdong and Macao" to foster regional co-operation. Under the Agreement, the three sides has enhanced the regional air quality monitoring network, with the number of monitoring stations increased from 16 to 23 and the inclusion of a monitoring station in Macao for the first time. Apart from continuously monitoring the levels of four air pollutants (i.e. SO_2, NO_2, RSP and O_3), CO and fine suspended particulates have also been put under regular monitoring. The enhanced network has also started to release real-time

concentration levels of the pollutants hourly since 3 September 2014. In November 2014, the three sides commenced a joint study on regional $PM_{2.5}$ with a view to providing a robust scientific basis for mapping out further air quality improvement strategies. The study is targeted for completion in 2017.

28. We have been collaborating with the relevant authorities in Guangdong to take forward the Cleaner Production Partnership Programme (the Programme) since April 2008. The Programme aims to encourage and facilitate Hong Kong-owned factories in Guangdong and Hong Kong to adopt cleaner production technologies and practices, thereby contributing to improving the regional air quality. As at 31 March 2015, the Programme approved over 2 400 funding projects and organized about 390 awareness and technology promotion activities with over 34 000 participants. In the light of the environmental benefits brought by the Programme and positive feedback from the industries, we have earmarked $150 million to extend the Programme for five years until 31 March 2020. To strengthen the cooperation, the two sides signed the "Guangdong-Hong Kong Cooperation Agreement on Cleaner Production" in November 2014 and set up a Hong Kong-Guangdong Joint Working Group on Cleaner Production in February 2015.

WAY FORWARD

29. Members are invited to note the latest progress of the air quality improvement measures. We will continue to implement air quality improvement measures and work with the Guangdong Government to improve the air quality in the PRD region.

Environment Bureau / Environmental Protection Department
April 2015

Annex A

Annual Concentration of Key Air Pollutants from 2006 to 2014 (in µg/m^3)

Pollutants/Air Quality Monitoring Stations		Year									Changes between 2006 and 2014
		2006	2007	2008	2009	2010	2011	2012	2013	2014	
Respirable suspended particulates	Ambient	54	55	51	47	45	48	42	47	43	-20%
	Roadside	75	73	68	61	60	61	53	57	50	-33%
Nitrogen dioxide	Ambient	52	53	53	50	52	53	51	54	49	-6%
	Roadside	96	97	98	110	117	122	118	120	102	6%
Sulphur dioxide	Ambient	22	21	20	14	12	13	11	13	11	-50%
	Roadside	21	22	23	14	10	12	10	11	9	-57%
Ozone	Ambient	36	37	39	43	39	41	40	43	46	28%
	Roadside	N/A					13	15	14	21	N/A

Note:

- Regular monitoring of ozone at roadside air quality monitoring stations began in 2011.
- N/A denotes Not Applicable

Annex B

Number of applications for ex-gratia payment as of 31 March 2015

Vehicle Categories	No. of applications for ex-gratia payment (take-up rate)					No. of applications approved	No. of eligible DCVs
	Pre-Euro	Euro-I	Euro II	Euro III	Total		
Light goods vehicles	5,793 (59.5%)	5,087 (48.1%)	2,864 (26.9%)	1,557 (8.9%)	15,301 (31.5%)	14,648	48 499
Medium goods vehicles	4,178 (58.2%)	1,109 (46.0%)	1,809 (29.6%)	994 (10.3%)	8,090 (31.9%)	7,797	25 358
Heavy goods vehicles	260 (38.2%)	91 (29.1%)	164 (20.9%)	63 (12.3%)	578 (25.2%)	548	2 290
Public light buses	4 (26.7%)	88 (30.8%)	22 (4.3%)	5 (1.2%)	119 (9.8%)	103	1 218
Private light buses	149 (47.5%)	69 (19.3%)	29 (7.2%)	12 (6.2%)	259 (20.4%)	249	1 270
Non-franchised buses	61 (34.3%)	48 (36.6%)	129 (21.7%)	577 (22.1%)	815 (23.2%)	735	3 515
Total	10,445 (57.7%)	6,492 (46.1%)	5,017 (26.3%)	3,208 (10.4%)	25,162 (30.6%)	24,080	82 150

A breakdown of eligible diesel commercial vehicles by categories and emission standards

Vehicle Categories	No. of eligible DCVs				
	Pre-Euro	**Euro-I**	**Euro-II**	**Euro-III**	**Total**
Light goods vehicles	9,744	10,572	10,658	17,525	48,499
Medium goods vehicles	7,182	2,413	6,104	9,659	25,358
Heavy goods vehicles	680	313	784	513	2,290
Public light buses	15	286	512	405	1,218
Private light buses	314	357	404	195	1,270
Non-franchised buses	178	131	595	2,611	3,515
Total	**18,113**	**14,072**	**19,057**	**30,908**	**82,150**

Annex C

Emission Reduction Targets for 2015 and 2020 for Hong Kong and the Pearl River Delta (PRD) Region

Pollutant	Area	2010 Emission (tonnes)	2015 Emission Reduction Targets* (%)	2020 Emission Reduction Ranges* (%)
Sulphur dioxide	Hong Kong	35,500	-25%	-35% to -75%
	PRD Region	507,000	-16%	-20% to -35%
Nitrogen oxides	Hong Kong	108,000	-10%	-20% to -30%
	PRD Region	889,000	-18%	-20% to -40%
Respirable suspended particulates	Hong Kong	6,250	-10%	-15% to -40%
	PRD Region	637,000	-10%	-15% to -25%
Volatile organic compounds	Hong Kong	33,200	-5%	-15%
	PRD Region	903,000	-10%	-15% to -25%

∗ as compared with 2010 emission levels