For discussion on
30 March 2016

LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS

Work Plan of the Review of Air Quality Objectives (AQOs)

PURPOSE

This paper sets out a work plan for undertaking the review of the Air Quality Objectives (AQOs) and reports on the latest progress of the implementation of air quality improvement measures.

WORK PLAN FOR THE REVIEW OF AQOs

Background

2. The current AQOs, which relate to seven key air pollutants as set out in **Annex A**, took effect on 1 January 2014. Under Section 7(A) of the Air Pollution Control Ordinance (Cap. 311) (APCO), the Secretary for the Environment (SEN) is required to review the AQOs at least once in every five years and submit to the Advisory Council on the Environment (ACE) a report of the review.

Guiding Principles of the Review

3. To help protect public health, the World Health Organization (WHO) recommends Air Quality Guidelines (AQGs) for key air pollutants including respirable suspended particulates (RSP or PM_{10}), fine suspended particulates (FSP or $PM_{2.5}$), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3) based on a wealth of studies on the health effects and consultation with leading air scientists and health experts worldwide. Recognizing the challenge of achieving the AQGs, particularly in more polluted areas, WHO also sets out Interim Targets (ITs) to promote steady progress towards meeting the AQGs. As it is, no countries have fully adopted the AQGs as their air quality standards.

4. Having regard to the recommendations of the WHO and the practices of other advanced countries, we adopted the following guiding

principles for the last AQOs review–

(a) the AQOs should be set with a view to protecting public health;

(b) the AQOs should be updated by benchmarking against the WHO AQGs and ITs; and

(c) a progressive approach be adopted in updating the AQOs with a view to achieving the WHO AQGs as a long-term goal. The pursuit of such goal will be considered with reference to the international practices, the latest technological developments and local circumstances, as recommended by the WHO.

5. These guiding principles are still valid. We will continue to adopt them in the upcoming review.

Key Tasks

6. In line with the practices of environmentally advanced regions such as the European Union and the United States, the AQOs review will encompass the following key tasks:

(a) appraising the latest development in respect of air science and the health effects of air pollution;

(b) examining the current air pollution levels and trends, and progress and effectiveness of committed air quality improvement measures;

(c) identifying new practicable air quality improvement measures and conducting cost benefit analysis of the measures;

(d) developing an air quality management plan for further improving air quality; and

(e) assessing air quality in future under different control scenarios and the scope for further tightening the AQOs for recommending a way forward.

All of the above tasks are technically complicated and need considerable time to complete.

Experts, Stakeholders and Public Engagement

7. In the coming AQOs review, we will proactively engage relevant stakeholders. The Under Secretary for the Environment (USEN) will lead an AQOs Review Working Group (Working Group) to gather views via dedicated sub-groups on four key aspects, namely air science and health, emission reduction in energy and power generation, as well as road transportation, and marine transportation. The Working Group will also look into control measures for other lesser air pollution sources, such as aviation and volatile organic compounds emission sources. The Working Group will reach out to the relevant parties as part of the review process involving participation of relevant group members. Members of the Working Group will include representatives from the field of air science, health, green groups, chambers of commerce, professional bodies, relevant trades and the relevant Government bureaux and departments. The Working Group will also organize public fora to collect views from the public.

8. The Working Group will provide a platform for stakeholders to share views and foster consensus so as to help the Government draw up the review findings and recommendations. The Working Group's report will be presented to SEN for Government's internal deliberations.

Work Plan

9. As the review involves a number of complicated tasks, we aim at completing the review and reporting on the review findings and recommendations to ACE and this Panel in mid-2018. Thereafter, we will launch a 3-month public consultation on the recommendations.

10. If any of the AQOs is to be tightened arising from the review, we will commence the legislative amendment process including the preparation of a Bill to amend the APCO and consult ACE and the Legislative Council accordingly. Our work plan is at **Annex B**.

LATEST PROGRESS OF AIR QUALITY IMPROVEMENT MEASURES

11. We have been making good progress in implementing the air quality improvement measures set out in the "Clean Air Plan for Hong Kong" published in March 2013. These measures will help us broadly attain the AQOs by 2020. Indeed, the overall air quality of Hong Kong

has been improving in the past years.

12. From 2011 to 2015, the ambient concentrations of RSP, FSP, NO_2 and SO_2 reduced by 21%, 24%, 13% and 31% respectively. Except for ozone which exhibits a rising trend due to the strong influence of regional pollution, there was a discernable declining trend in the concentration of other major pollutants in the last five years. This is attributed to the implementation of a number of local air quality improvement measures targeting at vehicles, marine vessels and power plants as well as the gradual improvement in air quality in the Pearl River Delta (PRD) region.

13. The roadside air quality has also been improving. From 2011 to 2015, the roadside concentrations of RSP, FSP, NO_2 and SO_2 reduced by 26%, 21%, 19% and 33% respectively. Except for ozone which exhibits a rising trend, there was a discernable declining trend in the concentration of other major pollutants since the implementation of air quality improvement measures targeting at vehicles in recent years.

14. The concentration levels of the key air pollutants at the ambient and roadside from 2011 to 2015 are set out in **Annex C**. 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 with a view to broadly attaining the AQOs by 2020.

Vehicle Emission Control

15. Tailpipe emissions are the key source of air pollution at the roadside though regional background ozone and particulates levels also have 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. Key measures include the incentive-cum-regulatory scheme to progressively phase out some 82 000 pre-Euro IV DCVs by the end of 2019, deploying mobile roadside remote sensing equipment to detect LPG and petrol vehicles with excessive emissions, retrofitting Euro II and III franchised buses with selective catalytic reduction devices (SCRs) to upgrade their emission performance and promoting a wider use of hybrid and electric vehicles (EVs).

Phasing out Pre-Euro IV DCVs

16. The response to the incentive-cum-regulatory scheme has been very encouraging since its launch in March 2014. As at end of February 2016, about 39 700 pre-Euro IV DCVs or 48% of the eligible pre-Euro IV

DCV participated in the ex-gratia payment scheme and retired. All eligible pre-Euro DCVs had been phased out by 31 December 2015. We shall continue to implement the scheme and encourage owners to phase out their DCVs before the deadlines stipulated below.

Emission Design Standard of DCVs	**Deadlines for application for ex-gratia payment**
Euro I	December 31, 2016
Euro II	December 31, 2017
Euro III	December 31, 2019

Strengthened Emission Control of LPG and Petrol Vehicles

17. From September 2014 to end of February 2016, our roadside remote sensing devices checked some 940 000 vehicle counts. About 5 600 Emission Testing Notices were issued to vehicle owners concerned requiring them to have their vehicles repaired and passed an emission test with the aid of a chassis dynamometer at a Designated Vehicle Emission Testing Centre within 12 working days. Vehicles that failed the emission test will have their licences cancelled. As at end of February 2016, the Transport Department cancelled licences of about 270 vehicles for failing to pass the emission test. The strengthened control has helped to reduce the number of taxis and light buses with excessive emissions from over 80% before the control regime to about 10%, 15 months after implementation.

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

18. The franchised bus companies are fully subsidized by the Government to retrofit some 1 400 eligible Euro II and III franchised buses with SCRs to upgrade their emission performance to that of Euro IV or above level. As at end of February 2016, about 360 eligible franchised buses have been retrofitted with SCRs. Our target is to complete the entire retrofit programme by the end of 2016 on a best endeavour basis. The New World First Bus Services Limited and Citybus Limited have already completed the SCR retrofit programme. We will continue to follow up with The Kowloon Motor Bus Co. (1933) Ltd. (KMB) to expedite the progress.

Promoting the use of green transport technologies

19. The Government has been taking the lead in promoting a wider use of EVs and working with the private sector in expanding the charging network. As at end of February 2016, there were 4 629 EVs in Hong Kong,

up from 96 in end 2010. 245 EVs are in the Government fleet. There are currently about 1 300 public chargers across the territory, including over 200 medium chargers, 15 CHAdeMO quick chargers and 142 quick chargers of other charging standards. The First Registration Tax for EVs has been waived since 1994 and the current exemption will last until 31 March 2017.

20. The trial run of six double-deck hybrid buses is in progress as they have commenced operation by end 2014 on six bus routes. Five single-deck electric buses have been put into service since end of 2015. The remaining 31 electric buses would be put into service progressively in 2016. 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.

21. As at end of February 2016, the Pilot Green Transport Fund approved 87 trials with a total subsidy of about $88 million to test out various green transport technologies including electric taxis, buses and trucks as well as hybrid trucks. We have been disseminating the findings of the trials to the transport trades with a view to encouraging them to adopt these new technologies.

Marine Emission Control

22. Marine vessels are the largest contributor of local emissions, accounting for 50% and 36% of the SO_2 and RSP emissions respectively in 2013. To reduce their emissions, we have introduced cleaner fuels for the marine sector.

23. Since 1 April 2014, we imposed a statutory cap of 0.05% on the sulphur content of locally supplied marine diesel. This measure can help reduce the SO_2 and RSP emissions from local vessels by 90% and 30% respectively.

24. Since 1 July 2015, ocean-going vessels (OGVs) have been required to switch to low sulphur fuel (with a sulphur content not exceeding 0.5%) while berthing in Hong Kong. Hong Kong is the first port in Asia to mandate the fuel switch at berth. This measure can help reduce the SO_2 and RSP emissions from OGVs at berth by 60%.

25. Since the implementation of the regulation, we have seen notable reduction in the concentrations of SO_2 in the vicinity of container terminals and other port areas. For example, when the wind was blowing from the container terminals, the average SO_2 concentration recorded at Kwai

Chung air quality monitoring station had been reduced by around 50% after the implementation of the regulation in 2015 as compared with the average of 2010 to 2014.

Non-road Mobile Machinery

26. Starting from 1 June 2015, all Non-road Mobile Machinery (NRMMs) newly supplied for use in Hong Kong are required to comply with the emission standards stipulated in the Air Pollution Control (NRMM) (Emission) Regulation (Cap. 311Z). The emission standards for regulated machines including crawler cranes, gantry cranes, air compressors, excavators, etc. are set at European Union Stage IIIA level, while those for non-road vehicles, such as internal vans and trucks in the airport and port facilities, are the same as the prevailing statutory emission standards for vehicles seeking first registration (currently at Euro V emission standards).

27. Starting from 1 December 2015, 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 APCO.

28. For the NRMMs currently used in Hong Kong, their emission standards are predominantly at European Union Stage I level. Comparing with European Union Stage I emission standards, NRMMs complying with the European Union Stage III A will emit about 60% less for both nitrogen oxides (NO_x) and RSP. The control also helps reduce environmental nuisance caused by NRMMs to the residential areas close to container terminals and construction sites.

Power Plants

29. Electricity generation is one of the major local sources of air pollution. We have been progressively tightening up the statutory emission caps of power plants via the promulgation of Technical Memorandum (TM) issued under the APCO. We issued the Fifth TM in December 2015 to further tighten the emission caps from 2020 onwards. Compared to the emission caps in the Fourth TM, the emission caps for SO_2, NO_x and RSP in the Fifth TM will be further reduced by 16% to 17%.

30. In 2016, we shall review the Fifth TM taking into account the timing and capacity of China Light and Power Hong Kong Limited's plan for installing new gas-fired units at its Black Point Power Station. Increasing the use of natural gas for electricity generation would reduce emissions and enable us to issue a new TM for imposing more stringent

emission caps on power companies for 2021 onwards. We will report to this Panel the outcome of the review later this year.

Regional Collaboration

31. In addition to reducing emissions from local sources, we have been working closely with the Guangdong Provincial Government to improve the air quality of the PRD region. Over the past years, Guangdong has implemented a wide range of measures to reduce emissions in the PRD region, such as requiring coal-fired power plants to install flue-gas desulphurization and denitrification devices, tightening the vehicle emission standards and fuel standards, phasing out highly polluting industrial facilities, etc.

32. The air quality in the PRD region has been improving as a result of the joint efforts between the Hong Kong and Guangdong governments, as set out in **Annex D**. From 2006 to 2014, the concentration levels of three key air pollutants, namely, SO_2, NO_2 and RSP in the PRD region decreased by 66%, 20%, and 24% respectively. Nevertheless, the ozone concentration increased by 19% in the same period, indicating a deterioration in smog pollution in the PRD region.

33. In November 2012, both Governments agreed to set emission reduction targets for four key air pollutants, namely SO_2, NO_x, RSP and volatile organic compounds (VOCs) in Hong Kong and the PRD region for 2015 and 2020. The details are at **Annex E**. Both governments have been implementing emission reduction measures for achieving the 2015 emission reduction targets. In February 2015, both sides started a joint mid-term review with a view to concluding the emission reductions for 2015 and finalizing the emission reduction targets for 2020. The review is expected to be completed in 2017 and we will report to this Panel on the outcome of the review.

34. In December 2015, the Ministry of Transport (MoT) issued an implementation plan for controlling marine emissions in three major regions in the Mainland including the PRD region. Under the plan, a marine emission control area (ECA) will be established in the PRD waters requiring OGVs to switch to low sulphur fuel (with sulphur content not exceeding 0.5%) while at berth in PRD ports progressively from 2017. By 2019, all OGVs in the ECA are required to use low sulphur fuel. We will collaborate with MoT and Guangdong authorities on the setting up of the ECA which will further reduce emissions from OGVs in the PRD region.

ADVICE SOUGHT

35. Members are invited to comment on the work plan of the AQOs review as set out in paragraphs 3 to 10 and note the progress of the air quality improvement measures in paragraphs 11 to 34. We will report to this Panel the outcome of the review by mid-2018.

Environment Bureau/
Environmental Protection Department
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Annex A

Hong Kong's Air Quality Objectives

Pollutant	Averaging time	Interim Target-1 ($\mu g/m^3$)	Interim Target-2 ($\mu g/m^3$)	Interim Target-3 ($\mu g/m^3$)	WHO AQGs ($\mu g/m^3$)	Number of Exceedances Allowed
Sulphur Dioxide (SO_2)	10-min	-	-	-	**500**	3
	24-hour	**125**	50	-	20	3
Respirable Suspended Particulates (RSP/PM_{10})	24-hour	150	**100**	75	50	9
	Annual	70	**50**	30	20	Not Applicable
Fine Suspended Particulates ($FSP/PM_{2.5}$)	24-hour	**75**	50	37.5	25	9
	Annual	**35**	25	15	10	Not Applicable
Nitrogen Dioxide (NO_2)	1-hour	-	-	-	**200**	18
	Annual	-	-	-	**40**	Not Applicable
Ozone (O_3)	8-hour	**160**	-	-	100	9
Carbon Monoxide (CO)	1-hour	-	-	-	**30,000**	0
	8-hour	-	-	-	**10,000**	0
Lead (Pb)	Annual	-	-	-	**0.5**	Not Applicable

Note：

Figures in bold and underlined in the above table are Hong Kong's AQOs

WHO – World Health Organization

AQGs – Air Quality Guidelines

Annex B

Timetable for the Review of Air Quality Objectives (AQOs)

Milestones of the AQOs Review	**Timeline**
Set up the AQOs Review Working Group and engage stakeholders and the public to collect their views on the AQOs review	Q2 2016 to Q3 2017
Consolidate review recommendations and prepare a review report	Q1 2018
Report to Advisory Council on the Environment (ACE) and Legislative Council Panel on Environmental Affairs (LegCo EA Panel) on the review recommendations	Mid 2018
Launch a 3-month public consultation on the review recommendations	Q3 2018
Consult LegCo EA Panel and ACE on the final recommendations	Q2 2019
Introduce the Air Pollution Control Ordinance (APCO) Amendment Bill to the LegCo if the AQOs are to be tightened	Mid 2019

Annex C

Annual Average Concentration of Key Air Pollutants in Hong Kong from 2011 to 2015 (in μg/m^3)

Station		2011	2012	2013	2014	2015*	**Change between 2011 and 2015**
RSP (PM_{10})	General	48	42	47	43	38	**-21%**
	Roadside	61	53	57	50	45	**-26%**
FSP ($PM_{2.5}$)	General	33	28	31	29	25	**-24%**
	Roadside	38	36	37	32	30	**-21%**
NO_2	General	53	51	54	49	46	**-13%**
	Roadside	122	118	120	102	99	**-19%**
SO_2	General	13	11	13	11	9	**-31%**
	Roadside	12	10	11	9	8	**-33%**
O_3	General	41	40	43	46	45	**10%**
	Roadside	13	15	14	21	19	**46%**

Note:
* 2015 data are preliminary only.

Annex D

Annual Average Concentration of Key Air Pollutants in the Pearl River Delta (PRD) Region from 2006 to 2014 (in μg/m^3)

Pollutant	2006	2007	2008	2009	2010	2011	2012	2013	2014	Change between 2006 and 2014
RSP (PM_{10})	74	79	70	69	64	64	56	63	56	**-24%**
SO_2	47	48	39	29	25	24	18	18	16	**-66%**
NO_2	46	45	45	42	43	40	38	40	37	**-20%**
O_3	48	51	51	56	53	58	54	54	57	**19%**

Annex E

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

Pollutant	Area	2015 Emission Reduction Targets* (%)	2020 Emission Reduction Ranges* (%)
SO_2	Hong Kong	-25%	-35% to -75%
	PRD Economic Zone	-16%	-20% to -35%
NOx	Hong Kong	-10%	-20% to -30%
	PRD Economic Zone	-18%	-20% to -40%
RSP (PM_{10})	Hong Kong	-10%	-15% to -40%
	PRD Economic Zone	-10%	-15% to -25%
VOCs	Hong Kong	-5%	-15%
	PRD Economic Zone	-10%	-15% to -25%

*as compared with 2010 emission levels