

**For discussion on
26 June 2017**

**LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS**

Progress of the Review of Air Quality Objectives (AQOs)

PURPOSE

This paper informs Members of the latest progress of the review of the Air Quality Objectives (AQOs) (the “Review”).

BACKGROUND

2. The current AQOs, which relate to seven key air pollutants as set out in Annex A, took effect on 1 January 2014. The “Clean Air Plan for Hong Kong”, published by the Government in March 2013, sets out a series of air quality improvement measures with a view to broadly attaining the AQOs by 2020.

3. On roadside air quality, measures included the incentive-cum-regulatory programme to phase out progressively pre-Euro IV diesel commercial vehicles by 2019, strengthened emission control programme for petrol and Liquefied Petroleum Gas (LPG) vehicles, retrofitting franchised buses with emission control device to upgrade their emission performance, and progressive tightening of emission standards of newly registered vehicles, etc.

4. To reduce emissions from marine vessels, sulphur content of locally supplied marine light diesel has been capped at 0.05% since April 2014 and ocean-going vessels at berth have been mandated to switch to fuel of sulphur content not exceeding 0.5% since July 2015. An incentive scheme has been launched since September 2012 to waive 50% of the light facilities and port

dues for ocean-going vessels that switch to low sulphur fuel while at berth until end March 2018.

5. In addition, emission caps for power plants have been progressively tightened and new non-road mobile machinery has been required to comply with emission standards. The Government is also implementing a plan to phase out the use of exempted non-road mobile machineries¹ in public works projects with an estimated contract value exceeding \$200 million.

6. The above measures have borne fruits. There have been discernable improvements in our air quality in the past few years. From 2012 to 2016, the ambient concentrations of sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and respirable suspended particulates (RSP/PM10) reduced by 18%, 8% and 19% respectively. During the same period, the roadside concentrations of SO₂, NO₂, and RSP/PM10 also reduced by 30%, 31% and 28% respectively due to the stepped-up efforts to reduce vehicle emissions in recent years. There were also some initial signs of a reversal of the increasing trend of ozone in the ambient air.

7. 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.

8. At the meeting of this Panel on 30 March 2016, the Administration briefed Members on the key tasks, approach and work plan of the Review of the AQOs (LC Paper No. CB(1)705/15-16(03)). In accordance with the work plan, we embarked on the Review in mid-2016. The aim is to complete the Review and report its findings and recommendations to the ACE and this Panel in mid-2018.

¹ In February 2015, the Development Bureau issued a Technical Circular (Works) No. 1/2015 which promulgates the requirements for the use of non-road mobile machinery (NRMM) under the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation in new capital works contract. The Technical Circular sets out an implementation plan to phase out the use of four types of exempted NRMM, namely generators, air compressors, excavators and crawler cranes. Exempted NRMM are those exempted from the emission compliance requirements granted by the Environment Protection Department under the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation.

PROGRESS OF THE AQOs REVIEW

9. As set out in the Panel paper in March 2016 referred above, the key tasks of the Review include:

- (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 relevant cost and benefit analysis;
- (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.

Engagement of experts and stakeholders

10. To proactively engage relevant experts and stakeholders, a AQOs Review Working Group (“Working Group”), led by the Under Secretary for the Environment (USEN), was formed in May 2016. The Working Group comprises some 60 external members from the fields of air science, health, green groups, academics, chambers of commerce, professional bodies (including urban planning experts) and relevant trades, as well as officials representing ten Government Bureaux and Departments (B/Ds)². The diversified composition of the Working Group allows it to serve as a cross-sectoral platform for experts, stakeholders and Government officials to engage in thorough deliberations in a gainful manner.

² Apart from the Environment Bureau and Environmental Protection Department as the lead B/D, representatives from other B/Ds include Development Bureau, Transport and Housing Bureau, Civil Engineering and Development Department, Electrical and Mechanical Services Department, Department of Health, Marine Department, Planning Department, and Transport Department.

11. Four dedicated Sub-groups have been formed under the Working Group, *viz.* Road Transportation, Marine Transportation, Energy and Power Generation, as well as Air Science and Health. The first three Sub-groups are to identify new practicable air quality improvement measures under their respective areas (taking into account emission reduction potentials, economic and social impacts and other relevant factors) for the consideration of the Working Group. The Sub-group on Air Science and Health focuses on examining the air science and health aspect of the Review including the assessment of air quality improvements and health and economic impact arising from possible measures, and hence the possible scope for further tightening the AQOs.

Identification of new Air Quality Improvement Measures

12. The Sub-groups on Road Transportation, Marine Transportation, and Energy and Power Generation have convened 19 meetings to discuss possible new air quality improvement measures and deliberate on the practicability of their implementation within the timeframe up to 2025. The timeframe has taken into consideration the target of broadly attaining the current AQOs by 2020 and the need to review the AQOs at least once every five years.

13. A total of 69³ possible new air quality improvement measures have been thoroughly deliberated in the three Sub-groups. They covered a wide spectrum encompassing transport planning/management (e.g. measures to alleviate road traffic congestion), urban planning and design (e.g. building cycle track networks and plan for walkable space), use of clean fuel (e.g. marine vessels to use Liquefied Natural Gas (LNG)), as well as energy demand management and pursuit of renewable energy (RE) in increasing the use of wind and solar energy in electricity generation.

14. Amongst the possible new measures discussed, 26⁴ are either on-going or ready under consideration by the relevant B/Ds which are likely to produce

³ Amongst these 69 measures, the assessment of 9 measures will be further discussed by the Road Transportation Sub-group.

⁴ 3 out of the 26 measures are considered as “short to medium-term” or “short, medium to long-term” depending on the extent of implementation.

results by 2025 or earlier (*short-term*), 4 may be ready for consideration in the next AQOs review period of 2019 – 2023 (*medium-term*) while 14 require detailed planning or further study to ascertain the practicability for implementation beyond the next review period (*long-term*). The remaining 25 are considered as not practicable, short of air quality benefits or not suitable to be considered under the current scope of the Review. The gist of the discussions in the Sub-groups is set out in the ensuing paragraphs.

Road Transportation

15. The Road Transportation Sub-group has deliberated 37 possible measures under the following categories—

- (a) tunnel toll policy and toll collection method,
- (b) maintenance and repair of vehicles exhaust system,
- (c) fostering a “pedestrian-friendly” and “bicycle-friendly” environment,
- (d) promotion of low-emission transport mode,
- (e) utilisation of Intelligent Transport Systems (ITS),
- (f) land use and transport infrastructure planning,
- (g) managing road space, and
- (h) others.

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16. The Government’s transport policy is to maintain the use of public transport at a high proportion of passenger trips made and to reduce reliance on private cars. At the same time, the Government endeavours to foster a green community by promoting non-mechanised mode for short-distance commuting, such as walking and cycling. It is noted that there are public aspirations and sentiments over the reduction of roadside air pollution and hence the improvement of living environment. The Government will continue its efforts on this front although these measures might not bring significant improvement in air quality to such an extent that could lead to the tightening of the AQOs.

17. Separately, the Government considers that the rapid growth of private car fleet size has not only aggravated road traffic congestion but also caused adverse impact on the environment, particularly air quality. The Government

is taking forward progressively the recommendations of the Transport Advisory Committee (TAC) in the Report on Study of Road Traffic Congestion in Hong Kong. The recommendations include containing the growth of private car fleet size through fiscal means such as increasing the first registration tax and annual licence fee for private cars. The successful implementation of any measures to control private car growth needs the consensus and support of the community and Legislative Council as legislative amendments are required.

18. Deliberations of individual possible measures in the Road Transportation Sub-group are set out in Annex B.

Marine Transportation

19. The Marine Transportation Sub-group has deliberated 17 possible measures under the following categories -

- (a) use of clean fuel,
- (b) technical measures,
- (c) fuel economy, energy efficiency and port management, and
- (d) others.

20. The Sub-group has discussed the use of clean fuel in marine vessels such as LNG, hybrid and electric vessels, on-shore power, particularly whether the sulphur cap of marine fuel for ocean-going vessels when berthing in Hong Kong should be tightened to 0.1% from the present limit at 0.5%. Taking into account that a Domestic Marine Emission Control Area (DECA) will be set up progressively by January 2019 in the Pearl River Delta (PRD) waters and the Ministry of Transport plans to determine by end 2019 whether to further reduce the sulphur cap in the DECA, the Sub-group agreed that this possible measure be pursued on a PRD regional basis so as to avoid jeopardising the competitiveness of the ports in Hong Kong. Deliberations of individual possible measures in the Marine Transportation Sub-group are set out in Annex C.

Energy and Power Generation

21. The Energy and Power Generation Sub-group has deliberated on 15 possible measures under the following categories—

- (a) building energy efficiency measures,
- (b) use of RE,
- (c) fuel mix for electricity generation,
- (d) operation of power generation plants,
- (e) new solar energy technology,
- (f) use of biomass as fuel, and
- (g) energy storage.

22. Most of the possible measures on enhancing energy efficiency and conservation, increasing the use of RE, and controlling emissions from power plants tally well with the Government's continuous efforts and align with the recently published Government policies such as the *Energy Saving Plan for Hong Kong's Built Environment 2015~2025+* and *Hong Kong's Climate Action Plan 2030+*. With regard to increasing the use of RE, Environmental Protection Department (EPD) has been developing waste-to-energy facilities to tap the energy generated from the wastes (e.g. the sludge treatment facility or the T-PARK commissioned in 2015 and the organic resources recovery centre that will be commissioned shortly). Deliberations of individual possible measures in the Energy and Power Generation Sub-group are set out in Annex D.

Other Sources

23. Apart from the possible measures deliberated in the above three Sub-groups, control measures for other lesser air pollution sources, namely products containing volatile organic compounds (VOCs), non-road mobile machinery, civil aviation and cooking fumes, are being further examined separately.

Review on Methodology and Air Quality Assessments

24. The Air Science and Health Sub-group has discussed the general approach and tools on the assessment of air quality, health and economic impacts. The Sub-group has agreed that the World Health Organisation's (WHO's) current Air Quality Guidelines (AQGs) should continue to be adopted as the benchmark in this Review and an assessment year of 2025 should be adopted taking into account the statutory review will be conducted at least once in every five years.

25. This Sub-group will assess the air quality under different control scenarios, health and economic impacts and evaluate possible scope for further tightening of the AQOs.

WAY FORWARD

26. The Working Group will continue the remaining tasks for the Review. We aim to solicit the comments/input from the general public on their aspirations for the AQOs before the end of 2017. We plan to complete the Review in the first quarter of 2018, report the Review findings to the ACE and this Panel in mid-2018, and launch a full-scale public consultation on the recommendations of the Review. Our latest work plan is at [Annex E](#).

ADVICE SOUGHT

27. Members are invited to note the latest progress of the AQOs Review.

Environment Bureau /

Environmental Protection Department

June 2017

**WORLD HEALTH ORGANIZATION (WHO)'S
AIR QUALITY GUIDELINES (AQGS) and
HONG KONG'S AIR QUALITY OBJECTIVES (AQOs)**

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

Note :

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

**POSSIBLE NEW AIR QUALITY IMPROVEMENT MEASURES
DISCUSSED -
ROAD TRANSPORTATION**

Possible New Measures Discussed	Deliberations at the Sub-group
A. Tunnel toll policy and toll collection method	
A1. Review the tunnel toll policy and level to alleviate traffic congestion, thereby reducing the emission caused by congestion at the tunnels.	<p>The Transport and Housing Bureau (THB) commissioned a consultancy study on the overall strategy and feasible options for the rationalisation of traffic distribution among the three road harbour crossings (RHCs) and the three land tunnels connecting the New Territories and Kowloon. The Government will submit toll adjustment proposals covering the six tunnels to the Panel on Transport of Legislative Council for discussion in the 2017-18 legislative year. (Short-term measure) #</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
A2. Consider replacing the existing toll collection system with completely automatic systems.	<p>The reason for traffic congestion at tunnels is that the vehicular traffic volume substantially exceeded the design capacity of those tunnels. Replacing the toll collection system cannot resolve the underlying cause of congestion. (Others*)</p>

*These measures are considered not-practicable, short of air quality benefits or not suitable to be considered under the current scope of the Review.

Possible New Measures Discussed	Deliberations at the Sub-group
B. Maintenance and repair of vehicle exhaust system	
B1. Propose to use chassis dynamometer for testing vehicle tailpipe emissions.	The programmes targeting excessive emission problems of various types of vehicles have reduced considerably the number of their gross emitters and resulted in discernible air quality improvements. Gross emitters now account for only a small part of the vehicle fleet. It would be difficult to seek sufficient support from the community to make passing the dynamometer test mandatory for vehicles undertaking roadworthiness examination, as taking such a test could cause a significant increase in vehicle examination fee and time. Cost-ineffective and unjustified. (Others*)
B2. Tighten the annual vehicle examination for private cars from over six years old to over three years old (or consider adopting vehicle kilometres travelled as the vehicle examination criterion).	There are no strong justifications to tighten the annual vehicle examination for private cars from over six years old to over three years old. Nevertheless, the Government will continue to promote the importance of vehicle maintenance and repair. (Others*)
B3. Provide vehicle tailpipe emission testing equipment for rent by small and medium-sized vehicle repair workshops.	Affordable vehicle tailpipe emission testing equipment is common tool in vehicle repair workshops. There are also already on the market specialist diagnostic services for vehicles of advanced engine design, particularly diesel ones, which are far better than this measure which is not common elsewhere. (Others*)
B4. Establish a maintenance information database of vehicle	When Euro VI vehicle emission standards are introduced, vehicle

Possible New Measures Discussed	Deliberations at the Sub-group
tailpipe emission system.	manufacturers will have to provide access to vehicle maintenance information for new vehicle models at reasonable fees. Besides, Environmental Protection Department (EPD) will upkeep the cooperation with the Vocational Training Council (VTC), repair trade and vehicle manufacturers in organizing training and workshops for the vehicle repair trade to share experience/information on vehicle maintenance. The trade finds such training/workshops useful. (Short-term measure)
B5. Raise awareness on the importance of vehicle maintenance and repair.	On-going. The Government will keep up the effort on promoting the importance of vehicle maintenance and repair so that the vehicle repair trade and vehicle owners could understand the benefits of proper vehicle maintenance for reducing vehicle emissions. (Short-term measure)
C. Fostering a “pedestrian-friendly” and bicycle-friendly” environment	
C1a. Foster "pedestrian-friendly" environment (such as widening of footpaths, construction of covered walkways and enhancing the pedestrian connections) to encourage people to walk <i>in existing new towns and urban areas</i> .	The Sub-group noted the Government's work on this front, and has offered some suggestions. The Government will continue to promote walkability to reduce the need of the public using mechanised transport mode for short distance commuting. (Short to medium-term measure)
C1b. Foster "pedestrian-friendly" environment (such as widening of footpaths, construction of covered walkways and enhancing the pedestrian connections) to encourage people to walk <i>in new development areas (NDAs)</i> .	As regards NDAs, as part of the Smart City initiatives, measures for improving pedestrian connectivity will be considered to promote walking in these places. Generally, there should not be insurmountable problems rendering the provision of pedestrian connectivity not

Possible New Measures Discussed	Deliberations at the Sub-group
	<p>technical feasible. Nonetheless, technical feasibility and environmental impact have to be investigated in detail at planning and detailed design stage for NDAs. (Long-term measure)</p>
<p>C2a. Foster “bicycle-friendly” environment and study into the provision of ancillary facilities for cycling (such as provision of cycling track network and bicycle parking spaces, park-and-ride facilities at public transport interchanges and bike-friendly policies to facilitate carriage of bicycles on public transport) <i>in existing new towns and urban areas.</i></p>	<p>The Sub-group noted the Government’s work on this front, and have offered some suggestions. The Government will continue to foster “bicycle-friendly” environment in existing new towns.</p> <p>As regards urban areas, the traffic is generally very heavy, with narrow and crowded roads. On-street loading and unloading activities are frequent, with many vehicles passing by and needing to stop temporarily. Owing to road safety considerations, the Government does not encourage the public to use bicycles as a mode of transport in urban areas.</p> <p>(Short to medium-term measure)</p>
<p>C2b. Foster “bicycle-friendly” environment and study into the provision of ancillary facilities for cycling (such as provision of cycling track network and bicycle parking spaces, park-and-ride facilities at public transport interchanges and bike-friendly policies to facilitate carriage of bicycles on public transport) in NDAs.</p>	<p>As regards NDAs, this measure is in fact part of the Smart City initiatives being pursued in NDAs.</p> <p>Technical feasibility and environmental impact have to be investigated in detail at planning and detailed design stage. (Long-term measure)</p>
<p>C3. Set up cycling and walking shared space at harbourfront areas.</p>	<p>Referencing to the successful overseas examples for shared use of space between pedestrians and cyclists along the harbourfront areas, the concept should be</p>

Possible New Measures Discussed	Deliberations at the Sub-group
	<p>carefully looked into in the Hong Kong context. At the planning and detailed design stages, technical feasibility and environmental impact would have to be conducted, as well as a study into possible implications to the Protection of Harbour Ordinance.</p> <p>Besides, there is road safety concern for the shared use of space by cyclists and pedestrians because of their different speeds (pedestrian around 4 km/h, cyclists on average 20 to 30 km/h) and maneuvering modes. The feasibility of this measure is subjected to further studies. (Long-term measure)#</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
C4. Establish lower vehicle speed limits zones (e.g. 30km/h) in community roads, school zone and areas with elderly centres, to foster pedestrian environment.	This measure is assessed together with “Foster “pedestrian-friendly” environment” (Measure C1) as it carries the same spirit. (Others*)
D. Promotion of low-emission transport mode	
D1. Tram or electric bus interchange schemes at busy road sections (e.g. Nathan Road) to replace the franchised bus services so as to reduce the number of buses and boarding/alighting passengers on the road section.	It is not yet practicable to replace bus services on busy corridors with trams or electric buses due to inadequate road space and given that the feasibility of adopting electric buses on a wide scale in Hong Kong is yet to be proven. The Transport Department (TD) will continue to work with bus operators to pursue bus route rationalisation and encourage them to offer more bus-bus interchange (BBI) concessionary schemes with a view to

Possible New Measures Discussed	Deliberations at the Sub-group
	alleviating traffic congestion and roadside emissions in busy road sections. (Others*)
D2. Electric vehicles pilot schemes - switching the existing vehicle fleet of selected routes to electric vehicles.	The Sub-group noted that the trial of 36 single-deck electric buses fully funded by EPD is in progress to assess the reliability of buses, batteries, supercapacitors and charging facilities; maintenance requirements; and economic feasibility, etc. for ascertaining their suitability for use as franchised buses in Hong Kong. If the trial results are satisfactory, the Government will encourage franchised bus companies to use electric buses on a wider scale, taking into account the affordability of franchised bus companies and passengers. The Sub-group suggested the Government partner with bus operators to help identify appropriate models which might be potentially suitable for the local environment for trial on a wider scale in the longer term. More proactive and positive measures to support the installation of ancillary facilities should also be explored. (Long-term measure)
D3. Promotion of hybrid private cars.	With the advances in the technology of electric cars which have no tailpipe emissions, it is considered more beneficial to promote the use of electric cars instead of hybrid cars in terms of air quality benefits. The Government's priority is to promote the use of electric cars instead of hybrid cars. (Others*)
D4. Exploring the use of new-energy vehicles.	Natural gas (NG) or hydrogen vehicles are not viable in Hong Kong as it is not practicable to find enough suitable

Possible New Measures Discussed	Deliberations at the Sub-group
	<p>locations for setting up NG/hydrogen filling stations and their storage facilities due to our high development density as well as the explosive nature of NG/hydrogen. The Government will continue to keep in view the development of new energy vehicles in the market. (Others*)</p>
E. Utilisation of intelligent transport systems (ITS)	
<p>E1. Launch one-stop mobile app for the public to choose the most time-saving, economical and low-emission transportation mode.</p>	<p>The “Hong Kong eTransport” mobile application currently provides transport mode and route search function based on journey time and fare. It is possible to include the environmentally-friendly transport mode information in “Hong Kong eTransport” through the provision of useful tips. While this may not bring about substantial improvement to roadside air quality, it helps increase the public awareness and understanding of the low-emission transport modes. EPD will provide the necessary input and support to TD in this regard. (Short-term measure)#</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
<p>E2. Launch one-stop mobile app for the public to access real-time information on car parking vacancies which helps them choose the best parking location and shortening the driving distance.</p>	<p>The Government has taken forward this measure by updating the “Hong Kong eRouting” smartphone application in 2016 to disseminate real-time parking vacancy information of about 50 car parks (including government car parks). TD will continue to encourage car park operators to provide and disseminate real-time parking vacancy data of their car parks. (Short-term measure)</p>

Possible New Measures Discussed	Deliberations at the Sub-group
E3. Implement electronic road pricing (ERP) scheme to tackle road traffic congestion at busy roads.	The Sub-group in principle agreed that reaching a consensus within the community is crucial to successful implementation of the ERP Pilot Scheme. The Sub-group noted that the Government would conduct an in-depth feasibility study to formulate detailed options for the next stage of public discussion. (Long-term measure)
E4. Introduce intelligent transport systems (ITS) (e.g. manage traffic flow by traffic signal control, install smart sensors and surveillance cameras for illegal parking enforcement).	The Government has been developing ITS under a three-pronged approach, viz dissemination of traffic information to the public, traffic control and supporting traffic enforcement. Regarding the further use of ITS, further studies will be required for specific measures. (Short, medium, to long-term measure, depending on individual ITS measure)
F. Land use and transport infrastructure planning	
F1. Through proper land use planning to redress the current imbalance in home-job distribution and bring jobs closer to home so as to reduce commuting time and private car usage.	The Sub-group considered that this would in the long term improve traffic and air quality, and provided some recommendations. (Long-term measure)
F2. Use urban planning and design solutions together with transport management to improve air ventilation in high density development.	The Sub-group acknowledged the works to improve air ventilation in district and site levels by the Government, and provided some recommendations. The Government will continue to work on these aspects to improve the air ventilation. (Short-term measure)
F3. Conduct comprehensive review on the development of road transportation infrastructure and networks (such as construction of new tunnels and roads) to cope	The Sub-group noted the Hong Kong 2030+ is being conducted by the Government. The Government is preparing to take forward strategic studies on railways and

Possible New Measures Discussed	Deliberations at the Sub-group
with population growth and to tackle road traffic congestion.	major roads beyond 2030 based on the results of Hong Kong 2030+ and its public engagement exercise with regard to the planning directions for Hong Kong beyond 2030. (Medium-term measure)# [#: Tentative. To be further discussed by the Sub-group.]
F4. Provide low-emission transport mode to the residents of NDAs.	It should be feasible to construct a low-emission mode of transport in the development of new towns and NDAs. In fact, the Government has actively considered the suitable environmentally-friendly transport systems in projects such as Hung Shui Kiu and Kai Tak Developments. (Long-term measure)
F5. Enhance district-based publicity on bus route rationalisation.	TD pursues the rationalisation of bus routes on an ongoing basis. Suitable publicity to build up awareness of the benefits of bus route rationalisation to air quality will be arranged as appropriate to help canvass community's support during consultation of bus route rationalisation proposals and before their implementation. (Short-term measure)
G. Managing road space	
G1. Raise the first registration tax (FRT) of highly polluting vehicles and impose higher licence fees on more polluting vehicles, as well as to manage the growth of vehicles in particular private cars.	On managing the growth of vehicles (in particular private cars), the Sub-group noted that the Government is taking forward progressively the recommendations of the Transport Advisory Committee in the Report on Study of Road Traffic Congestion in Hong Kong, including recommendations for containing the growth of private car fleet size through increasing the first

Possible New Measures Discussed	Deliberations at the Sub-group
	<p>registration tax and annual licence fee for private cars and raising the “fuel levy” for diesel private cars. The Sub-group acknowledged that the implementation of both fiscal and non-fiscal measures to control private car growth needs the consensus and support of the community and Legislative Council as legislative amendments are required. (Short-term measure)#</p> <p>As regards the control over highly polluting vehicles, the Government has been implementing a wide range of measures targeting high emitting vehicles, including programmes to phase out pre-Euro IV diesel commercial vehicles (DCVs), limit the service life of newly registered DCVs, and inspection programs to identify highly emitting vehicles and request them to fix their problems and undergo vehicle emission tests, etc. Therefore, vehicle owners and the transport trades would object to the introduction of additional measures to further raise the licence fees and FRT for high emitting vehicles. Moreover, some members pointed out that it would be difficult to set the criteria for determining licence fees based on emission levels. Therefore, this measure to impose higher licence fee on more polluting vehicles is not practicable.</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
G2. Enhance enforcement against	The Police will continue to step up

Possible New Measures Discussed	Deliberations at the Sub-group
illegal parking.	enforcement against illegal parking as well as other traffic problems at the district level. The Police also conducts territory-wide enforcement programme from time to time to tackle illegal parking. (Short-term measure)
G3. Review on-street metered parking fees.	<p>The Sub-group in general agreed that the parking meter charges at present are very low, and there is room for increasing the charges to disincentivise drivers circulating on streets waiting for parking spaces, thus worsening traffic congestion at some of the roads. However, the Sub-group acknowledged that this measure may induce increase of pricing in some private car parks. (Short-term measure)#</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
H. Other suggestions	
H1. Provide information on the energy efficiency, emission performance and noise level of vehicles, etc. to facilitate the public to make a more environmentally-friendly choice.	<p>The Government stipulated the vehicle exhaust emission standards and the noise emission standards. All new vehicle models are required to comply with the relevant standards. Also, vehicle dealers have been providing fuel consumption figures of light duty vehicles (design weight not more than 3.5 tonnes) including private cars to potential purchasers upon request. (Others*)#</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
H2. Set out objectives/policies to support the use of cleaner vehicle fuels.	The Government will continue with its multipronged approach in reducing tailpipe emissions from motor vehicles,

Possible New Measures Discussed	Deliberations at the Sub-group
	and to continue monitoring relevant international developments so as to adopt the most stringent motor vehicle fuel standards and introduce cleaner fuels when they become practicable for Hong Kong. (Others*)
H3. Extend the coverage areas of the existing low emission zones and their restriction to other vehicle types.	A number of effective measures have been put in place to reduce tailpipe emissions from the entire vehicle fleet. Such measures are more effective than extending the coverage of the low emission zones. The Government will continue the multipronged approach and consider the latest technological developments as well as the effectiveness of current measures when formulating policies for further improvement of roadside air quality. (Others*)
H4. Address the personal and operational needs of heavy vehicle drivers, such as provision of parking space and arrangement of meal and rest breaks at the Kwai Chung Container Terminals area, so as to reduce air pollution arising from idling engines.	The Sub-group acknowledged the work by the Government on increasing commercial vehicle parking space, and recommended the Government to step up the work on the issues and provide more commercial parking space for long term / short term parking. (Medium-term measure)
H5. Set up a continuous and effective priority road network for public vehicles.	Given the role of franchised buses as road-based mass carriers, TD had already set up 25 kilometres of bus-only lanes and 14 designated bus gates as at March 2017. Initial proposals for designating new bus-only lanes at various locations have also been put forward in the report of the Public Transport Strategy Study. TD will keep in view the need and feasibility of expanding the bus priority

Possible New Measures Discussed	Deliberations at the Sub-group
	<p>measures as appropriate.</p> <p>The setting up of a priority road network for public vehicles may have huge adverse effect on the effectiveness of the entire road network. Not only that this measure may worsen traffic congestion, the congestion may also extend beyond the starting point of the priority road network, preventing public transport vehicles from entering the priority road network thus reducing the effectiveness of the measure. Moreover, the possible measure may affect the current loading/unloading and picking up/setting down activities, causing inconvenience to other road users. In fact, some public vehicles may even change lanes due to the blockage by buses ahead which are picking up or setting off passengers in the priority network. Therefore, the feasibility of this possible measure is in doubt and would cause significant impact on other road users. This possible measure requires further detailed research. (Others*)#</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
H6. Review the policy on replacement of franchised buses.	<p>Franchised bus companies had pledged to deploy buses under the age of 18 in providing franchised bus services under normal circumstances. All Euro I buses have already retired from services, while the EPD has been working with the franchised bus companies to retrofit Euro II and Euro III buses with selective</p>

Possible New Measures Discussed	Deliberations at the Sub-group
	<p>catalytic reduction devices to reduce roadside emissions from these buses. On the other hand, further tightening of the maximum age limit of the franchised bus fleets might not be practicable as there could be substantial implications for the efficient operation of franchised bus services. The higher cost arising from more frequent replacement of vehicles would create pressure for fare increase which might eventually affect the basic fare level. In addition, it is not environmentally-friendly to replace franchised buses well before their design lifespan ends. (Others*)#</p> <p>[#: Tentative. To be further discussed by the Sub-group.]</p>
<p>H7. Provide funding to support District Councils for implementing air quality improvement projects</p>	<p>There is no strong justification to set up this funding. Members of the public who would like to conduct innovative projects that can help improve air quality can apply for funding from existing resources such as the Environment and Conservation Fund. (Others*)</p>
<p>H8. Raise public awareness on environmental protection, promote green living and encourage the public to use public transport systems as well as low emission transportation options.</p>	<p>This is an on-going measure. The Government will make efforts to promote walking and cycling, and the use of public transport services. (Short-term measure)</p>

**POSSIBLE NEW AIR QUALITY IMPROVEMENT MEASURES
DISCUSSED-
MARINE TRANSPORTATION**

Possible New Measures Discussed	Deliberations at the Sub-Group
A. Use of Clean Fuel	
A1. Explore the use of Liquefied Natural Gas (LNG) for marine vessels.	The use of LNG in marine application is an international trend, and more LNG vessels including container vessels and cruise ships might be used in the Pearl River Delta (PRD) region if LNG bunkering facilities are available in Hong Kong. The Government should thus develop the technical requirements and associated safety regulations for using LNG in marine vessels while keeping a close watch on all relevant developments for planning ahead the development of LNG bunkering facilities in Hong Kong; and explore collaboration within the PRD region on LNG bunkering. (Long-term measure)
A2. Explore the use of biofuel (e.g. B5), fuel cell, Liquefied Petroleum Gas (LPG), compressed natural gas (CNG), methanol, nuclear and renewable energy, etc. for marine vessels.	The use of these alternative fuels on marine applications is subject to a number of technical constraints such as technology maturity, availability of supply and cost and commercial considerations, etc. Hence, these alternative fuels are unlikely to become a mainstream marine fuel in the foreseeable future. Nevertheless, the Government should keep a close watch on this development. (Long-term measure)
A3. Explore the use of hybrid, diesel electric and electric vessels	Owing to the high investment cost and a number of operational constraints for these vessels, these technologies are unlikely to replace conventional powering

Possible New Measures Discussed	Deliberations at the Sub-Group
	technologies of vessels in the foreseeable future. The Government should keep close monitoring of the technology development in adopting these technologies in local marine application. (Long-term measure)
A4. Ocean-going vessels (OGVs) at berth to use marine diesel with lower fuel sulphur content, e.g. not exceeding 0.1%.	A Domestic Marine Emission Control Area (DECA) will be set up in the PRD requiring vessels to use low sulphur fuel (sulphur content not exceeding 0.5%). The Ministry of Transport plans to determine by end 2019 whether to further tighten the sulphur limit in the PRD DECA to 0.1%. Regulating fuel Sulphur content should be pursued on a regional basis to avoid jeopardizing the competitiveness of local ports. (Short-term measure)
A5. Local vessels to use electricity from the power grid while at berth	Operators of local vessels can approach the power companies for the setting up of power supply installations at the piers for their use, provided that the conditions such as space, safety and operation requirements could be satisfied by the power companies and the relevant authorities. The measure has already been adopted by some local vessel operators. (Short-term measure)
A6. River trade vessels to use on-shore power supply (OPS) while at berth at terminals	Given the quick turnaround time of river trade vessels and the lack of space at terminals for the installation of the OPS, both the container terminal and the river trade vessels operators considered that using OPS while at berth at terminals would impose operational constraints on

Possible New Measures Discussed	Deliberations at the Sub-Group
	their operations. The possible measure is considered not practicable. (Others*)
A7a. OGVs to use OPS while at berth at Cruise Terminal.	Despite there is an increasing trend for cruise ships to equip with scrubbers or use LNG as fuel instead of OPS connection system to comply with the fuel sulphur requirements, some cities in the PRD region are developing cruise terminals with OPS facilities and planning to encourage the use of OPS in cruise ships. Cruise companies might consider deploying their OPS-ready cruise ships to the PRD region. The Government should continue to keep close monitoring of the development so that timely action could be taken to pursue the use of OPS for cruise ships. (Long-term measure)
A7b. OGVs to use OPS while at berth at container terminals.	The lack of a unified standard for OPS system and space to accommodate the required OPS infrastructure and facilities at the container terminals are the insurmountable constraints. The measure is therefore considered impracticable. (Others*)
B. Technical Measures	
B1. Impose emission standards on outboard engines of local vessels.	It is technically feasible for small local vessels to use low-emission outboard engines to reduce their emissions. While these low-emission outboard engines are available in Hong Kong, a detailed consultation with the shipping trade is required to ascertain its implementation.

*These measures are considered not-practicable, short of air quality benefits or not suitable to be considered under the current scope of the Review.

Possible New Measures Discussed	Deliberations at the Sub-Group
	The Government would thoroughly consult the relevant trade to address its concerns before pursuing this possible measure. (Medium-term measure)
B2. Install emission reduction device (e.g. particulate filters) to reduce particulate matters (PM) emitted from local vessels.	Installation of emission reduction device to reduce PM from local vessels is subject to a number of technical constraints such as additional space for retrofitting the device on local vessels, applicable experience in merchant shipping (which is very limited), as well as additional investment and fuel costs, etc. The Sub-group considered that the scope for application is very limited. (Others*)
B3. Impose control on nitrogen oxides (NOx) emissions from engines of local vessels.	Having considered the technical constraints and additional cost implications in adopting various NOx emission control technologies on local vessels, such as exhaust gas recirculation, water injection and selective catalytic reduction, the scope for applying these technologies on local vessels is very limited. (Others*)
C. Fuel economy, energy efficiency and port management	
C1. Explore financial incentive and disincentive schemes to encourage liners to use less polluting OGVs calling Hong Kong ports.	The trade prefers the provision of financial incentive schemes. The Sub-group considers that financial incentive schemes should be pursued in the PRD regional basis to increase its attractiveness and effectiveness. The Government will maintain dialogues with the trade and seek opportunities of collaboration with other ports in the PRD region. (Medium-term measure)
C2. Optimise port efficiency to shorten waiting and turnaround time of OGVs and river trade	Measures to optimize port efficiency have been extensively discussed in the Hong Kong Maritime and Port Board

Possible New Measures Discussed	Deliberations at the Sub-Group
vessels at container terminals, river trade terminals and public cargo working areas (PCWA)	(HKMPB). While the optimization of port efficiency may involve long term planning, the Government would keep in view the discussions in the HKMPB, and would take on board the outcome of the discussions to study the associated emission reduction potential. (Others*)
C3. Slow-steaming of OGVs in Hong Kong waters.	Having considered the busy marine traffic and navigation safety, the Sub-group agreed that the scope for further extending the speed restricted areas in the Victoria Harbour and its adjacent waters, lowering the speed limits for OGVs, or establishing new speed restriction areas, would be limited. This possible measure is considered not practicable for implementation. (Others*)
C4. Encourage academia to carry out studies on fuel and energy efficient measures in terms of operation and maintenance for local vessels; and collaboration between academia and local marine trade for the development of best practice guidelines and award system to facilitate adoption of the measures.	Funding is currently available to support academic studies and trials related to fuel and energy efficient measures on local vessels. However, there is little collaboration between the academia and the local marine trade in initiating studies on the fuel and energy efficient measures for their wider adoption. The Government should explore opportunities to facilitate long-term collaboration between the local marine trade and academia in pursuing this measure. (Long-term)
D. Other suggestions	
D1. Remove floating rubbish for smooth operation of small local vessels.	Not related to air quality improvement and not further discussed in the Sub-group. (Others*)
D2. Government to expedite the approval process of new local vessels.	

**POSSIBLE NEW AIR QUALITY IMPROVEMENT MEASURES
DISCUSSED-
ENERGY AND POWER GENERATION**

Possible New Measures Discussed	Deliberations at the Sub-Group
A. Building energy efficiency measures	
A1. Encourage stakeholders in the commercial sector and the non-government sector, e.g. universities and hospital to adopt demand-side management (DSM) measures.	The Government has taken forward this measure under the <i>Energy Saving Plan for Hong Kong's Built Environment 2015 ~2025+</i> which sets a target of reducing Hong Kong's energy intensity by 40% by 2025 using 2005 as the base. Achieving this target requires actions by the whole community. To this end, the Government has established a dialogue platform with relevant stakeholders in the built environment under the "4Ts" framework (namely target, timeline, transparency and together) to discuss ways to promote green buildings and to explore energy saving targets and measures. Under the post-2018 Scheme of Control Agreements (SCAs) which was signed on 25 April 2017, power companies will be incentivised to introduce relevant programmes. (Short-term measure)
A2. Explore building energy efficiency measures for old existing buildings which are not covered by the Buildings Energy Efficiency Ordinance.	Ditto. (Short-term measure)
A3. Encourage major electricity users to reduce peak load demand so as to reduce the operation and emissions from coal-fired	Comprehensive studies on feasibility of advanced metering infrastructure technologies have yet to be conducted in Hong Kong. The Government and the

Possible New Measures Discussed	Deliberations at the Sub-Group
generating units for coping with peak load demand.	<p>power companies would require more in-depth studies and tests on its application in Hong Kong.</p> <p>Under the post-2018 Scheme of Control Agreements (SCAs) which was signed on 25 April 2017, power companies will be incentivised to introduce demand response programmes to help reduce peak load demand. (Long-term measure)</p>
B. Use of renewable energy	
B1. Encourage or provide incentives for the private sector to develop distributed renewable energy (RE).	<p>To help achieve the target of reducing carbon intensity by 65-70% by 2030 (using 2005 as the base year) as set out under the <i>Hong Kong's Climate Action Plan 2030+</i>, the Government will take the lead in applying RE on a wider and larger scale based on mature and commercially available technologies, and continue to create the conditions to promote the development of distributed RE by the private sector, including the introduction of Feed-in Tariff and RE Certificate schemes to encourage the private sector and the community to consider investing distributed RE as provided for under the post-2018 SCAs with the two power companies. (Short-term measure)</p>
B2. Facilitate distributed RE systems to connect to the power grid.	<p>The Government has reached agreement with the power companies to facilitate and improve the distributed RE grid connection arrangements under the post-2018 SCAs. (Short-term measure)</p>
B3. Encourage the development of	The Government is already on a

Possible New Measures Discussed	Deliberations at the Sub-Group
more waste-to-energy facilities, such as waste incinerators, organic resources recovery centres, etc. for waste disposal as well as recovering energy for local use.	committed path to turn our waste into renewable energy. The Government will identify the need for additional waste-to-energy facilities to meet our future waste management needs. (Short-term measure)
B4. Increase the use of wind and solar energy in electricity generation.	The Government is committed to applying RE in wider and larger scale in the immediate years ahead based on mature and commercially available technologies, including wind, solar and waste-to-energy. (Short-term measure)
C. Fuel mix for electricity generation	
C1. Replacement of coal-fired generating units by gas-fired units.	The Government has taken forward this measure under the <i>Hong Kong's Climate Action Plan 2030+</i> which sets a target of reducing carbon intensity by 65-70% by 2030 using 2005 as the base year. To help achieve this target, Hong Kong will phase down coal-fired generating units as they reach their normal retirement life and replace them with gas units or generating facilities using non-fossil fuels. (Short-term measure)
C2. Consider importing more nuclear electricity from the Mainland.	Given the diverse views on the use of nuclear power received during the 2014 public consultation on future fuel mix for electricity generation, the present arrangement is to maintain the current nuclear import at around 25% of our fuel mix in 2020. The Government needs to consult the public again before consideration might be given to further import nuclear electricity from the

Possible New Measures Discussed	Deliberations at the Sub-Group
	Mainland. (Others*)
D. Operation of power generation plant	
D1. Upgrade burners of gas-fired generating units to improve fuel efficiency and emission performance.	The Government has been working with the power companies to explore potential upgrading of existing gas-fired generating units with a view to enhancing fuel efficiency and emission performance. (Short-term measure)
D2. Review operations of gas-fired power generating units with a view to identifying further emission reduction potential.	Power companies have been required to maximise the operation of their existing gas-fired generating units to meet the emission caps as stipulated in the Technical Memorandum as well as other environmental targets. (Short-term measure)
E. New solar energy technology	
E1. Explore the idea of “SolarRoad” for promoting the use of solar energy.	Solar road technology is immature at the current state and its application in congested environment like Hong Kong is subject to a number of technical constraints, e.g. installation in roadways with packed underground utilities. The measure is considered not practicable. (Others*)
F. Use of biomass as fuel	
F1. Explore the use of waste materials such as corncobs, waste wooden pallets (i.e. biomass) as fuel.	Other than the biomass potential of municipal solid waste, there is a limited supply of other biomass in Hong Kong. There are a number of completed and planned waste-to-energy facilities to capture the biomass energy from our municipal solid waste and transform them to electricity. (Short-term

*These measures are considered not-practicable, short of air quality benefits or not suitable to be considered under the current scope of the Review.

	measure)
G. Energy storage	
G1. Explore the feasibility of using electric vehicles (EV) as electrical energy storage for power grid.	The vehicle-to-grid (V2G) technology is only at experimental stage and that a number of technical issues, e.g. shortened EV's battery life due to frequent charging and recharging remain to be resolved. In addition, the relatively small number of EVs in Hong Kong could not support the need for energy storage of power grid. The measure is considered not practicable. (Others*)
G2. Explore the use of old EV batteries as an electrical energy storage system for the power grid.	The technology of using retired EV batteries for grid storage is still at experimental stage and thus this measure is not practicable within the time horizon of this AQO review. Nevertheless, the Sub-group suggested the Government and power companies to keep watching of the development and consider conducting trials when opportunity arises. (Long-term measure)

LATEST WORK PLAN OF THE AQOs REVIEW

Key Milestones	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 end 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 ACE and LegCo EA Panel 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