AIR QUALITY OBJECTIVES (AQO) REVIEW WORKING GROUP
AIR SCIENCE AND HEALTH SUB-GROUP

Digest of the 6th Meeting
13 December 2018 (Thursday) at 3:30pm
in Conference Room, 33/F, Revenue Tower, 5 Gloucester Road, Wan Chai

Present:

Mr. C.W. TSE	Under Secretary for the Environment **(Chairperson)**, Environment Bureau (ENB)
Mrs. Alice CHEUNG	Deputy Director of Environmental Protection (3) **(Vice-chairperson)**, Environmental Protection Department (EPD)
Mr. Alfred Tak Kong LEE	
Mr. Tsz Wai LOONG	
Dr. Zhi NING	
Dr. Loletta Kit Ying SO	
Ir. Pak Cheong LO	
Prof. Peter BRIMBLECOMBE	
Dr. Nicky Yun Fat LAM	
Dr. Steve Hung Lam YIM	
Mr. Dave HO	Assistant Director of Environmental Protection (Air Policy), EPD
Dr. Kenneth LEUNG	Principal Environmental Protection Officer (Air Science), EPD
Mr. Brian LAU	Acting Principal Environmental Protection Officer (Air Policy), EPD
Ms. Irene PANG	Chief Assistant Secretary (Works) 3 , DEVB
Mr. Edmund CHAN	Chief Engineer, CEDD
Dr. Eddy NG	Principal Medical & Health Officer (Non-Communicable Disease), DoH
Mr. Patrick WONG	Senior Town Planner (Strategic Planning 1)

Absent with Apologies:
Prof. Alexis Kai Hon LAU
Prof. Lin Wei TIAN
Prof. WANG Tao
Dr. Roland Chung Chuen LEUNG
Dr. MAN Chi Sum
Dr. Eunice MAK

In Attendance:

Mr. C.F CHOW	Senior Environmental Protection Officer (Air Science) 4, EPD
Mr. K.W. NG	Senior Environmental Protection Officer (Air Science) 2, EPD
Mr. Roy TSANG	Environmental Protection Officer (Air Science) 42, EPD
Mr. Simon C.F. LAM	Environmental Protection Officer (Air Policy) 11, EPD
Mr. Freeman CHEUNG	Consultant's representative, AECOM Asia Co. Ltd.
Mr. Ping KONG	Consultant's representative, AECOM Asia Co. Ltd.
Mr. Marcus IP	Consultant's representative, AECOM Asia Co. Ltd.
Mr. Karl AN	Consultant's representative, AECOM Asia Co. Ltd.
Prof. Jimmy FUNG	Consultant's representative, HKUST
Mr. Xuguo ZHANG	Consultant's representative, HKUST
Prof. WONG Tze Wai	Consultant's representative, CUHK

Opening Remarks

The **Chairperson** welcomed Members to the 6th meeting of the Air Science and Health (ASH) Sub-group. He said that, since the last AS&H Sub-group meeting held in June 2017, in accordance with the methodologies agreed at this Sub-group earlier, the Consultant engaged for the Air Quality Objectives (AQOs) Review had conducted the air quality assessment and health and economic impact assessment (HEIA), which was based on the possible short air quality improvement measures identified from the deliberations in the three Sub-groups, namely "Road Transportation", "Marine Transportation" and "Energy and Power Generation" and focus groups on other emission sources as well as other on-going and committed measures by the Government. This meeting aimed to report on the assessment results and seek Members' comments on the assessment and the identified potential scope for tightening of the AQOs from scientific view point. The **Chairperson** said that, subject to the deliberations of this meeting, the findings on the assessment results would be presented to the Working Group for consideration.

Agenda Item 1 – Confirmation of Digest of the Fifth Meeting

1. The draft digest of the 5th meeting held on 7 June 2017 was confirmed without amendment.

Agenda Item 2 – Assessments on Air Quality for 2025 and the Associated Health and Economic Benefits (AS&H Paper 1/2018)

Air Quality Assessment Findings

2. The **Chairperson** invited the **Consultant, Prof. Jimmy FUNG**, to brief Members on the air quality modelling results in 2015, 2020 and 2025. The Consultant advised that air quality assessment had been conducted based on methodologies agreed in the previous AS&H Sub-group meetings. The key observations/findings were :

(a) The 2015 air quality modelling results demonstrated a good agreement with the air quality monitoring data recorded at EPD's general air quality monitoring stations;

(b) The air quality modelling results showed that Hong Kong could broadly attain the prevailing AQOs in 2020 except for ozone (O_3)(8-hr);

(c) The air quality modelling results in 2025 indicated that the implementation of on-going, committed and new measures would lead to continuous improvement in the concentration of air pollutants, except for a slight increase in ozone;

(d) The projected SO_2(24-hr) concentrations in 2025 could meet the World Health Organization (WHO) Interim Target-2 (IT-2), with the current number of exceedance allowable (i.e., three) remaining unchanged;

(e) The projected annual averaged concentrations of $PM_{2.5}$ in 2025 could possibly meet the WHO IT-2. As for $PM_{2.5}$ (24-hour), there would be potential to meet the WHO IT-2 if the number of allowable exceedances be relaxed from the current nine to 35;

(f) The projected O_3(8-hr) concentrations in 2025 could not meet the current AQO set at WHO IT. There would be no scope for further tightening its AQO;

(g) The projected annual averaged concentrations of PM_{10} in 2025 could not meet the next higher WHO IT level, i.e., WHO IT-3. Hence, there would be no scope for further tightening its AQO; and

(h) The predicted air quality of a hypothetical scenario assuming no emission in Hong Kong was presented for comparing with the projected air quality in 2025 to illustrate the substantial contributions to PM_{10} and $PM_{2.5}$ and ozone from sources outside Hong Kong.

3. Upon further clarifications on the emission assumptions and the agreement between monitoring data and modelling results by **Prof. FUNG**, **Members** agreed that the air quality model and approach had good performance and could produce robust air quality assessment results.

4. **Members** did not raise comments on the findings of the air quality assessment for SO_2. **A member** commented that reducing the sulphur content of marine fuel might reduce energy content and lead to higher fuel consumption. **Mr. Dave HO** responded that previous local study conducted by a local university showed that the change of energy content due to reducing sulphur content was insignificant.

5. **A member** commented that without incorporating the median- and long-term emission control measures discussed under the Working Group of this AQO review, the 2025 All Short-term scenario might not fully reflect the benefits of all possible control measures to be taken. Hence, the results would potentially underestimate the air quality improvement. **Prof. FUNG** responded that the 2025 All Short-term scenario had already covered all the feasible and quantifiable emission control measures to be taken by 2025. Nevertheless, a hypothetical scenario of zero Hong Kong emission was simulated and the results were sufficient to demonstrate the maximum level of air quality improvement when we exhausted all possible control measures.

6. Most **Members** agreed with the air quality assessment for $PM_{2.5}$ and the possible scope for tightening of $PM_{2.5}$ (Annual and 24-hours) AQOs from WHO IT-1 to IT-2 with upward adjustment of the number of allowable exceedance of the $PM_{2.5}$ (24-hr) AQO. In response to a member's question about the rationale for adjusting the number of allowable exceedance for the AQO of $PM_{2.5}$ (24-hours) upward, the **Chairperson** pointed out that from science point of view, the adjustment was to cater for uncontrollable factors (e.g. unfavourable meteorological conditions) leading to exceedance if the AQO was to be tightened. For instance, the European Union also allowed 35 exceedances for the 24-hour air quality standard for PM_{10}.

7. **A member** commented that as the modelling results showed that the majority of the particulate matters reduction was due to a reduction in $PM_{2.5}$ and only a very small contribution was from the coast particle (i.e. PM_{10}), it might indicate that the model did not consider sufficient PM_{10} emission reduction. **Dr. Kenneth LEUNG** responded that the majority of the existing and proposed emission control policies for reducing particulate matters in Hong Kong and PRD were related to combustion sources which mainly emitted finer portion of the particulate matters, i.e., $PM_{2.5}$, and its precursors, and the model had already incorporated all the relevant emission reduction policies. The monitoring data also showed that majority of the reduction of particulate matters was due to $PM_{2.5}$ reduction. EPD would conduct PM_{10} source apportionment measurement in future to identify the various components of PM_{10}

observed in Hong Kong and their sources so that targeted control policy could be formulated in future.

8. **Some members** commented that freezing the emissions in PRD and other parts of the Mainland at 2020 level in the air model runs could lead to over-estimation of the background PM_{10} contribution as the potential additional emission reduction in the PRD and Mainland after 2020 was not accounted. Therefore, the overall pollution levels might be over-estimated and the assessment results might not be suitable for determining the potential scope for tightening the AQO, for example the PM_{10}. **Dr. Kenneth LEUNG** responded that, given there being no official emission projection for PRD and other parts of Mainland beyond 2020 from the Mainland Government, the 2020 emissions for PRD and Mainland were the best available information for air quality assessment up to 2020, and the approach of adopting the 2020 PRD and Mainland emissions had been agreed by the Emission Reduction Estimation and Air Quality Modelling Task Force of this Sub-group. Moreover, judging from the background annual PM_{10} contribution of 30$\mu g/m^3$ and the PRD PM_{10} reduction of 17% from 2010 to 2020, the predicted annual PM_{10} level in 2025 would unlikely decrease from the modelled output from 37 $\mu g/m^3$ to less than 30 $\mu g/m^3$. Hence there would unlikely be scope to tighten PM_{10} AQOs to WHO IT-3. Nevertheless, the Hong Kong and Guangdong governments had embarked on a study on emission reduction targets beyond 2020 and given that AQO review would be a continuous exercise to be conducted every 5 years, future joint efforts to reduce emissions in the region and their impact on improving air quality and hence the potential for tightening AQOs for various pollutants including PM_{10} would be evaluated in the next AQO review exercise.

9. **Some members** also suggested that some refinements on the assessment and modelling approach, such as analysis on pollution source characteristics, could be explored in the next AQO review exercise.

Findings of Health and Economic Impact Assessment

10. The **Consultant, Prof. WONG Tze Wai,** gave a presentation on the findings of the Health and Economic Impact Assessment (HEIA):

(a) The health benefits from reduced short-term and long-term exposure to air pollutants due to improvement in air quality between 2015 and 2025 were assessed;

(b) The health benefits attributed to reduced exposure to NO_2 in 2025 was larger than that to $PM_{2.5}$ because of the greater improvement in NO_2 concentration compared with $PM_{2.5}$;

(c) The mortalities attributed to long-term exposure to NO_2 and $PM_{2.5}$ were

much larger than those attributed to short-term exposure due to the higher relative risk factors associated with long-term exposure;

(d) There would be slight adverse impact on health and economic for ozone due to the increase in ozone concentration in 2025 compared with 2015;

(e) The associated economic impacts based on valuation of statistical life (VOSL) were found to be much larger than the direct medical cost and the cost associated with loss of productivity;

(f) The limitations of the HEIA were mainly the uncertainty of the VOSL and the lack of emergency hospital admission data for cardiovascular and respiratory diseases in private hospital (accounting for about 10% of total hospital beds in Hong Kong).

11. **A member** suggested that alternative presentation methods of the potential health impacts could be considered in future AQO review, such as Value of life years (VOLYs) to reflect the change in life expectancy. **Prof. WONG** clarified that the use of VOSL to present the economic implications over a calendar year is to facilitate public's understanding on the magnitude of impacts, while VOLY would be more difficult for interpretation by the general public.

12. **A member** suggested including the health impacts of a scenario assuming all criteria air pollutant levels complying with the WHO Air Quality Guidelines for public information. **Prof. WONG** clarified that while theoretically the HEIA can be performed for scenarios with different pollutant levels, it might not be pragmatic to simply assess the ideal scenario without considering the technical feasibility to achieve the air quality improvement, which would also deviate from the original aim to identify possible scope for tightening for AQOs. The **Chairperson** commented that based on findings of the air quality assessment, even assuming zero emission in Hong Kong in 2025, the WHO AQG levels still could not be achieved.

13. **A member** asked about the rationales of not covering certain diseases (e.g. skin diseases) in the assessment. **Prof. WONG** explained that the HEIA covered the health outcomes with well-proven linkage with air pollution and where health data needed for assessment were available. As more scientific evidence would emerge over time, the impact of air pollution on more diseases might be covered in future AQO reviews. The current estimation was erred on the conservative side.

14. **A member** asked if the health data obtained from General Practitioner (GP) was sufficient to support the HEIA and would the uncertainty affect the estimated benefit. **Prof. WONG** explained that it was difficult to obtain a comprehensive health data from GPs and data used in the HEIA was collected by a survey conducted 10 years ago. Since over 90% cases of cardiovascular diseases and respiratory diseases

were handled by the Hospital Authority, the uncertainty in the GP data would not affect the conclusion of the HEIA significantly. The **Chairperson** added that although there were uncertainties on the assessment as explained by **Prof. WONG**, the HEIA results showed broadly that there would be substantial health and economic benefits by improving the air quality. The information already helped provide strong support to pursue new air quality improvement measures.

Scope for Tightening the AQOs

15. To conclude the meeting, the **Chairperson** summarised the air quality assessment results that there was scope for tightening the AQOs of SO_2 and $PM_{2.5}$, but not for PM_{10} and ozone. The findings would be submitted to the Working Group for consideration. No further comments were raised by members.

Agenda Item 3– Any other business

16. No other business was raised and the meeting was adjourned at 6:30 p.m.