Appendix 2 to ACE Paper 1/2019

Supplementary Assessments on Respirable Suspended Particulates (RSP/ PM_{10}) and Sulphur Dioxide (SO_2)

EPD has assessed whether there is scope to tighten the annual Air Quality Objective (AQO) for RSP/PM10 from the current Interim Target (IT)-2 (50μg/m^3) to IT-3 (30μg/m^3); and to tighten the 24-hour AQO for SO2 from IT-1 (125μg/m^3) to Air Quality Guidelines (AQG) (20μg/m^3), instead of IT-2 (50μg/m^3), by increasing the allowable number of exceedance.

RSP/ PM_{10}

2. The 2015 measurement and the 2025 modeling results for RSP/PM_{10} and FSP/$PM_{2.5}$ are set out in the table below (same as Table 2 in paragraph 21 of Appendix 1). The assessment shows that the highest annual PM_{10} concentrations in 2025 would be at about 37μg/m^3, exceeding the World Health Organisation (WHO)'s IT-3 limit of 30μg/m^3 –

Pollutants	**Prevailing HK AQOs (Annual Conc.) (μg/m^3)**	**2015 Air Quality[a] (Annual Conc.) (μg/m^3)**	**Next higher standards (Annual Conc.) (μg/m^3)**	**2025 Air Quality Assessment[b] (Annual Conc.) (μg/m^3)**
RSP/PM_{10}	50 (IT-2)	45	30 (IT-3)	37
FSP/$PM_{2.5}$	35 (IT-1)	30	25 (IT-2)	24

Note:

a. 2015 air quality is based on the measurement data of 12 general air quality monitoring stations. Highest concentration among the 12 general air quality monitoring stations is presented.

b. 2025 air quality assessment result is based on the territorial wide air quality modelling outcome. Spatial maximum concentration and maximum number of exceedances are presented.

3. EPD has examined the following aspects to ascertain whether there is scope to reduce the above 2025 assessed PM_{10} annual concentrations by 7μg/m^3, in order to be able to comply with the IT-3 (30μg/m^3) –

(a) the coarse part of PM_{10} (i.e. particulates with aerodynamic diameter between 2.5μm and 10μm)

EPD's measurement data has revealed that about 60% of PM_{10} are $PM_{2.5}$, while the remaining (more than 10μg/m^3) are the coarse part which are made up of particles from natural sources (e.g. crustal elements, sea-salt, etc.) and unidentified sources. Since there were no control measures targeting these natural and unidentified sources of PM_{10}, the majority of the PM_{10} improvement in the past were realized by the reduction of $PM_{2.5}$ from major air pollution sources such as power plants, motor vehicles, vessels and combustion sources through various emission control measures introduced by Hong Kong and the Pearl River Delta (PRD) region (e.g. requiring existing power plants to be retrofitted with emission reduction devices and replacing coal-fired generating units by gas-fired ones, tightening emission standards for motor vehicles and emission caps for power plants, requiring vessels to use low-sulphur marine fuel, etc.). It is likely that the PM_{10} improvement at least in the near future would continue to be a result of control measures targeting at $PM_{2.5}$. As set out in paragraph 20 of Appendix 1, the emission reduction of all the practical measures with quantifiable emission reduction results targeting at $PM_{2.5}$, have already been put in place and their potential impact included in the 2025 air quality assessments.

(b) Bolder assumptions on emission reduction in the PRD region

As said in paragraph 20 of Appendix 1, the PRD Region 2020 emission targets had to be adopted as the 2025 emissions in the 2025 air quality assessment, since official projection beyond 2020 is not available. There is no basis for us to make arbitrary assumptions beyond the latest official projection available at the moment.

(c) PM_{10} Concentration Trend

Higher PM_{10} levels were observed in the North Western New Territories and the highest annual PM_{10} concentrations measured by our monitoring network were observed at the Tuen Mun monitoring station in the past few years. The Tuen Mun monitoring station started operation in 2015. The measured annual PM_{10} concentrations have reduced from 45μg/m^3 in 2015 to 42μg/m^3 in 2018, with an averaged improvement of 1μg/m^3 per year. For indicative purposes only, even if we assume that the same improvement trend would continue to 2025, the projected annual PM_{10} concentration at Tuen Mun is estimated to reach 35μg/m^3 at 2025 at best.

Given the above reasons, EPD's professional assessment is that there is no scope to further tighten the annual AQO for PM_{10} to WHO IT-3.

SO_2

4. The Government has been making long and continuous efforts to cut

SO_2 from local emissions sources. For motor vehicles, we have been adopting the most stringent motor vehicle standards available worldwide, and since 2017, we have been progressively tightening the emission standards for motor vehicle fuels to Euro VI. For industrial and commercial fuels, we have also progressively tightened the fuel standards since 1990 and have adopted the ultra-low sulphur diesel since 2008.

5. For vessels, the Government introduced a regulation in 2014 capping the sulphur content of locally supplied marine light diesel at 0.05%. We also implemented a regulation from July 2015 requiring ocean-going vessels to switch to low-sulphur marine fuel (with sulphur content not exceeding 0.5%) while berthing in Hong Kong. And since January 2019, all vessels have been required to use compliant fuel (including low-sulphur fuel) within Hong Kong waters, irrespective of whether they are sailing or berthing.

6. For power plants, we impose caps on the emission from power plants and have been progressively tightening the caps on an annual basis. To meet the emission caps on SO_2 set by the EPD, power companies have adopted effective measures to reduce SO_2 emissions, such as increasing the use of natural gas in electricity generation, using low emission coals for coal-fired generating units, and retrofitting existing coal-units with flue-gas desulphurisation units.

7. As a result of the above measures, there has been significant reductions in SO_2 emissions. During 2010 to 2016, total emissions of SO_2 in Hong Kong have reduced by 51%, primarily owing to the emission reductions from power plants and vessels. Since 2010, the ambient concentration of SO_2 in Hong Kong have also reduced by 50%.

8. The WHO's guiding principle in setting the exceedance allowance is to avoid uncontrollable exceedance events[1], such as extreme weather. Unlike the case of particulate matters (PM) which are subject to strong regional influence[2], SO_2 is a more localized air pollutant and its concentrations measured are largely due to local emission sources especially power plants and vessels.

9. As a matter of principle, therefore, we do not consider it appropriate to tighten the AQO for daily SO_2 to WHO AQG by merely relaxing the allowable number of exceedance. We will continue to explore and implement measures, as those in paragraphs 4 - 6 above, to further reduce the SO_2 emissions from the two major emission sources, i.e. power plants and vessels

[1] WHO Air Quality Guidelines Chapter 8 and also see footnote 1 in Appendix 1.

[2] According to a study by Hong Kong University of Science and Technology commissioned by the EPD completed in 2012, around two-third of the PM measured in Hong Kong came from non-local sources.

with an ultimate goal to meet the WHO AQG.

Environmental Protection Department
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