LCQ13: Concentration of ozone in air

Following is a question by the Hon Kenneth Leung and a written reply by the Secretary for the Environment, Mr Wong Kam-sing, in the Legislative Council today (May 20):

Question:

For several consecutive days in April this year, the Air Quality Health Indexes recorded by the general and roadside air quality monitoring stations in various districts reached 8 or above (i.e. “Very High” or “Serious” health risk), with the 1-hour concentrations of ozone (O3) in some districts even exceeding 200µg/m3. Under the prevailing Air Quality Objectives (AQOs), the 8-hour average concentration limit of O3 in air is 160µg/m3, which is less stringent than that of 100µg/m3 as recommended by the World Health Organization. However, in the latest review of AQOs, the Government did not propose to tighten the AQO for O3 on the grounds that the regional background O3 level was relatively high and the various emission reduction measures would further reduce the emission of nitric oxide in the urban areas, thereby reducing the consumption of O3 in the urban areas. In this connection, will the Government inform this Council:

(1) of the measures in place at the present stage to lower the background O3 level in Hong Kong, and reduce the O3 produced locally and O3 which originated from the Mainland; the effectiveness of such measures; and

(2) as the authorities indicated at the end of 2019 that the Guangdong and Hong Kong sides had jointly launched in 2018 the Study on Post-2020 Regional Air Pollutant Emission Reduction Targets and Concentration Levels, of the latest progress of the Study; whether it will formulate emission reduction targets for O3 precursors; if so, of the details; if not, the reasons for that?

Reply:

President,

(1) The overall air quality in Hong Kong has shown a discernible improvement in recent years. According to the data recorded at the air quality monitoring stations of the Environmental Protection Department, the annual average concentrations of respirable suspended particles (PM10), fine suspended particles (PM2.5), nitrogen dioxide (NO2) and sulphur dioxide (SO2) in the ambient air and at roadside have dropped by about 30 per cent to 60 per cent between 2013 and 2019 (relevant data is set out in Annex 1). The above monitoring results reflect the effectiveness of the emission reduction measures implemented by the Government in recent years. However, the ozone concentration in the ambient air is still on a rise.

Ozone is a complicated air pollution issue as well as a regional issue. It is not directly emitted from pollution sources but formed by the

photochemical reaction between nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the presence of sunlight.

As Tap Mun air quality monitoring station is distant from the local emission sources, its monitoring results can reflect the regional background air pollution level. Between 2013 and 2019, the annual average concentration of ozone recorded at Tap Mun station increased from 75μg/m3 in 2013 to 80μg/m3 in 2019, with a rise of 7 per cent (relevant data is set out in Annex 2). During the same period, the average annual ozone concentrations recorded at the general and roadside monitoring stations increased respectively from 43μg/m3 and 14μg/m3 in 2013 to 60μg/m3 and 32μg/m3 in 2019, with a rise of 40 per cent and 129 per cent respectively.

Ozone can be scavenged by some pollutants (such as nitric oxide (NO)) in the ambient air via chemical reactions. The main reason for the higher rise of ozone concentrations in Hong Kong than the background level is attributed to the reduction in local NOx emissions from vehicles, resulting in less NO to react with and titrate ozone and hence more ozone remaining in the atmosphere and a larger increase in ozone concentrations measured. Nevertheless, since NOx and VOCs are ozone precursors, reducing NOx emissions will not only reduce the local NO2 levels but also help reduce the overall ozone levels and its exceedances in the region and Hong Kong in the long run.

The Environment Bureau has implemented a wide range of control measures focusing on local NOx and VOCs emission sources in recent years, including phasing out some 80 000 pre-Euro IV diesel commercial vehicles; strengthening the control of emissions of liquefied petroleum gas and petrol vehicles; tightening the vehicle emission standards and progressively tightening the emission caps of power plants, etc. Meanwhile, Guangdong and Hong Kong have been strengthening collaboration, including launching a number of emission reduction plans covering power plants, vehicles, vessels and industries under the framework of the Pearl River Delta Regional Air Quality Management Plan, to deal with regional air pollution. These measures to reduce NOx and VOCs emissions will help improve the ozone problem in the region in the long run.

In addition to the above policies being implemented, the SAR Government will continue to launch a number of new measures in the short to medium term to further reduce the local NOx and VOC emissions, including reducing vehicle emissions, promoting the use of electric vehicles and tightening the control of emissions from power plants (as detailed in Annex 3).

(2) In order to continuously improve the regional air quality, the Hong Kong and Guangdong Governments established a science team in 2018 to jointly conduct a study on post-2020 regional air pollutant emission reduction targets and concentration levels. The two Governments held a meeting every six months to discuss the compilation of emission inventories of air pollutants, formulate practical air quality improvement measures beyond 2020 for the two places, and conduct air quality modelling to predict the achievable air quality levels in the region.

The study will formulate the emission reduction targets for five major air pollutants up to 2030, including SO2, NOx, PM10, PM2.5 and VOCs. Among

these pollutants, NOx and VOCs are ozone precursors, hence reducing their emissions will help alleviate the ozone pollution problem. The two Governments are now taking forward the work in accordance with the timetable of the study agreed by both parties. The results of the study are expected to be announced in 2022.

In addition, the Governments of Guangdong, Hong Kong and Macao will launch a three-year joint study from 2020 to 2023 on Characterization of photochemical ozone formation, regional and super-regional transportation in the Greater Bay Area, in order to better apprehend the origins of ozone precursors, the formation mechanism of ozone and characteristics of its regional and super-regional transportation in the Greater Bay Area. The Hong Kong and Guangdong Governments are also adding the real-time VOCs monitoring in the regional air quality monitoring network by stages. These studies and enhanced monitoring will strengthen the understanding of the formation mechanism and sources of ozone in the region, and help further devise policies to tackle ozone pollution.