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14 December 2012
 (By fax 2840 0716)

Miss Mary SO
 Clerk, Public Accounts Committee
 Legislative Council Secretariat
 Legislative Council Complex
 1 Legislative Council Road
 Central, Hong Kong

Dear Miss SO

Public Accounts Committee
Consideration of Chapter 1 of the Director of Audit's Report No. 59
Monitoring and reporting of air quality

Thank you for your letter dated 7 December 2012 on the captioned.

Please find enclosed an information note to facilitate the Committee's further consideration of the captioned Chapter of the Audit Report. If you have any question, please feel free to contact me or our Mr. K.W. Fong at 2594 6412.

Yours sincerely,

(PANG Sik-wing)
 for Director of Environmental Protection

Encl. (13 pages)

c.c. Secretary for Financial Services and the Treasury (fax no. 2147 5239) w/encl.
 Director of Audit (fax no. 2583 9063) w/encl.

Public Accounts Committee
Consideration of Chapter 1 of the Director of Audit's Report No.59
Monitoring and Reporting of Air Quality

- (a) Reason(s) why the existing air quality objectives (“AQOs”) in Hong Kong, which were set in 1987, have never been revised;**

- (b) Reason(s) why no attempt has been made by the Environmental Protection Department to adopt the practices of the United States of America, the United Kingdom and the European Union to introduce new air quality standards for their air pollutants individually as referred to in paragraph 2.19 of the Audit Report;**

Hong Kong established its AQOs in 1987 by referencing United States Environmental Protection Agency (USEPA)'s then national ambient air quality standards (NAAQS), which were the most stringent air quality standards among advanced countries at the time. USEPA's assessments on the health and welfare impacts of air pollutants were the most detailed, comprehensive and in-depth. The NAAQS had been our reference until the World Health Organization (WHO) published its Air Quality Guidelines (AQG) for global application in 2006.

Since the establishment of the Hong Kong's AQOs in 1987, the USEPA did not propose tightening of their NAAQS until 1997. In 1997, the USEPA proposed to introduce new standards for PM_{2.5} and replace the 1-hour standard for ozone (O₃) with a new 8-hour standard for those states already in compliance with the 1-hour standard. The former was more relevant to Hong Kong because we were still striving to meet the 1-hour ozone standard here. Given these developments, the EPD formed a Working Group on the Health Effects of Air Pollution to review the AQOs, which first met in March 1997. The Working Group completed in July 1999 a report on health effects of air pollution with the conclusion that adopting more stringent objectives for sulphur dioxide (SO₂), respirable suspended particulates (PM₁₀), nitrogen dioxide (NO₂) and O₃ would provide reasonable targets for further protection of public health. The Working Group did not provide numerical target values for these pollutants. It also concluded that that PM_{2.5} was potentially of greatest importance. As US was the only place having put forward PM_{2.5} standards, we had to make reference to the US standards for setting ours.

After putting forward the proposed PM_{2.5} standards, the USEPA encountered a number of lawsuits challenging the adequacy of the proposal. After the settlement of these lawsuits, the USEPA eventually promulgated the final PM_{2.5} standards on 17 October 2006, keeping the rest of its standards in the NAAQS essentially unchanged.

While awaiting for the resolution of the lawsuits in the US, we were closely monitoring the progress of WHO in drafting its AQG. Around the time of USEPA's promulgation of the PM_{2.5} standards, the WHO published the AQG which provide comprehensive advice on how AQOs should be tightened and numerical targets for the pollutants. We had waited for these events to be clarified before taking further action because we regarded the USEPA and WHO standard-setting to be most authoritative.

We then commissioned the AQO Review Consultancy Study in mid-2007 with a view to revising our AQOs with reference to the WHO new guidelines and practices of advanced countries and developing a long-term air quality management strategy as soon as possible. Immediately after the completion of the AQO Review Consultancy Study, the Government consulted the public in July 2009 on a proposal to update the AQOs together with a package of 19 air quality improvement measures proposed by the Consultant. On 17 January 2012, the Government announced the adoption of the proposed new AQOs together with the package of 22 air quality improvement measures for achieving these new AQOs.

We aim to submit the Amendment Bill to LegCo in early 2013 to make the new AQOs statutory standards by 2014 and require the AQOs be reviewed at a frequency of no less than once every five years.

(c) Criteria under which the 2014 AQOs, as detailed in Appendix B to the Audit Report, are set.

When proposing the new AQOs, the AQO Review makes reference to:

- (i) the WHO AQGs and interim targets (ITs) on the major air pollutants,
- (ii) the local pollution concentration levels; as well as
- (iii) the feasibility of achieving the respective WHO AQGs or ITs in the foreseeable future, having regard to technological developments and local circumstances.

This approach is in line with the recommendation of the WHO's guideline that governments need to set their standards according to their own particular circumstances. Specifically, the WHO AQGs recommend that –

- (i) “the standards set in each country will vary according to specific approaches to balancing risks to health, technological feasibility, economic considerations and

other political and social factors”^[1] . The WHO further recommends that “in formulating policy targets, governments should consider their own local circumstances carefully before using the guidelines directly as legal standards”^[2]; and

- (ii) “given that air pollution levels in some countries often far exceed the recommended guideline levels, interim target levels are proposed, in excess of the guideline levels themselves, to promote steady progress towards meeting the WHO guidelines”^[3].

Out of the seven air pollutants in the new AQOs and the 12 average time measurements in the WHO AQG, we have already adopted the WHO AQGs for CO, Pb, NO₂ and SO₂ 10-minutes average concentration limit. Details are in Appendix B of the Audit report.

For CO and Pb, our previous control efforts have already reduced their emissions to such levels that we are already in compliance with the respective WHO AQGs.

As regards NO₂, the WHO does not provide Interim Targets, and this is a pollutant that presents significant challenges to Hong Kong, particularly at the roadside. Its concentration is largely contributed by our local sources though regional ozone also affect our NO₂ concentration levels. While it presents a major challenge to attain the ultimate AQG, where there is community support for decisive measures to reduce emission from major local sources, in particular, from commercial vehicles and together with regional collaboration to reduce O₃, we consider it feasible to attain the proposed standard in general at the ambient stations though there will remain certain local hotspots at the roadside. Further to the 22 measures, we would continue to strive for additional emission control measures to reduce NO₂.

As regards SO₂ (24 hours average time measurement), the WHO provides Interim Targets 1 and 2. We have adopted Interim Target 1 which is by no means a loose target as it is also being adopted by the advanced countries such as the European Union (EU). Hong Kong has already taken very strong actions to cut SO₂ emissions in past years, including the use of virtually sulphur free Euro V diesel as vehicular fuel, the use of ultra-low sulphur diesel across all industrial and commercial processes, retrofitting power plants with flue gas de-sulphurisation devices and continual tightening of SO₂

^[1] “WHO Air Quality Guidelines Global Update 2005” published in 2006, p.5.

^[2] “WHO Air Quality Guidelines Global Update 2005” published in 2006, p.6.

^[3] “WHO Air Quality Guidelines Global Update 2005” published in 2006, p.5.

emission cap of the power sector. Both ambient and roadside SO₂ are essentially the same as our background level observed at Tap Mun where it is free of any local emission sources.

The 10-minute SO₂ relates mainly to the direct and transient impingement of SO₂ emissions from major stationary fuel-combustion sources such as factories, power plants, etc. to their receptors in proximity. By reducing proactively the sulphur content of our fuel, we consider it practicable and necessary to achieve the ultimate WHO AQG of 500 µg/m³.

For PM, the air quality monitoring data and assessment by local academics show that the PM concentration in Hong Kong is subject to very strong regional influence. Widespread exceedances of the WHO AQGs for PM have been recorded even at Tap Mun where it is free of any local emission sources. Our PM measurement shows that Tap Mun has also significantly exceeded the standard tighter than the proposed ones (i.e., IT-3). It would be difficult to significantly bring down PM concentration levels in Hong Kong without an overall reduction of the concentration levels in the region as a whole. Taking this into account, we proposed adopting WHO IT-1 of 35 µg/m³ and 75 µg/m³ for annual and 24-hour PM_{2.5} respectively. With PM_{2.5} accounts for about 70% of PM₁₀ found in Hong Kong, it is proposed to tighten the annual and 24-hour PM₁₀ objectives from 55 µg/m³ and 180 µg/m³ to the WHO IT-2 of 50 µg/m³ and 100 µg/m³ respectively.

Same as PM, O₃ in Hong Kong is also strongly affected by regional air pollution. It is our major air pollutant of public health concern that is not in compliance with the current AQOs in the general ambient air of Hong Kong.

O₃ is not a pollutant directly emitted from man-made sources but formed by photochemical reactions of other primary pollutants such as NO_x and volatile organic compounds (VOCs) under sunlight. As it takes several hours for these photochemical reactions to take place, O₃ recorded locally could be attributed to VOC and nitrogen oxides (NO_x) emissions from places afar. It is appropriate to adopt the WHO IT-1 of 160 µg/m³ as the new AQO for O₃.

- (d) When and how the 22 air quality improvement measures referred to in Appendix C to the Audit Report would be taken forward to achieve the 2014 AQOs for each of the seven air pollutants.**

A progress report on the implementation of the 22 air quality improvement measures is at Annex 1.

(e) Estimated timeframe for Hong Kong to meet the Air Quality Guidelines issued in 2006 by the World Health Organization.

It is our long-term objective to fully achieve the ultimate WHO AQGs. At present, Hong Kong has already achieved the WHO AQGs for Pb and CO.

We are committed to implementing additional measures to further reduce local emissions and work with Guangdong Provincial Government to tackle regional air pollution in order to bring down the pollution levels.

On 23 November 2012, we announced jointly with Guangdong Environmental Protection Department a new emission reduction plan for the Pearl River Delta (PRD) Region, which sets air pollutant emission reduction targets for both Hong Kong and PRD Economic Zone up to 2020.

Our air quality projection shows that, upon attainment of the new emission reduction targets, we would be able to broadly achieve the WHO AQGs for NO₂ and 10-minute SO₂ at the ambient level by 2020. For other pollutant measurements, we would be able to broadly meet the new AQOs by 2020. Through our efforts on the local and regional fronts, we will move progressively towards the long term goals of achieving the WHO AQGs as soon as possible. As pledged in our proposal to adopt the new AQOs, we will review progress in our regular review at a frequency of no less than every five years.

(f) Public expenditure on improving air quality in Hong Kong as a percentage of Gross Domestic Product and how this compares with other major/world cities.

The expenditure incurred by EPD in financial year (FY) 2011-12 on air programme was about HK\$ 566 M, accounting for about 23% of the total expenditure of the EPD and 0.03% of the GDP of 2011.

Besides providing expenditure on air programmes, the Government has also supported various air quality improvement initiatives through revenue forgone and compliance by stakeholders concerned, such as:

- (i) Tax incentive for environment-friendly petrol private cars: HK\$ 633 million (FY 2011-12)
- (ii) Tax incentive for environment-friendly commercial vehicles: HK\$ 154 million (FY 2011-12)
- (iii) Fuel duty foregone for supporting the use of EURO V diesel with virtually no sulphur content: HK\$ 2,018 million (FY 2011-12)

It should also be noted that the public expenditure reflects only a fraction of the Government's efforts to clean up the air of Hong Kong. Most of the emission reduction efforts were made through the mandatory control programmes, e.g., the imposition of stringent emission caps on power sector, implementing various energy saving measures to reduce electricity demands, upgrading the emission limits on vehicles, tightening the fuel sulphur content of commercial/industrial diesel fuel, prohibition of the import and manufacture of commercial and consumers products with excessive volatile organic compound contents.

We do not have the information on the public expenditures of other countries/economies on tackling air pollution as the percentage of their respective GDP for comparison. As the air pollution issues encountered by different countries and their control strategies are different, it is very difficult to make comparisons with other countries/economies.

Update of Air Quality Improvement Measures

1. Emission Capping and Control

- (i) Increasing the ratio of natural gas in local electricity generation to 50% with additional emission abatement measures

Progress: We have tightened the statutory emission caps on the power plants with effect from 2015. To comply with the emission caps, the power sector will have to maximize the use of gas-fired generation units, thereby raising the ratio of natural gas in local electricity generation to 50%, and prioritize the use of coal-fired generation units equipped with advanced emission control devices.

The Technical Memorandum for power plants requires us to review the emission caps every two years. The Third Technical Memorandum was endorsed by the LegCo on 21 November 2012. It will further tighten the emission caps for power plants starting from 2017. We will continue to examine the scope for further tightening the emission caps in the light of the future fuel mix for the power sector and advancement in emission control technologies.

- (ii) Early retirement of aged / heavily polluting vehicles

Progress: We completed a subsidy scheme in March 2010 to encourage the early replacement of pre-Euro and Euro I diesel commercial vehicles. Under the scheme, 17,000 vehicles were replaced with our grants, representing about 30% of all eligible vehicles at the commencement of the scheme.

We launched another subsidy scheme for Euro II diesel commercial vehicles in July 2010. As at end October 2012, about 14% of the eligible owners took up the incentive and replaced their aged vehicles.

We are examining how to phase out these heavily polluting vehicles more effectively and will consult stakeholders when specific proposals have been drawn up.

- (iii) Earlier replacement of Euro III commercial diesel vehicles with models meeting latest Euro standards

Progress: The oldest batch of Euro III vehicles will be more than 10 years old by 2012. We will consider introducing suitable measures to

accelerate their replacement.

We are examining how to phase out these heavily polluting vehicles more effectively and will consult stakeholders when specific proposals have been drawn up.

- (iv) Wider use of hybrid / electric vehicles or other environment-friendly vehicles with similar performance

Progress: Government has launched incentive schemes through First Registration Tax (FRT) concession to encourage the use of electric vehicles (EVs), environment-friendly petrol private cars (including hybrid private cars) and environment-friendly commercial vehicles.

In respect of EVs, we have also been expanding the network of charging facilities and working closely with the manufacturers and dealers to encourage them to bring in their EVs into Hong Kong. As at August 2012, there are about 350 EVs in Hong Kong, increasing from 16 units in end 2009 and 74 in end 2010. The Government and the private sector have also jointly installed around 1,000 standard charging facilities all over the territory for public use.

There are currently 38 hybrid vehicle models available on the local market.

Up to end October 2012, we received about 43,300 applications for environment-friendly petrol private cars (which represented 20% of all private petrol cars newly registered from April 2007) and about 12,000 applications for environment-friendly commercial vehicles (which represented 41% of all commercial vehicles newly registered from April 2008).

As for franchised buses, the 2010-11 Policy Address announced the ultimate policy objective of having zero emission buses running across the territory. In this regard, additional requirements were included in the three bus franchises granted in April 2012 so that the bus companies concerned have to acquire the most environment-friendly buses that are technologically proven and commercially available when acquiring new buses in future, taking into account affordability of the companies and passengers. Similar requirements will be imposed on the three remaining bus franchises upon their expiry in 2016/17. Separately, Government has sought funding for franchised bus companies to procure six hybrid buses and 36 electric buses for trial to assess their performance in different conditions. We expect that the trial can start in 2014.

In addition, Government set up the \$300 million Pilot Green Transport Fund in March 2011 to encourage the transport sector to test out green and low-carbon transport technology (including hybrid/electric vehicles). Up to mid-November 2012, 37 applications were approved, which cover trials of electric buses, goods vehicles and taxis, and hybrid light buses and goods vehicles (amounting to a total subsidy of about \$87 million).

(v) Use of 0.05% sulphur diesel for local vessels

(Target to complete technical trial in Q1 2013 and, subject to findings of the trial, prepare legislation in mid 2013)

Progress: We completed a trial of local ferries using Ultra Low Sulphur Diesel (ULSD) (i.e., diesel with a maximum sulphur content of 0.005%) in August 2010. The trial confirmed the technical feasibility of ULSD as fuel for local ferries but there will be an increase in fuel cost largely due to the extra handling cost of providing ULSD to a very small number of local ferries. To reduce the cost implications and achieve greater environmental benefits, we have revised the proposal and are working with the local marine trades on a trial to ascertain the technical feasibility of reducing the sulphur content of marine light diesel sold in Hong Kong from the current maximum limit of 0.5% to 0.05%. The trial is expected to be completed in the first quarter of 2013. Subject to successful outcome of the trial, we plan to effect the reduced sulphur cap within 2013 at the earliest.

(vi) Measures to reduce nitrogen oxides emissions from Government vessels

Progress: Upon further evaluation, we have found that it would be more cost-effective to replace the existing engines with new ones that comply with the more stringent emission limits, particularly in respect of NOx. To ascertain the technical feasibility and better understand the technical implications, we are working on a trial to replace the existing engine of a government vessel and aim to commence the trial in the third quarter of 2013.

(vii) Electrification of aviation ground support equipment (GSE)

Progress: There are currently about 300 units of GSEs and vehicles running on electricity at the Hong Kong International Airport. To facilitate the use of electric GSEs and vehicles in the coming years, the Airport Authority has installed additional electric charging stations and put in place new vehicle purchase policy which favours the use of electric vehicles. The pace of GSE replacement would depend on factors such as the availability of electric alternatives, age and maintenance conditions of the GSE fleet, the financial position of operators and the business outlook.

(viii) Emission control for off-road vehicles / equipment

Progress: We have completed the stakeholders' consultation on our revised control proposal for imposing emission standards for newly imported non-road mobile machinery that will be used locally. We are preparing the necessary legislative amendments with a view to effecting the proposed control regime towards end 2013.

(ix) Strengthening volatile organic compounds (VOC) control

Progress: Legislation on tightened control has been fully implemented. The new statutory VOC content requirements of 14 types of vehicle refinishing paint, 36 types of vessel paint and pleasure craft paint and 47 types of adhesives and sealants have been implemented in phases with effect from 1 January 2010. The last phase came into operation on 1 April 2012.

2. Traffic Related Measures

(x) Low emission zones

Progress: We have identified three locations for establishing pilot low emission zones (LEZ) at the busy corridors in Causeway Bay, Central and Mong Kok. Starting from 2011, the franchised bus companies have accorded priority to the deployment of low-emission buses (i.e. those meeting the emission level of a Euro IV or above bus) to routes serving the pilot LEZs as far as possible. Our target is to have only low-emission buses in these zones by 2015.

(xi) Car-free zone / pedestrianisation scheme

Progress: Till September 2012, there are seven full-time pedestrian streets, 31 part-time pedestrian streets and over 40 traffic calming streets in Hong Kong. The introduction of further pedestrian streets will be increasingly challenging due to limited road space against competing needs and street management considerations. Our previous consultations with District Councils show that they have hesitations in further expanding the current pedestrianisation scheme. Some District Council members, however, are receptive to the option of adjusting the operation hours of the existing pedestrian streets to maximize the benefits of the scheme.

(xii) Bus route rationalization

Progress: It is an on-going plan of Transport Department (TD) to review the route development programmes (RDPs) of franchised bus operators each year and rationalization is one of the major areas that needs to be tackled in consultation with the affected District Councils. The objective is to balance the public demand for bus services, the need to improve road traffic and the environment. The Government will continue to work with the District Councils and the franchised bus companies to pursue bus route rationalization so as to reduce the number of bus trips and bus stopping particularly on busy corridors.

3. Infrastructure Development and Planning

(xiii) Expand rail network

Progress: Construction works have commenced for West Island Line, Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link, South Island Line (East), Kwun Tong Line Extension and Shatin to Central Link

(xiv) Develop cycle tracks in new development areas

Progress: The Government's long standing policy is to promote the use of public transport system as the main transport mode and to encourage the public to make use of the highly efficient mass transit transport systems and other public transport services. Due to safety considerations, the Government does not encourage the public to use bicycle as a transport mode in urban areas. Compared with urban areas, new towns in the New Territories or new development areas, where traffic density is relatively low, have better conditions for using bicycle for short-distance travel. Civil Engineering and Development Department (CEDD) is taking forward the development of a cycle track network in the New Territories by phased interconnection of the cycle tracks in various new towns between Ma On Shan, Sheung Shui, Yuen Long, Tuen Mun and Tsuen Wan. It is expected that the Sheung Shui – Ma On Shan section will be completed in 2013. CEDD has recently commenced detailed design and site investigation works for the proposed cycle track between Tsuen Wan and Ting Kau. For existing cycling facilities in new towns, TD commissioned a consultancy in May 2010 to carry out a study to examine measures to improve the existing cycle track networks and bicycle parking facilities. The study is expected to be completed by early 2013.

4. Energy Efficiency Measures

(xv) Mandatory implementation of the Building Energy Codes

Progress: The Buildings Energy Efficiency Ordinance was enacted and has taken full effect on 21 September 2012. We would continue to keep under review technological developments and tighten the efficiency standards where appropriate.

(xvi) Energy efficiency standards for domestic electrical appliances

Progress: The Energy Efficiency (Labelling of Products) Ordinance has been implemented to cover compact fluorescent bulbs, air-conditioning units, refrigerators, dehumidifiers and washing machines. We will continue to review the scope of the products under the Ordinance.

(xvii) Light-emitting diode (LED) or equivalent alternatives for traffic signal / street lighting

Progress: Replacement of all conventional traffic signal at 1,800 road junctions with LED light is underway and the works are expected to be completed by end 2012. Trial schemes of LED street lights for minor roads and light tubes at roadside and on footbridges are in progress to assess their cost/benefit and suitability in Hong Kong's outdoor environment. Their performance and cost-effectiveness will be reviewed after completion of the trial in 2012/13.

(xviii) Tree planting / skyrise greening

Progress: Government has all along been promoting active planting and new greening technologies such as skyrise greening (roof greening and vertical greening) for government premises. Development Bureau will continue to formulate and promulgate standards, guidelines and best practices related to greening, landscape planning and design and tree management; and carry out public education and community involvement activities to enhance public awareness of greening, landscape and tree management issues.

(xix) District cooling system for Kai Tak Development

Progress: Construction works are underway for Phases I and II of the district cooling system for Kai Tak Development. Phase III of the district cooling system will be subject to the progress and development programme of the Kai Tak Development.

5. Measures outside the AQOs Review

(xx) Retrofit Euro II and III franchised buses with selective catalytic reduction (SCR)

devices to reduce their NOx emissions

Progress: Government and franchised bus companies commenced a trial in September 2011 to retrofit Euro II and III buses with SCR to reduce their nitrogen oxides emissions. Together with the diesel particulate filters already installed on the buses, this could upgrade the emission performance of the buses to the level of Euro IV bus or above. Subject to satisfactory trial results, Government will fully fund the retrofit of the devices on Euro II and III buses.

- (xxi) Introduce a more stringent regime to control emissions from LPG and petrol vehicles through remote sensing equipment and dynamometer tests

Progress: We completed the stakeholders' consultation in January 2012 and reported the findings to LegCo in February 2012 with a view to implementing the tightened control regime towards 2014. We are now making preparation to help owners of LPG taxis and light buses to replace the catalytic converters in their vehicles with a one-off subsidy to improve their emission performance. The replacement could commence in July 2013 and would take about 9 months. Immediately after its completion, we will deploy remote sensing equipment to catch those LPG or petrol vehicles emitting excessively for repair by their owners.

- (xxii) Reduce emissions from the marine sector by adopting cleaner fuels for local vessels, requiring ocean-going vessels (OGVs) to switch to cleaner fuels while berthing at PRD ports and setting up an Emission Control Area (ECA) in PRD waters over the longer term.

Progress: We are discussing the proposals with the governments of Guangdong, Shenzhen and Macao.