

Subcommittee on Improving Air Quality

Responses to the Follow-up Actions

Arising from the Discussion at the Meeting on 4 January 2010

- (1) **To advise how the 2010 emission reduction targets can be achieved given that the emission level of sulphur dioxide is way behind schedule. To also advise the consequences in the event of failure to achieve the 2010 emission reduction targets.**

We are confident of achieving fully the 2010 emission reduction targets. As shown in the following table, the emissions of nitrogen oxides (NO_x), respirable suspended particulates (RSP) and volatile organic compounds (VOC) have been reduced to an extent close to or even exceeding the emission reduction targets –

	Emission Level in 1997 (Tonnes)	Emission Level in 2008 (Tonnes)	Change in Emission Level during 1997-2008¹	Emission Reduction Target for 2010
Sulphur dioxide	66 200	57 436	-13%	-40%
Nitrogen oxides	124 000	88 040	-29%	-20%
Respirable Suspended Particulates	11 500	5 290	-54%	-55%
Volatile Organic Compounds	68 800	34 400	-50%	-55%

As for sulphur dioxide (SO₂), the power generation sector is the major emission source accounting for nearly 90% of the local emissions. To achieve the 2010 emission reduction target for SO₂, we have imposed in the specified licences of the power plants stringent emission caps such that from 2010, the total SO₂ emissions of the power generation sector will not exceed

¹ The percentage changes in emission levels between 1997 and 2008 are preliminary figures because the emission figures for 2008 are being finalized.

25,120 tonnes a year. Should any power company breach the respective emission cap, it would be liable, upon first conviction, to a fine of \$30,000 in respect of each tonne of excessive emission; and on a second or subsequent conviction, to a fine of \$60,000 for each tonne of excessive emission and to imprisonment for 6 months, as prescribed in section 30B(1) of the Air Pollution Control Ordinance (Cap. 311). Moreover, under the Scheme of Control Agreement, the power company's permitted rate of return could be reduced by 0.2 or 0.4 percentage points for emitting more pollutants than permitted.

In response, the two power companies have been undertaking the following SO₂ abatement measures to fulfill the statutory emission requirements –

China Light & Power Company Limited (CLP)

CLP is retrofitting its four 677 MW coal-fired generating units with flue gas desulphurization (FGD) facilities, two of which will be completed in 2010 with the rest in 2011. The FGD facilities can remove some 90% of the SO₂ emissions from the coal-fired generating units. In addition, CLP will increase the use of ultra low sulphur coal and natural gas for power generation in 2010 for meeting the emission caps.

The Hongkong Electric Company Limited (HEC)

HEC has been retrofitting three more coal-fired generating units (two units of 350 MW and one unit of 250 MW) with FGD facilities. The retrofit for one of the 350 MW coal-fired generation units was completed and the FGD facility has been in operation since July 2009. The remaining retrofit will be completed in mid-2010. Besides, HEC will also increase the use of natural gas for power generation to reduce the SO₂ emission in 2010.

The above abatement efforts will by 2010 deliver the required emission reduction for fulfilling the 2010 emission reduction target for SO₂.

- (2) To review and enhance the supporting infrastructure, such as increase the number of liquefied petroleum gas (LPG) filling stations along the routes of public light buses (PLBs), to encourage the remaining 39% of diesel PLBs to switch to LPG.**

The majority of PLBs operate along specific routes in urban areas. Owing to safety concerns, it is difficult to find in urban areas suitable sites to provide more LPG refilling. Thus, some of the PLB routes do not have LPG refilling facilities nearby. For this reason, the Government has not stipulated the use of LPG vehicles for PLBs whereas such stipulation has been made for taxis.

To make the refilling more convenient for LPG vehicles, the Government has a standing policy to include LPG refilling facilities in all new land sales for petrol filling stations, subject to safety requirements being met. These new land sales include also existing petrol filling station sites that are due for re-tender. As a result of this policy, since 2000, 16 petrol-cum-LPG filling stations have been set up on new sites and 31 existing petrol filling stations have also been added with LPG refilling facilities.

- (3) To re-consider subsidizing the early replacement of more polluting franchised bus fleets so that the cost incurred will not be transferred to the public through increase of bus fare.**

At present, franchised bus companies have already committed to using buses below 18 years old for their franchised bus services. Based on the age distribution of the existing franchised buses, it is anticipated that all the pre-Euro and Euro I buses will retire by 2012 and 2015 respectively; and Euro II buses by 2019.

We have been in discussion with the bus companies to explore ways to expedite the replacement of franchised buses. However, when consider using public money to subsidize the bus companies to accelerate their bus replacement programme, we have to carefully balance the effectiveness of reducing road side pollution on one hand and the cost-effectiveness of utilizing public money and the potential impact on bus fares on the other. We will continue to discuss with the bus companies to explore various options to

reduce the emissions of their fleets. In parallel, the Financial Secretary has proposed in his recent Budget Speech to set up a \$300 million Pilot Green Transport Fund for application initially by public transport operators, including bus companies, to try out green transport technologies to reduce roadside pollution. We will continue to seek collaboration with the franchised bus companies to explore possible opportunity to reduce bus emissions through bus route rationalisation and deploying more clean buses to serve the busy corridors. We are consulting the District Councils on these proposals.

- (4) To provide a paper setting out the causes to low visibility, and the impacts of respirable suspended particulates (RSP) on public health. To also include in the paper on whether the Administration will advise the public to wear face masks in days of low visibility, and whether the face masks available can act as a filter for RSP.**

Please refer to the paper at Annex.

- (5) To consider increasing the licence fees for non-commercial motor vehicles with cylinders exceeding certain cubic centimeters.**

We have been implementing “Tax Incentives for Environment-friendly Petrol Private Cars” from 1 April 2007 to encourage the use of environment-friendly petrol private cars with low emissions and high fuel efficiency. At present, there are 39 environment-friendly car models and about 12% newly registered cars are environment-friendly cars.

Private cars having larger engine cylinders are already required to pay higher annual licence fees. For instance, the annual licence fee of a petrol private car with an engine cylinder over 4,500 c.c. is almost three times that of a petrol private car with an engine cylinder not more than 1,500 c.c. A breakdown of the annual licence fee and distribution of petrol private cars by engine cylinder capacity is given in Table 1. The table also shows that over 70% of the petrol private car fleet have an engine cylinder size not exceeding 2,500 c.c.

Table 1. Annual licence fee and distribution of petrol private cars with various engine cylinder capacities (As at 31 December 2009)

Engine Cylinder Capacity (in c.c.)	Annual licence fee (HK\$)	No. of licenced petrol private cars	% in the licenced petrol private car fleet
0 - 1500	3,929	92,651	24%
1501 - 2500	5,794	189,361	48%
2501 - 3500	7,664	83,035	21%
3501 - 4500	9,534	13,724	4%
Above 4500	11,329	12,579	3%

(6) To advise the existing policy on electric motorcycles.

It is the Government's policy to promote the use of electric vehicles, including electric motorcycles. All newly registered electric vehicles including motorcycles are waived from paying the first registration tax. Electric vehicles complying with the requirements of the Road Traffic Ordinance can be registered in Hong Kong. As at end of December 2009, there were 5 registered electric motorcycles in Hong Kong. In this year's budget, we also propose to accelerate the tax deduction for capital expenditure on environmental-friendly vehicles, including electric vehicles. Enterprises can enjoy 100 percent profits tax deduction in the first year under the proposal. This will encourage the business sector to purchase more electric vehicles, including electric motorcycles. As regards the use of electric motorcycles by the Government, the Police have introduced ten electric motorcycles into its fleet for trial.

Causes of Reduced Visibility and Impacts of Respirable Suspended Particulates on Public Health

This paper provides information on the causes of reduced visibility, the health impacts of respirable suspended particulates (RSP) and the effectiveness of face masks in guarding against such impacts.

Causes of Reduced visibility

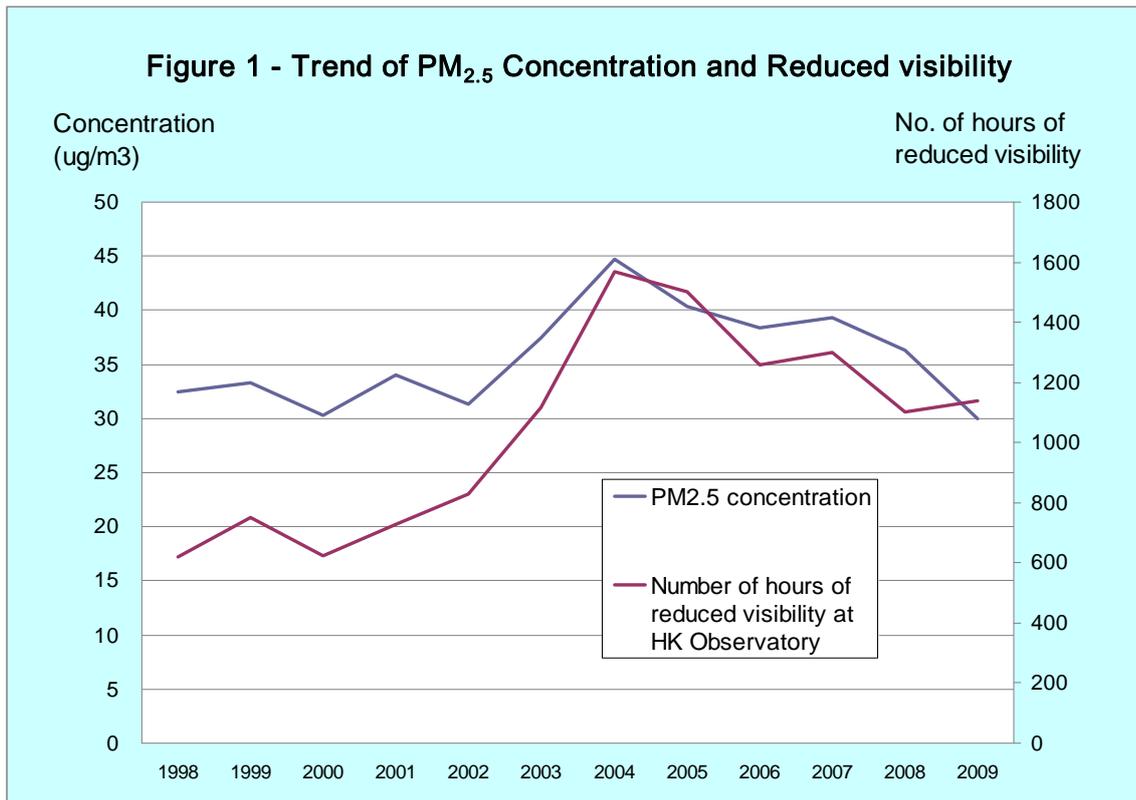
2. In simple terms, visibility is a measure of the greatest distance at which an object can be clearly seen. Visibility can be reduced by air pollution or high humidity or both because fine particulates and water droplets in the form of fog, mist or rain can absorb or scatter the light. Normally, reduced visibility refers to a visibility of less than 8 km. According to the World Meteorological Organization, reduced visibility will be caused primarily by air pollution if relative humidity does not exceed 80%. In studying the trends of reduced visibility incidents, we have however discounted only those incidents caused exclusively by meteorological phenomena (i.e., fog, mist or precipitation or relative humidity being at or above 95%) even though high humidity might have a part to play in some of the remaining incidents. Table 1 gives a breakdown of the reduced visibility incidents in 2008, which shows that both the meteorology and air pollution are major causes of low visibility in Hong Kong.

Mainly caused by meteorological factors (<i>visibility less than 8 km, with fog, mist or rain, or relative humidity at 95% or above</i>)	Mainly caused by air pollution (<i>visibility less than 8 km, without fog, mist or rain; and relative humidity at 80% or less</i>)	Due to combined effect of air pollution and high humidity (<i>visibility less than 8 km, without fog, mist or rain, and relative humidity above 80% but less than 95%</i>)	Total
1,017 hours	712 hours	388 hours	2,117 hours
48%	34%	18%	100%
Note : Based on the above, there were 1,100 hours of reduced visibility (i.e. 712 hours plus 388 hours) in 2008 that were mainly or partly caused by air pollution.			

Trend of Visibility

3. Over the last decade, the annual numbers of hours of reduced visibility as measured at the Hong Kong Observatory Headquarters were on the rise until 2004. Since then, such hours have been reduced by nearly 30% as shown in Figure 1. This trend correlates well with that of the ambient concentrations of fine suspended particulates (PM_{2.5})², a major air pollutant causing reduced visibility, which is also shown in the figure. The improved visibility since 2004 is due to a large measure our joint efforts with the Guangdong Provincial Government to reduce the emissions of air pollutants including particulates in the Pearl River Delta region for meeting the emission reduction targets for 2010.

² The ambient PM_{2.5} concentrations were measured at the general air quality monitoring stations at Tsuen Wan, Tung Chung, Yuen Long and Tap Mun.



Health Effects of Respirable Suspended Particulates (RSP)

4. Suspended particulates are solid particles and liquid particles suspended in the air. These particles are made up of various components such as sulphates, nitrates, organic chemicals, elemental carbon, metals, soil and dust, etc. They come either from natural sources such as the sea (wind-blown sea-salt) and soil (wind-blown soil particles) or from man-made sources such as electricity generation, diesel vehicle exhausts, construction activities and factories. Some particulates are emitted directly from pollution sources while others are formed by further reactions of gaseous air pollutants (such as sulphur dioxide and nitrogen oxides) to form fine particulates (such as sulphates and nitrates) after emission into the atmosphere.

5. Particulates can be categorized according to their size – aerodynamic diameter. Respirable suspended particulates (RSP) (or PM₁₀) are those suspended particulates of aerodynamic diameter smaller than 10 micrometres (μm) and they have the ability to penetrate deeply into the lungs. RSP includes both coarse particles (i.e. of particle size between 2.5 and 10 μm) and fine particles (i.e. particle size smaller than 2.5 μm), which are often called fine suspended particulates (FSP)

or PM_{2.5}. The latter have higher health impacts since, when inhaled, they can penetrate deeper into the lungs.

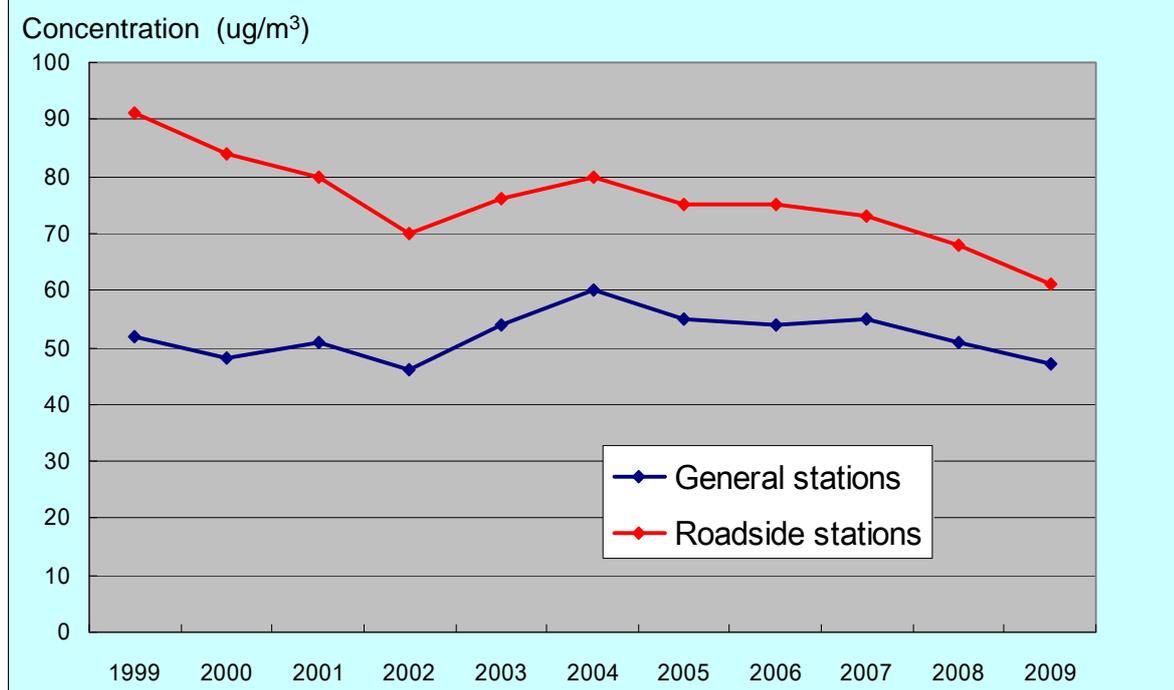
6. Overseas and local studies have shown that exposure to RSP including FSP (referred collectively as particulate matters) would cause adverse health effects predominantly to the respiratory and cardiovascular system, including decreasing lung function, developing chronic bronchitis, increasing respiratory symptoms such as irritation of the airway, coughing or difficulty in breathing, aggravating asthma, adverse effects on the cardiovascular system such as irregular heartbeat, and even premature death.

7. In general, all population can be affected by particulate matters, but people with heart or lung diseases, the elderly and the young are more susceptible to the adverse health effect especially when they are under physical exertions because physical exercises or activities cause people to breathe faster and more deeply and hence to take more particulate matters into their lungs.

Trends of RSP in Hong Kong

8. We have made significant progress in reducing the levels of RSP in Hong Kong and hence its impact on the health of the public. Figure 2 below shows the annual averages of RSP at the general (ambient) stations and roadside stations over the last decade. The roadside RSP concentration has been on a discernible downward trend since 1999, thanks to the implementation of various vehicle emission control measures such as the LPG taxis/light bus incentive programmes, the introduction of ultra low sulphur diesel (ULSD), the incentive programme to retrofit old diesel vehicles with particulate removal devices, the stepped-up smoky vehicle control programme and higher penalty for smoky vehicles, the tightening of vehicle emission standard to Euro IV, etc. As compared with 1999, the roadside RSP level was reduced by 33% in 2009. In the ambient air, the RSP concentration rose in 2003 and 2004 due to the influence of regional air pollution but the worsening trend has been reversed afterwards as a result of the control measures taken by the Guangdong Provincial Government in recent years, such as the implementation of flue gas desulphurization programme for the power sector, phasing out highly-polluting facilities, the introduction of cleaner motor vehicle fuels and standards, etc.

Figure 2 – Trends of RSP concentrations in Hong Kong



Can Face Masks Act as a Filter for RSP and Whether the Administration will Advise Public to Wear Face Masks in Days of Low Visibility?

9. When the level of air pollution is high, we suggest that people sensitive to air pollution, including those with heart or lung diseases, the elderly and the young, should reduce physical exertion. Common types of face masks are not effective means to filter RSP. People may need to seek the advice of doctors as to whether they are suitable to wear certain types of special masks as they could be uncomfortable and require greater effort of breathing.

**Environmental Protection Department
March 2010**