

COUNCIL FOR SUSTAINABLE DEVELOPMENT
STRATEGY SUB-COMMITTEE

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Strategy and Programme for Improving Air Quality in Hong Kong

Purpose

This paper informs Members of the current strategy and programme for improving the air quality in Hong Kong.

Air Pollution in Hong Kong

2. At present, Hong Kong is confronted with two different types of air pollution, namely, roadside pollution caused by local vehicles and regional air pollution. Different strategies are required to control these two types of problem.

Roadside Pollution

3. The road traffic density of Hong Kong is among the highest in the world. There are about 530,000 vehicles in Hong Kong but the total road length is about only 1,900 km, i.e., there are on average 275 vehicles per km. About one-fourth of these vehicles use diesel fuel, which is relatively more polluting, and they contribute to about half of the vehicle mileage in Hong Kong. Owing to the high density of buildings, pollutants cannot be dispersed effectively on our streets. As a result, large quantities of respirable suspended particulates (RSP) and nitrogen oxides (NO_x) accumulate at the roadside.

Regional Air Pollution

4. The industrial and commercial operations in the Pearl River Delta (PRD) region are a major source of air pollution. The pollutants generated by these activities have an adverse impact on the air quality of the whole region. Under sunlight, these pollutants undergo photochemical reactions to form ozone and smog. The regional smog problem is especially serious when weak northerly wind prevails in the South China area or when the region is under the influence of subsiding air at the periphery of a typhoon. The ambient air pollutants in the PRD region cannot be dispersed effectively under such meteorological conditions.

5. With the economic development in Guangdong and the growing affluence of its residents, the number of vehicles in the province doubled from 1.15 million in 1995 to 2.31 million in 2002. In addition, since Euro II emission standards have only just been introduced on the Mainland, the regional pollution problem caused by vehicular emissions is a major concern.

Co-operation between Hong Kong and Guangdong

6. The Environmental Protection Department (EPD) and the Guangdong Environmental Protection Bureau (GDEPB) conducted a joint study on regional air quality during 1999-2002. The aim of the study was to analyse the relative significance of different industrial and commercial sources of pollution and their direct and indirect impacts on regional air quality so that air pollution control measures could be prioritized. The study involved: quantifying the emissions of pollutants over an area of 42,800 km² in the PRD, collecting air samples and evaluating the regional distribution of air pollutants and changes.

7. The study assumed that the economy, population, electricity demand and vehicle mileage in the PRD Region would grow by 150%, 20%, 130% and 180% respectively from 1997 to 2010. In terms of total emissions, Hong Kong accounts for about 5% to 20% of regional air pollution while the PRD Economic Zone of the Mainland accounts for 80% to 95%. With continued growth in the PRD, it would not be possible to mitigate effectively the extensive air pollution in the region even if the two governments continued to implement existing improvement measures. The study also pointed out that we must control the total emissions of pollutants in order to address regional air pollution.

8. In April 2002, the SAR Government and the Guangdong Provincial Government jointly agreed to reduce, on a best endeavour basis, the emission levels of four major air pollutants: sulphur dioxide (SO₂), NO_x, RSP and volatile organic compounds (VOC) by 40%, 20%, 55% and 55% respectively by 2010, using 1997 as the base year. Achieving these targets would enable Hong Kong to meet its air quality objectives (AQOs) and would significantly improve the air quality of the PRD, relieving the regional smog problem.

9. In December 2003, the two governments jointly drew up the PRD Regional Air Quality Management Plan (the "Management Plan") with a view to meeting the emission reduction targets. The PRD Air Quality Management and Monitoring Special Panel was set up under the Hong Kong/Guangdong Joint Working Group on Sustainable Development and Environmental Protection to follow up on the tasks under the Management Plan. A regional air quality monitoring network is now being tested and will begin full operation within this year to provide comprehensive and accurate air quality data.

Emission Reduction Measures in Hong Kong

10. Air pollution is at the top of the Government's environmental agenda. Since 1999, we have –

- (a) Replaced diesel taxis with liquefied petroleum gas (LPG) taxis;
- (b) Provided financial incentives for light buses to switch to LPG or electric vehicles;
- (c) Introduced ultra low sulphur diesel (ULSD) and upgraded the statutory petrol standard to Euro IV;
- (d) Made it mandatory for all pre-Euro light diesel vehicles to retrofit particulate removal devices, and have provided incentives to heavy diesel vehicles to do the same;
- (e) Tightened emission standards for new vehicles to Euro III;
- (f) More than doubled the fines for smoky vehicles to \$1,000 and stepped up enforcement;
- (g) Required power plants to maximize the use of natural gas;
- (h) Required power companies to install desulphurization and de-NO_x facilities to reduce SO₂ and NO_x emissions; and
- (i) Required the installation of vapour recovery systems for fuel unloading and refuelling at petrol stations.

11. As a result of measures implemented in recent years, Hong Kong has achieved progress in reducing the total emissions of NO_x, RSP and VOC. For SO₂, however, much of this effort has been nullified by increased emissions from local power plants. Details are in the table below –

	Emission Level in 1997 (tonnes)	Emission Level in 2003 (tonnes)	Changes in Emission Level during 1997-2003	Reduction Target for 2010
SO ₂	64,500	90,900	+41%	-40%
NO _x	110,000	96,600	-12%	-20%
RSP	11,200	7,380	-34%	-55%
VOC	54,400	41,800	-23%	-55%

In 2003, power plants accounted for about 92%, 57% and 46% respectively of the total emissions of SO₂, NO_x, and RSP in Hong Kong. Details are set out below -

Sources	Share of total emissions in 2003 (%)			
	SO ₂	NO _x	RSP	VOC
Power Generation 92.2		57.2	45.9	0.9
Road Transport	0.1	20.8	28.4	16.8
Navigation	4.0	15.7	6.2	0.7
Civil Aviation 0.2		3.3	0.6	0.8
Other Fuel Combustion	3.5	3.0	3.2	0.3
Non-combustion	-	-	15.7	80.5
Total	100	100	100	100
Total Emission (Tonnes)	90,900	96,600	7,380	41,800

12. The emission trends of the two local power companies between 1997 and 2003 are further detailed below –

CLP (tonnes)	1997	1998	1999	2000	2001	2002	2003	Changes in Emission Level from 1997-2003
SO ₂	30,734	37,728	24,405	29,725	30,455	26,851	51,059	+66%
NO _x	39,414	40,796	26,510	28,022	22,347	23,476	38,202	-3%
RSP	2,572	2,679	1,643	1,910	1,011	1,223	1,697	-34%

HEC (tonnes)	1997	1998	1999	2000	2001	2002	2003	Changes in Emission Level from 1997-2003
SO ₂	23,700	23,233	23,346	27,035	28,767	33,274	32,765	+38%
NO _x	16,670	14,434	15,234	15,571	15,973	16,523	17,018	+2%
RSP	1,175	1,167	1,147	1,714	1,394	1,445	1,686	+43%

13. Road Transport is the second major source of emissions, accounting for about 21%, 28%, 17% of total NO_x, RSP, and VOC respectively in 2003. It accounts for an insignificant amount (0.1%) of total SO₂ emissions. Compared with 1997, vehicular emissions of SO₂, NO_x, RSP and VOC in Hong Kong have been reduced by 93%, 35%, 60% and 46% respectively by the end of 2003.

14. Between 1999 and 2004, the RSP and NO_x levels at roadsides dropped by 9% and 24% respectively. The number of smoky vehicles also dropped by nearly 80%. However, the concentrations of RSP recorded at the general air monitoring stations increased by 15% from 1999 to 2004, whereas those of ozone increased by 26% during the same period. Clearly, Hong Kong's air quality is increasingly affected by regional air pollution.

15. To achieve the 2010 emission reduction targets, the following measures are being pursued by the Government –

- (a) Tightening the motor petrol standard to Euro IV with effect from 1 January 2005;
- (b) Requiring the installation of vapour recovery systems for vehicle refuelling at petrol filling stations from 31 March 2005;
- (c) Introducing Euro IV emission standards for newly registered vehicles by 2006;
- (d) Requiring power companies to reduce emissions and increase the use of natural gas in electricity generation;
- (e) Working on a scheme to control VOC emissions from selected products; and
- (f) Working with GDEPB on an emissions trading pilot scheme covering power plants in Hong Kong and PRD, with a view to submitting a study report to the two governments by mid-2006 and presenting the details of the pilot scheme to the power plants in Hong Kong and PRD in the third quarter of 2006.

Emission Reduction Measures in Guangdong

16. The Guangdong Provincial Government has committed to pursue the following measures –

- (a) Construction of four large natural gas power plants, which are expected to be commissioned in phases from 2006, together with natural gas trunk pipelines to supply cities in the PRD;
- (b) Retrofitting of flue gas desulphurization (FGD) systems to all generation units above 125MW in existing power plants. When

these projects are completed by 2007, SO₂ emissions will be reduced by 225,000 tonnes annually. FGD retrofitting has been completed at 5 plants, and work has started on the 11 remaining power plants;

- (c) Installation of low-NOX burners (LNB). By 2010, all existing thermal power plants will be retrofitted with LNBs;
- (d) Phasing out of highly polluting coal-fired boilers and industrial furnaces – those that remain in operation will be required to use clean fuel, to install FGD and to adopt NOX control measures to reduce emissions;
- (e) Phasing out of industrial processes and facilities with high SO₂ and dust emissions; and
- (f) Introduction of motor diesel with sulphur content less than 500 ppm, which started in 2004. Newly registered motor vehicles have had to comply with China II (equivalent to Euro II) standards from July 2005. Guangdong will require newly registered motor vehicles to comply with China III (equivalent to Euro III) standards in 2006 and will study the feasibility of adopting Euro IV and Euro V equivalent standards for light-duty and heavy-duty vehicles respectively by 2010.

Conclusions

17. We have made progress in recent years in reducing local vehicle emissions. Further, the Hong Kong and Guangdong governments have also made some progress in the implementation of the Management Plan. However, the air quality of the PRD region will only improve significantly when all the control measures are fully implemented.

**Environmental Protection Department
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