

**Friends of the Earth (Hong Kong)**  
**Position Paper on**  
**Air Pollution in Hong Kong**

**Full Paper**

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**Acknowledgement**

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**1. The Issue: Air Pollution in Hong Kong**

*Background*

Air pollution has been a long-standing challenge for Hong Kong.

Back in the 1980s, there were serious concerns over the emission of high levels of sulphur dioxide in local industrial districts such as Kwai Chung, as a result of the burning of high sulphur content industrial diesel fuel. (PELB, 1989; Leung, 2001) It prompted the Hong Kong Government to regulate industrial fuel's sulphur content in 1990, and successfully slashed sulphur dioxide pollution to low levels (EFB, 2001), leading to significant health gains. (Wong, et.al., 1998; Hedley, 2002)

Since the 1990s, air pollution in Hong Kong has added a new regional dimension. The Pearl River Delta (PRD) of Guangdong Province, Hong Kong's immediate neighbour and traditional hinterland, has fast developed into 'the factory of the world'. One of the drivers of such tremendous growth was the investment and entrepreneurship coming from Hong Kong and the subsequent relocation of Hong Kong's industrial base to the PRD. Economic and industrial growth, coupled with rapid urbanization, led to the escalating demands for fuels, energy and infrastructure. The intensified use of fuel (in many cases low quality ones) in the power, manufacturing and transport sectors contributed significantly to the rising emission of air pollutants (such as sulphur dioxide, particulate matters, and nitrogen oxides), as well as the formation of smog that envelopes much of the PRD, including Hong Kong. To a large extent, Hong Kong people have benefited financially from the economic boom in the PRD, at the expense of clean air and good health.

Though, however significant the impact of regional air pollution has become on Hong Kong over the last two decades, local air pollution mainly from coal-fired power plants and road diesel vehicles, and increasingly from marine vessels and port-related activities, remains very much part of the problem which needs to be addressed irrespective of the pollution produced across the border.

#### *Air Pollution Sources*

In terms of the total emissions of the three major pollutants (SO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10</sub>) in Hong Kong during the period between 1990 and 2007, both SO<sub>2</sub> and NO<sub>x</sub> were roughly halved from 138,000 to 68,100 tonnes and from 188,000 to 97,200 tonnes, respectively, whereas PM<sub>10</sub> was reduced by about 55% from 12,600 to 5,640 tonnes. (Table 1) Among the major sectors, significant cuts were made across the three pollutants in the power sector. The transport sector also achieved a 95% reduction in SO<sub>2</sub> emissions, through the gradual tightening of emission standards and the introduction of ultra low sulphur diesel (ULSD) for the road fleet. The marine sector and the civil aviation sector, on the other hand, have recorded a slow, rising trend for all three pollutants. In 2007 in terms of the share of emissions by sector, the power sector remained the major contributor of SO<sub>2</sub> (89%), NO<sub>x</sub> (46%) and PM<sub>10</sub> (28%) emissions. The road transport sector came first in PM<sub>10</sub> (30%) and second in NO<sub>x</sub> (21.5%) emissions. The marine sector contributed 5.5% of SO<sub>2</sub> emissions, 15.5% of NO<sub>x</sub> emissions, and 7.4% of PM<sub>10</sub> emissions.

**Table 1: Total Emissions in Hong Kong, 1990 and 2007 (tonnes)**

Source	Sulphur Dioxide		Nitrogen Oxides		Particulate Matters	
	1990	2007	1990	2007	1990	2007
<b>Power Generation</b>	118,000	60,400	136,000	44,800	5,190	1,600
<b>Road Transport</b>	8,750	475	26,800	20,900	4,660	1,680
<b>Marine</b>	1,900	3,670	8,210	15,100	259	416
<b>Civil Aviation</b>	121	308	2,090	5,350	23	23
<b>Other Fuel Combustion</b>	9,390	3,300	15,100	11,000	1,810	1,180
<b>Non-combustion</b>	N/A	N/A	N/A	N/A	619	734
<b>Total</b>	138,000	68,100	188,000	97,200	12,600	5,640

Source: HKEPD *Hong Kong Air Pollutant Emission Inventory*

([http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission\\_inve.html](http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html))

When Hong Kong and the PRD (but not Macau) are considered together, between 85% and almost 99% of emissions of this combined region (depending on which air pollutant) were emitted from sources in the PRD in 2003. (Table 2) This is hardly surprising given the size and population of the PRD and its huge industrial base relative to Hong Kong. While Hong Kong's total air pollutant emissions are put into shadow in the regional context, it is important to note that not all the pollutants emitted from across the border will contribute to Hong Kong's air pollution levels. The extent of such impact will be determined by factors such as wind flow patterns and distance from emission sources.

**Table 2: Total Emissions in Hong Kong and the PRD, 1997 and 2003 ('000 tonnes)**

Pollutant	Region	1997 Emission	2003 Emission	Percentage Change in Emission
SO <sub>2</sub>	Hong Kong	65.9	91.8	+39%
	The PRD	732.5	745.2	+2%
	Total	798.3	837.0	+5%
NO <sub>x</sub>	Hong Kong	123.3	110.9	-10%
	The PRD	632.9	647.9	+2%
	Total	756.2	758.8	+0%
PM <sub>10</sub>	Hong Kong	11.4	7.1	-38%
	The PRD	519.5	525.7	+1%
	Total	530.9	532.7	+0%
VOC	Hong Kong	68.9	44.3	-36%
	The PRD	400.9	473.0	+18%
	Total	469.7	517.3	+10%

Source: HKEPD and Guangdong EPB (2007). *Mid-term Review of the Pearl River Delta Regional Air Quality Management Plan*, December 2007.

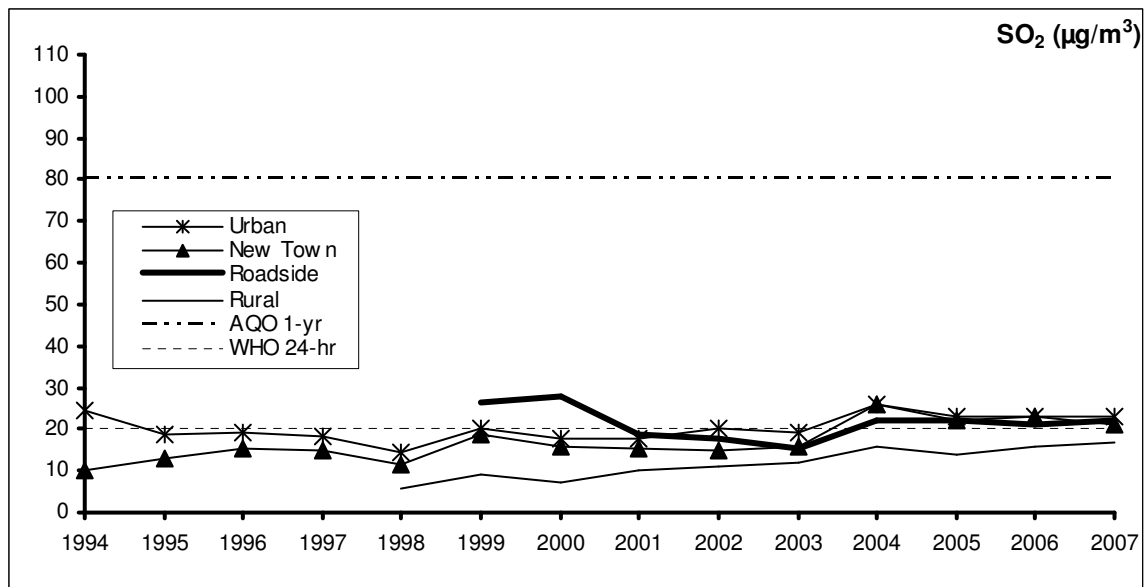
In 2006, a source apportionment study was conducted to analyze chemically speciated data collected at various air monitoring stations in Hong Kong. (Yuan, et.al., 2006) Based on the unique chemical signatures of air pollutants coming from different sources, the study concluded that on average regional sources from the PRD accounted for roughly 60% of the pollution in Hong Kong. In winter, the percentage would rise to 70%.

A first-of-its-kind, time-based study was completed in 2007 by the Hong Kong University of Science and Technology, to determine the number of days out of a calendar year when Hong Kong's air quality was dominated by local or regional source. (Lau, et.al, 2007) Results showed that in 2006, Hong Kong was affected mainly by regional sources on 132 days (or 36% of the time) and by local sources (power plant, road vehicles and marine source) on 192 days (53%). The findings were significant, as it showed that Hong Kong people were exposed to local pollution a longer period of time over a year, hence measures that target local emissions would greatly reduce people's exposure time to air toxics and the health risks associated with them.

## Air Quality Trends

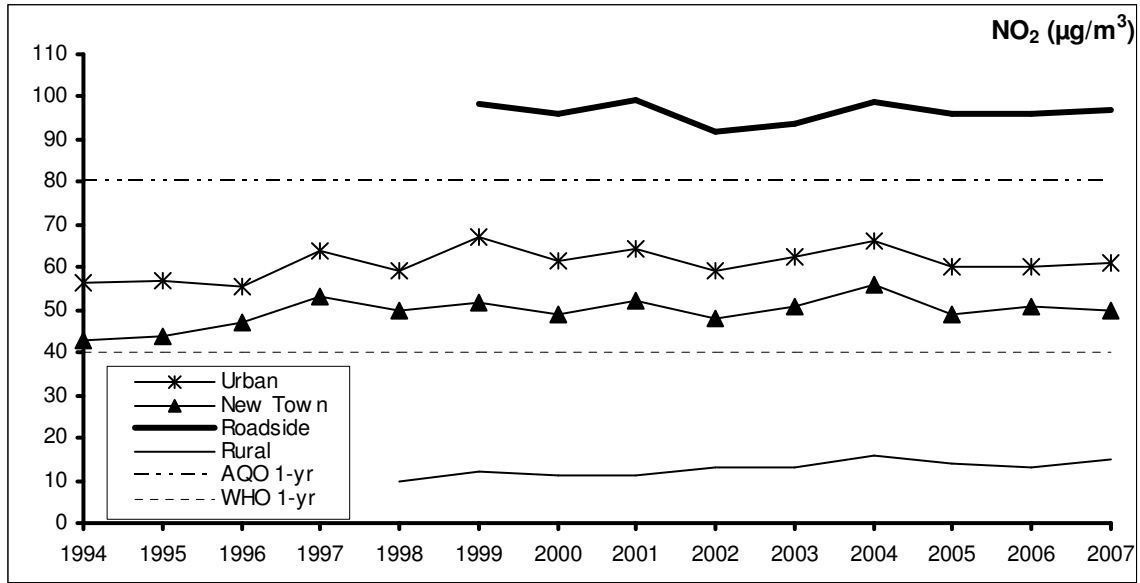
While apparently most of the major air pollution sources (like power plant and road transport) have come a long way in reducing total emissions in quantity, over the years Hong Kong's air quality has been far from satisfactory. Figures 1 to 3 plot the long-term trends of SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub> annual mean concentration between 1994 and 2007 by major types of monitoring station. First, it is plain to see that most of the trends are fairly flat over the period, without any noticeable improvement in air quality measurements. Second, a subtle, rising trend is emerging for all three pollutants at the rural station in Tap Mun, Hong Kong's background station, reflecting a growing negative impact of regional air pollution on Hong Kong's ambient air quality. Third, it is disturbing that SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub> annual concentrations at the roadside, which is close to where many Hong Kong people live and work, are higher than those of the general stations. NO<sub>2</sub> and PM<sub>10</sub> roadside concentrations were non-compliant with Hong Kong's one-year air quality objective since day one. Indeed, they were over twice and four times as high as the health-based air quality annual guidelines recommended by the World Health Organization (WHO) for NO<sub>2</sub> and PM<sub>10</sub>, respectively. In this respect, it is fair to say that air pollution arising from the road transport sector, among others, poses by far the greatest public health risk to Hong Kong people on a daily basis.

**Figure 1: SO<sub>2</sub> annual mean concentration in Hong Kong, 1994-2007**



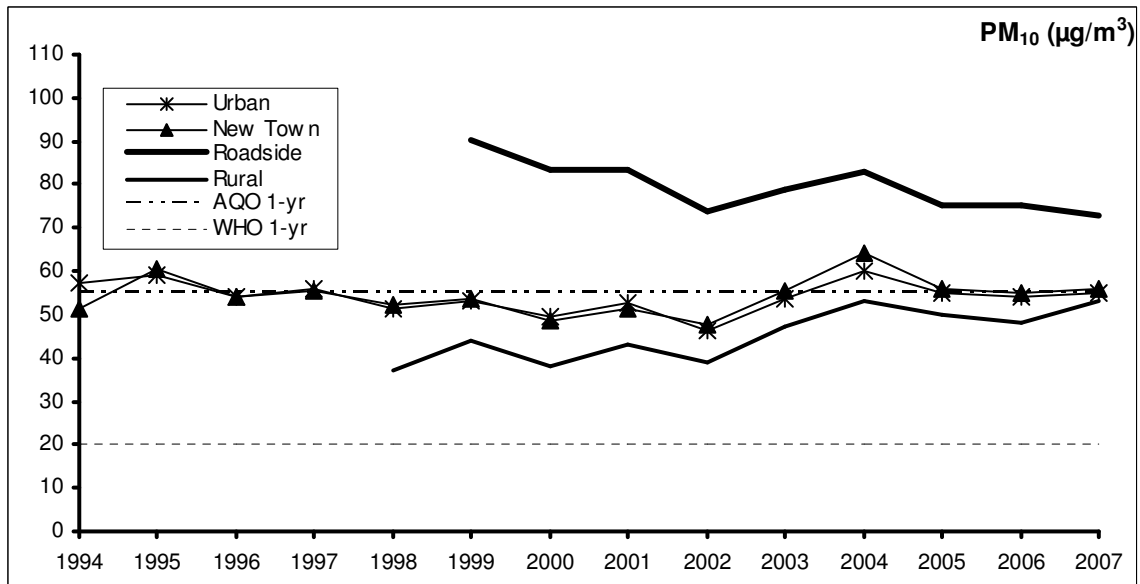
Sources: Environment Protection Department. (various years) *Air Quality in Hong Kong*; Census and Statistics Department, (various years) *Hong Kong Annual Digest of Statistics*.

**Figure 2: NO<sub>2</sub> annual mean concentration in Hong Kong, 1994-2007**



Sources: Environment Protection Department. (various years) *Air Quality in Hong Kong*; Census and Statistics Department, (various years) *Hong Kong Annual Digest of Statistics*.

**Figure 3: PM<sub>10</sub> annual mean concentration in Hong Kong, 1994-2007**



Sources: Environment Protection Department. (various years) *Air Quality in Hong Kong*; Census and Statistics Department, (various years) *Hong Kong Annual Digest of Statistics*.

### *Adverse Health Effects*

In general, air pollution puts a heavy disease burden on Hong Kong people, causing acute and long-term damage to health. Health effects of air pollution on people are determined by a number of factors, such as the type of air pollutant, the length of time of exposure, pollutant concentration, and health condition of individuals. Common health complaints associated with poor air include chronic and acute bronchitis, pneumonia, asthma, heart attacks and strokes. Groups that are especially sensitive or most at risk to the adverse health effects of air pollution include pregnant women (and their wombs), young children, the elderly, and those with pre-existing heart and respiratory illnesses (such as coronary heart and cardiovascular diseases, asthma, and chronic obstructive pulmonary diseases). Even a slight increase in air pollution level for a short period of time may trigger or exacerbate illness among the most vulnerable. (WHO, 2003; WHO, 2005)

Laboratory studies and population surveys have provided evidence of adverse health effects of air pollution. Depending on the severity of health detriment, people would look for primary medical care, hospitalization and specialist care, while the seriously ill would die prematurely. However, this is just the tip of an iceberg of a problem. There are other undiagnosed harms due to air pollution that carry unmeasured significance, which is probably affecting an even broader population.

### *Costs of Air Pollution in Hong Kong*

In 2006, a joint study by the Hong Kong University of Hong Kong, the Chinese University of Hong Kong, and the Hong Kong University of Science Technology provided an assessment of the annual costs to society of exceedances of air pollutants over the WHO air quality guidelines. (Hedley, et.al, 2006; Hedley, et.al, 2008) It was estimated that Hong Kong's poor air is costing the community over HK\$20 billion a year. By lowering Hong Kong's air pollution to levels close to WHO's recommendations, Hong Kong would avoid each year 1,600 premature death, 64,000 hospital bed days, and 6.8 million doctor visits. In monetary terms, estimated tangible savings in health care costs would be in the order of HK\$1.5 billion, plus HK\$0.5 billion in productivity savings and avoided intangible costs (people's willingness to pay to avoid a day of respiratory symptoms and hospitalization for a serious illness and the value of lives lost) of up to HK\$19 billion per year.

Based on a similar methodology, the Hedley Environmental Index estimated that air pollution in 2008 alone has cost Hong Kong \$2.3 billion, 1,155 premature deaths, 81,023 hospital bed days, and 7.25 million doctor visits.

Apart from the health-related costs, air pollution is also eroding Hong Kong's competitive edge over other Asian cities, in terms of attracting and retaining multi-national corporations, foreign investors and tourists. (Loh, 2006b; Merrill Lynch, 2006) These costs are difficult to estimate, but significant to our economy.

### *Legislation and Administration Gaps*

The Air Pollution Control Ordinance (APCO, Cap 311 of the Law of Hong Kong) is the principal law for managing air quality in Hong Kong, with regulations covering specific areas related to air pollution, such as motor vehicle fuel and emissions, asbestos control, construction dust, and industrial emissions.

However, unlike the air pollution control legislation in most parts of the world that put an emphasis on protection of public health, Hong Kong's APCO has taken a nuisance-based approach towards air pollution, which means air pollution will only be addressed if it causes a nuisance, health-related or not, and triggers a complaint. The apparent downside of the latter approach is that the legislation tends to be reactive, and it does not address the long-term, incremental impact of air pollution on public health. (Da Roza, 2009)

Under the APCO, the Secretary for the Environment is required to establish Air Quality Objectives (AQOs) for Hong Kong. However, the Ordinance does not explicitly connect the setting of AQOs with the objective of preventing emissions prejudicial to health. The Health Department, who is responsible for the protection of public health, is not involved in the setting of standards. Worse still, there is no legal requirement for the government to achieve the AQOs within a certain time limit, to hold relevant government agencies or bureaux accountable for not achieving them, to review and update Hong Kong's AQOs, and to make external reference to WHO guidelines and the most recent research on air pollution and health. (Da Roza, 2009) As a consequence, Hong Kong's current non-health-based AQOs were set up back in 1987 and were largely inadequate to protect the public from bad air. (AQOCCG, 2006; AQOCCG, 2007)

Due to pressure from the medical community and civil society, the Hong Kong Government began to review the AQOs for the first time in 2007. (EPD, 2006a) Preliminary findings from the consultancy study were discussed in the Legislative Council and in an open public forum in March 2009, and the process will continue into the rest of the year. (EPD, 2009a) It is disappointing, though not unexpected, that the Government is adopting the lowest WHO Interim Target (that is IT-1) as the new AQOs for most of the air pollutants. (EPD, 2009b) IT-2 is recommended only if IT-1 of a certain pollutant is lower than Hong Kong's current standard for that pollutant (like PM<sub>10</sub>). WHO's full standard is selected for a few pollutants only because there are no interim targets. Unfortunately, the new AQOs shall provide no meaningful improvement on our current standards. They merely serve as a stark reminder of how the Government is only interested in adopting standards that are considered achievable, rather than standards that duly protect the health of the public.

### *Communication Gaps*

The current tool in Hong Kong for communicating air pollution information to the public is the Air Pollution Index (API). API is calculated based on Hong Kong's AQOs, which were established in 1987 under the APCO and have never been revised since then. An

API of 100 or below means that pollution levels are in compliance with Hong Kong's short-term AQOs over a 24-hour period. However, as Hong Kong's AQOs are outdated and lax relative to the most updated standards in say the European Union and the WHO guidelines (which is health-based), the API value tends to be lower, hence misleading the public about the real level of air pollution. It also does not communicate air pollution-related health risk, short-term or long-term, to the members of the public. Misinformation could be harmful to those who rely on the API to decide on whether or not to engage in outdoor activities on a particular day.

There is also the issue of timeliness of API reporting in case of an air pollution episode caused by a sudden surge of PM. PM measurement is averaged over a 24-hour period, while other pollutants are measured by a shorter averaging time (like 1-hour average or 8-hour average), because there is a lack of scientific evidence about the exposure-response relationship for PM over a 1-hour period. As a result, when PM is the dominant pollutant, Hong Kong's API system will not be responsive enough to indicate a sudden surge of PM concentration, because PM sub-index is based on a 24-hour average. A time lag between the rise in PM concentration at the monitoring station and the rise in API values will have a delaying impact on the issuance of health warnings to population about an impending air pollution episode, thus putting the population at risk.

Last, but not least, even it is well known that PM<sub>2.5</sub> is more lethal in causing health problems than particles of a large size, (Zhang, 2005; Pope & Dockery, 2006) Hong Kong at present does not have an air quality objective for PM<sub>2.5</sub>, and PM<sub>2.5</sub> readings or measurements are not part of the API calculation or reporting system. Hong Kong people should have the rights to know the level of PM<sub>2.5</sub> pollution, as well as an appropriate standard to protect them against this harmful pollutant.

### *Policy Gaps*

The Hong Kong Government has put in enormous efforts and resources over the last 10 to 15 years to combat air pollution. (Trunbull, 2007; EPD, 2008) While the emissions of certain air pollutants have been reduced significantly (such as SO<sub>2</sub> emissions from the road transport sector), the overall air quality picture remains fairly doomed. Air quality at the roadside is alarmingly unhealthy. It is obvious that current committed measures are falling short of reversing the deteriorating air quality trend, and determined and expedient efforts are required to make profound improvements.

One of the shortcomings of previous pollution control strategies was that the Hong Kong Government seldom related air pollution with public health, (Loh, 2006a; AQOCCG, 2006) and used the protection of public health as the driver for air quality policies, even though the connection between air pollution and public health is well established and widely acknowledged. Sticking with the same old AQOs for over 20 years that do not reflect the latest known health risks is a prime example for such a failure. It is demoralizing that the government always gives priorities to the interest of business, trade and industry, but only pays lip service to protecting the health of Hong Kong people against filthy air.

There is also a lack of a comprehensive air quality management strategy that tackles multi-source air pollution problems with a long-term and holistic approach. (Loh & Ng, 2005; Loh, 2006a) Piecemeal approach and end-of-pipe measures favoured by the Government tend to have limited and short-lived impacts as shown in past. Hong Kong needs a strategy that goes beyond cleaning-up at the tail pipes – the cleaner the energy we use, the less the emission; the more efficient we use the energy, the less the emission; the less energy we use, the less the emission. The strategy would involve emission prevention at source, and resource (energy) use management. It would require supports from the government, the private sectors, as well as from individuals. It would also require cross-border co-operation and cross-department co-ordination.

One of the ways to influence people's consumption behaviour (for both natural resources and manufactured goods) is through pricing and costing. When it comes to the distribution of the costs of air pollution control in society, the government has been fairly inconsistent in adopting the polluter pays principle amongst different sectors. (Leverett, et.al, 2007) The idea of polluter pays principle is to internalize the cost of pollution, hence polluters will think twice about cost implication before he pollutes, or he will have to reduce pollution. However, as polluters in some sectors can still get away from compensating their polluting act, whereas the community has to shoulder a significant portion of the external costs of air pollution, people get confused as to whether they should support the principle when it applies to them. This is a classic case of government failure.

### *Public Opinion*

The government should know all too well about public opinion as a two-edged sword. In implementing environmental policies in particular, it is something you want to be on your side.

A recently conducted public opinion survey on air pollution, environment and public health concluded that public concern about air pollution rose dramatically between 2001 and 2008. (DeGolyer, 2008) 54% of the survey respondents considered air pollution a major environmental concern in 2008, upped from 49% in 2001. Besides, 81% of the respondents demanded the government to give priority to tackling the problem of air pollution, compared to 62% in 2001. Survey findings also showed that Hong Kong people believe air pollution makes Hong Kong an undesirable place to work for both locals and prospective international talent, and air pollution is damaging their quality of life.

Other public consultation exercises not only reflect the rising public awareness and concerns over air pollution, but also witness a newly found willingness of Hong Kong people to sacrifice oneself to a certain extent, in order to breathe cleaner air and to live a better quality life. For example, the Council for Sustainable Development (CSD) engaged the public in 2007 to seeking views on ways to achieve better air quality in Hong Kong. Road pricing was one of the three selected topics for public discussion. (CSD, 2007)

After the engagement process, it was reported that “over three quarters of stakeholders agreed that some increase in transport cost was acceptable in return for cleaner air”. (CSD, 2008) It is a strong indication that Hong Kong people are ready to pull their weight behind the government in strategies that would bring clean air to Hong Kong, even those that might involve paying a higher cost, or those as controversial as road pricing scheme.

Is it not a green light for the government to clean up?

### *Climate Change and Co-benefits*

It is important to consider air pollution control strategies in conjunction with their impact on global climate change and greenhouse gas (GHG) emissions for a number of reasons. Firstly, some measures that help reduce local or regional emissions may also have a beneficial impact on GHG emissions. Such measures that offer “co-benefits” would be superior to an alternative at the same cost that only reduce air pollution or GHG emissions but not both. Secondly, there will be options that reduce air pollution but at the same time directly or indirectly produce undesirable environmental impact, such as increase in GHG emissions. In other words, it is unwise for the government to formulate its air quality management strategy in isolation from its climate change policy. The government has to make informed decision in light of deteriorating air quality and changing climate.

## 2. FoE's Position on Air Pollution in Hong Kong

(a) *Friends of the Earth (Hong Kong) urges the Hong Kong Government to immediately adopt the full WHO air quality guidelines as the new air quality standards for Hong Kong, with mandatory review of the standards carried out once every five years to consider the latest research findings about the health effects of air pollution.*

Counter views: The Hong Kong Government argued back in July 2006 that the full WHO recommended guidelines are too stringent for Hong Kong. (EPD, 2006a) The Government explained that the guidelines could not be met even at Tap Mun (Hong Kong's background air quality monitoring station), implying that even if all emissions in Hong Kong were to be completely wiped out, the new WHO guidelines still may not be met. Therefore, drastic measures will have to be taken in Hong Kong, as well as in the PRD, and those measures will be costly and will have far reaching impact on policy areas including energy, transportation, industrial production, urban planning, conservation and people's way of life. (EPD, 2006a)

The Hong Kong Government also reiterated that WHO advises individual governments to carefully consider local circumstances when using the WHO air quality guidelines, as air quality standards to be set in each country will vary according to country-specific approaches in balancing public health risks, technological feasibility, and other socio-economic considerations. (EPD, 2006a)

FoE agrees that WHO's air quality guidelines are much more stringent than Hong Kong's current AQOs, and it will have to be achieved over a period of time through a well-thought, comprehensive, long-term air quality management plan, coupled with sustained commitment and support from the government, the private sector, and the community. However, FoE disapproves government's attempt to lower public expectation with respect to Hong Kong's ability to attain good air quality by playing negative even before public consultation has begun. The remark about Tap Mun is likely to be seen as a harsh reminder that even the air in Tap Mun is bad, rather than an easy excuse to not taking up the responsibility to clean up. In fact, FoE argues that with plentiful financial resources and technological capability, Hong Kong is in a much better position to enhance public health protection from air pollution over a relatively short period of time than many other cities that are as badly polluted. While control measures could be costly, allowing unhealthy levels of air pollution to continue would impose even greater economic and financial cost on society.

Hong Kong Government's assertion that the WHO has reminded individual jurisdictions to consider local circumstances while setting air quality standards has been taken out of context. The original statement made in the WHO document says that "national standards will vary according to the approach adopted for balancing health risks, technological feasibility, economic considerations and various other political and social factors, which in turn will depend on, among other things, the level of development and national

capability in air quality management. The guideline values recommended by WHO acknowledge this heterogeneity and, in particular, recognize that when formulating policy targets, governments should consider their own local circumstances carefully before adopting the guidelines directly as legally based standards". (WHO, 2006) In other words, the setting of an appropriate air quality standard should be determined by the level of development and capability in air quality management, and with that Hong Kong has no excuse to opt for a lower standard, such as IT-1. In essence, FoE argues that Hong Kong should aim for a higher standard to drive air quality improvement and protection of public health, rather than to content with a standard that is more achievable.

*(b) Friends of the Earth (Hong Kong) maintains that there is still a lot to be done in curbing local emissions; emission prevention at source and resource use management and minimization should be preferred over end-of-pipe cleaning and treatment.*

Counter views: Given the far greater quantity of air pollutants emitted from across the border (see page 2), there are arguments within Hong Kong that very little can be done locally to reduce air pollution in Hong Kong. Particularly, the Hong Kong Government has already implemented a long list of air pollution control measures in different sectors over the last ten years, but air pollution levels are still high. It therefore shows that Hong Kong's air pollution is in fact imported from the PRD. Hong Kong's air quality will improve, only if the PRD takes the lead in regulating and controlling emissions.

Even when local air pollution was tackled, it was mostly done through tailpipe solutions. End-of-pipe solutions are popular and the preferred options because very often they are less expensive and improvement (emission reduction) can be achieved over a relatively short period of time. Most importantly, end-of-pipe solutions do not interfere with current practice and do not demand a change in behaviour, thus avoiding potential conflicts with institutions or people who are reluctant to change.

FoE agrees that regional co-operation is one of the keys for a successful air quality management strategy. It is important that the PRD keeps its environmental regulation, control measures and enforcement efforts up to speed with its economic development. However, it is wrong to put all the blame on the PRD. First, it is already explained earlier that not all the regional pollution produced in the PRD, despite its large quantity, will end up in Hong Kong and have a significant impact on Hong Kong's ambient air. Second, many of the polluting factories are owned and managed by Hong Kong entrepreneurs, and in this respect Hong Kong still owns part of the responsibility to clean up. (Barron, et.al., 2006)

On the other hand, the 2007 HKUST study showed that Hong Kong's air pollution was dominated by local sources over half of the time. (Lau, et.al, 2007) In other words, reducing emissions from local power plants, road vehicles and marine vessels would at

least clean up some 192 days in a year (based on analysis of 2006 data). This is a vast improvement in terms of air quality, the health of Hong Kong people, and quality of life in general. There will be enormous social benefits associated with it, such as savings in health care costs, and less frequent doctor visits.

More importantly, most of the solutions involved in cleaning up the local sources are within Hong Kong's own control, which means control measures can be formulated and implemented within a reasonable time scale. We can also choose from the toolbox measures that bring long-lasting impact, rather than a quick fix.

FoE accepts that end-of-pipe solutions could be effective, and in some cases necessary, in reducing emissions over the short term. However, tail-pipe solutions should not be taken as replacement for long term measures that tackle the root of the problem. Very often, the underlying cause of air pollution lies with over consumption and/or inefficient use of energy resources, other than the use of sub-standard fuels or machines. In other words, to solve the problem we need better technologies *plus* a new mindset with respect to energy use.

Given we are depleting our energy resources at an alarming rate, and we are facing the wrath of global warming and climate change in the near future, FoE feels the urgent need to promote responsible and sustainable urban living in Hong Kong – one that encompasses sustainable city planning, green construction, clean production, and sensible consumption, as against the modern, consumerist society we are now in that emphasizes convenience over conservation, mobility over accessibility, and build at all cost over smart growth.

This is going to be a gradual, long term process for all the stakeholders – the government, the private sector and ordinary citizens – to understand the need for a change in the ways we build our city, expand our economy and live our lives, to realize the benefits and co-benefits brought by such change (and the costs of taking a business-as-usual approach), and to actually put sustainable development and sustainable living into everyday practice. But without a doubt, this is slowly taking shape in Hong Kong – consider the growing support behind any energy saving campaigns in recent time, or the movement in sustainable building practice, or people's willingness to pay more for cleaner transport. FoE believes Hong Kong people are willing to adjust their lifestyle for a better world, and are ready to stand up and be counted.

*(c) Friends of the Earth (Hong Kong) believes that regional air pollution remains a serious problem, which requires a strong working relationship and long term commitment between the HKSAR government and the Guangdong authorities to make greater improvement.*

Counter views: Monitoring results of the Pearl River Delta Regional Air Quality Monitoring Network (PRD RAQMN) showed that air quality has improved as the 2008 annual average concentration of sulphur dioxide and respirable suspended particulates in the region decreased by 19% and 11%

respectively as compared to the 2007 levels (GDEMC and EPD, 2009). The Mid-term Review of the Pearl River Delta Regional Air Quality Management Plan also concluded that with the current and committed measures in Hong Kong and the enhanced control measures in Guangdong, the regional as a whole will meet the 2010 emission reduction targets by cutting SO<sub>2</sub>, NO<sub>x</sub>, RSP and volatile organic compounds (VOC) by 40%, 20%, 55% and 55% respectively from the 1997 levels (EPD and EPB, 2007).

There is no doubt committed measures like the closing down of small-scale coal-fired thermal power generating units, installation of flue gas desulfurization systems at power plants, and the tightening of fuel standards are making positive impacts in reducing air pollutant emissions in Guangdong. However, there is still some way to go before regional air quality will eventually come good and safe to breathe.

In 2008, a study conducted by leading health, science and public policy experts in Hong Kong revealed that based on 2006 data, 10,000 annual death, 440,000 annual hospital bed-days, and 11 million annual outpatient visits in the PRD region were attributable to poor regional air quality. Health-related monetary costs of PRD's air pollution amount to RMB 6.7 billion a year (Loh, et.al., 2008). It was also explained that while monitoring results of the PRD RAQMN showed improvement in some pollutants in terms of their annual average concentrations across the entire monitoring network, for individual stations there were still large number of exceedences in national standards. In industrial area like Foshan, for example, annual PM<sub>10</sub> levels were a few hundred percent above WHO's recommended guidelines (Loh, et.al, 2008), posing a serious threat to the well-being of the people.

Therefore, the 2010 joint emission reduction targets, whether it will be achieved or not, should be taken as just the beginning, rather than the end of a long term partnership in regional air quality management between Hong Kong and Guangdong. It is encouraging and absolutely vital that the Hong Kong Government and the Guangdong authorities are already taking steps to consider post-2010 actions for tackling regional air pollution, like the promotion of energy efficiency and cleaner production in industries. On top of that, FoE calls for serious action against other major, but overlooked, regional emission sources, such as marine vessels and port-related activities. FoE also urges both governments to set new, challenging emission targets and drive improvement through tighter standards, complementary policies and a strong enforcement mechanism, rather than doing so on a best endeavour basis.

### 3. FoE's Recommendations

#### (A) Overarching Goals:

- (i) Adopt full WHO air quality guidelines as Hong Kong's air quality standards to protect public health, which is the basic protection that every single Hong Kong citizen deserved.
  - ◆ The new air quality standards should also include a mandatory review mechanism and a new standard for PM<sub>2.5</sub>.
  - ◆ Health Department should be involved in the AQO review mechanism to making sure that health-related considerations would always command top priority over cost and finance considerations.
- (ii) Implement a new health-based API system, based on the new air quality standards, for the effective communication of air pollution information and pollution-related health risks to the population.
  - ◆ Given our compact urban setting and concentration of activities at street level, communication of roadside air quality is extremely important here in Hong Kong. The Government should take every opportunity to expand the coverage of the current air quality monitoring network – locations like the container port and airport sites, congested traffic corridors, the recently built new towns, and densely populated old urban centres would be welcomed additions.
  - ◆ The monitoring of PM<sub>2.5</sub> should be extended to more stations. PM<sub>2.5</sub> readings could be used to devise a better air quality management plan that tackles fine particulates, and to raise public awareness about such a harmful pollutant.
- (iii) Set clear targets for Hong Kong in terms of energy saving and GHG reduction
  - ◆ Set specific targets as drivers for different sectors, such as power generation, manufacturing, transport, logistics, building construction and design, as well as property management. The government should also work closely with the various sectors in moving forward with necessary regulations and practical measures in achieving the targets. For example, the imminent mandatory implementation of the Building Energy Codes would help improving energy efficiency and conservation in Hong Kong's buildings.
  - ◆ Engage the community in energy saving and conservation, through education programmes and public-awareness campaigns organized by the government and non-government organizations. Extend the mandatory Energy Efficiency Labelling Scheme to products other than room air conditioners, refrigerating appliances and compact fluorescent lamps, to further facilitate the public in choosing energy efficient products.

(B) Road Transport:

- (i) Devise an overall plan to reduce traffic emission (including greenhouse gas) and to cut transport sector energy use, in order to improve roadside air quality and to reduce the sector's carbon footprint. This plan should include, but not limited to, the following:
  - ◆ Promote the use of low-emission, low-carbon and energy-efficient vehicles, not only amongst private vehicle owners, but also public transport operators, and other commercial vehicle owners
  - ◆ Provide concessions in first registration tax (RFT) and annual licence fee (ALF) for environmentally friendly vehicles, with RFT and ALF determined by emission standard and energy efficiency of the vehicle, rather than by vehicle class. This would provide incentives for drivers and operators to switch to cleaner vehicles.
  - ◆ Set a timetable for the phasing out of all pre-Euro, Euro I, and Euro II diesel and petrol vehicles, including both private and commercial vehicles.
- (ii) Diesel commercial vehicles, like buses and goods vehicles, are the major contributors to traffic emission, accounting for 90% and 80% of the total emission of PM<sub>10</sub> and NO<sub>x</sub> respectively from the vehicular fleet, (EPD, 2006b). Specific measures have to be taken to target the most polluting mobile source on the road.
  - ◆ Up the frequency of emission test for diesel commercial vehicles (like buses and goods vehicles) to half-yearly or even quarterly, depending on the emission standard and past emission test results of the vehicle.
  - ◆ Expand and enhance the scheme of deploying environmentally friendly buses in busy corridors – to cover more urban roads in addition to Yee Wo Street, (TD, 2007) and to raise the requirement from using Euro II or better buses to using at least Euro III buses.
  - ◆ Expand the current bus route rationalization schemes to areas other than Central, Wanchai, Yee Wo Street in Causeway Bay, and Nathan Road in Mongkok. This would further reduce the number of bus stoppings and bus trips in congested areas, especially during peak hours.
  - ◆ Expand bus-bus interchange schemes to achieve the efficient use of bus resources, reduce the need for long-distance direct bus services, and reduce the number of half-full buses on the road that would contribute to additional emissions and congestion.
  - ◆ On top of the current incentive scheme for pre-Euro and Euro I diesel commercial vehicles to voluntarily switch to Euro IV vehicles by taking a one-off grant, the Government must set out a timetable to ultimately phase out pre-Euro, Euro I, and also Euro II diesel commercial vehicles within a reasonable

time frame. The Government estimated that the switching of all pre-Euro and Euro I (but not Euro II) diesel commercial vehicles to Euro IV models would reduce vehicular emissions of PM<sub>10</sub> and NO<sub>x</sub> by 74% and 38% respectively, which would also mean a reduction of territory-wide PM<sub>10</sub> and NO<sub>x</sub> emissions by 18% and 10% respectively. (EPD, 2006b)

- ◆ There is a price and quality differential between ULSD allowed in Hong Kong and the motor fuel available in Guangdong. The price difference has tempted drivers to smuggle and use illicit, sub-standard motor fuel. Cross-border goods vehicle drivers, who are legally allowed to carry a 75%-full fuel tank in their in-bound journey, often top up their tank with cheap and poor-quality fuel that will be subsequently burnt in Hong Kong and pollute the city. Measures must be taken in the short term to control the amount of sub-standard motor fuel brought into Hong Kong by cross-border vehicles, through lowering the amount of fuel allowed in the fuel tank of an in-bound vehicle, and frequent inspection at border control points.
- (iii) Set up low-emission zones (LEZs) in the most crowded and congested urban areas to protect the public from roadside pollution.
- ◆ Restrict the entry of polluting vehicles (like Euro III and older vehicles, and all vehicles that failed the last emission test) through low-cost car labeling scheme
  - ◆ High-polluting delivery vehicles would be granted entry into LEZs only in specific time period when street activities are low (e.g. in Guangzhou, high-emission vehicles are only allow in certain areas after 10 pm)
- (iv) Reduce unnecessary road traffic and vehicle use, especially for short-distance journeys, by promoting pedestrian-friendly and transit-oriented urban planning.
- ◆ Provision of facilities that encourage the use of sustainable transport modes such as walking and cycling over a short distance (like traveling from home to a rail station or a public transport interchange).
  - ◆ Provision of rapid mass transit for long distance commuting, like railway.
  - ◆ Provision of park-and-ride facilities at rail stations or public transport nodes for the motorists to transfer to public transport.
  - ◆ Implement parking control in the urban centres as a complementary policy tool to discourage long-distance commuting by private cars.
- (v) Impose emission cap in stages on bus companies through franchise agreements. Similar emission caps should be extended to other commercial fleet operators, such as delivery trucks and courier fleets, as well as the government vehicle fleet.

(C) Marine Sector:

- (i) Ban the use of high-sulphur marine fuel oil by all ocean-going vessels and river vessels within Hong Kong waters. Require all ocean-going vessels to use marine fuel not exceeding 1.5% sulphur content, and all river vessels to use marine fuel not exceeding 0.5% sulphur content, with both standards subject to further tightening according to international regulations and practice.
- (ii) Re-devise a vessel speed reduction programme for ocean-going vessels that reward compliant vessels / companies through financial incentives like lower port dues.
- (iii) Impose emission cap on ferry operators through franchise agreements. Similar arrangements should be made with other local craft operators as far as practical.
- (iv) Tighten fuel standard for local crafts (such as ferries, lighters, barges, tugs, work boats, pleasure boats, and fishing vessels) from marine light diesel (0.5% sulphur content) to ULSD (0.005% sulphur content).
- (v) Make mandatory the provision of shore power in all new berthing facilities (including both cruise terminal and container terminal), and devise a timetable for the upgrading of existing port facilities in providing shore power to vessels at berth. This would reduce the use of high-sulphur marine fuel during the most polluting operation mode and at locations usually closest to the population.

(D) Power Sector:

- (i) For the power generation sector, demand a fuel mix policy of at least 50% natural gas and a greater portion of renewable energy when they become cost-effective – CO<sub>2</sub> and NO<sub>x</sub> emissions per unit of electricity generated by natural gas are about 50% and 70% lower than those by coal, and gas-fired power plants produced almost no particulates or SO<sub>2</sub>.
- (ii) Re-align the rationale behind future Scheme of Control (SoC) for the two power companies by rewarding them not for selling more electricity through higher asset investment, but for helping customers to cut their electricity bill by using energy more efficiently.
- (iii) Make sure all the emission reduction projects committed by the two electricity companies be completed on time, and the total emission caps imposed through the SoC be achieved accordingly.

(E) Urban Planning and Design:

- (i) Reduce energy intensity of Hong Kong, especially the urban core area, through innovative urban planning and design.
  - ◆ Encourage city planning designs that make use of clean energy (like sunlight) and natural cooling, which in turn minimize long-term energy use in the city.

- ◆ In areas where development is compact and dense, sufficient air passages between buildings have to be provided so as to reduce ‘street canyon effect’ and ‘wall effect’, and to improve air circulation, which in turn will enhance the dispersion of air pollutants.
- ◆ Encourage urban greening and rooftop greening, which will help lower urban temperature, absorb pollutants, and reduce the use of air conditioning – air conditioning accounted for 29% of Hong Kong’s annual electricity consumption in 2006. (EMSD, 2008)

(F) Collaboration with the Pearl River Delta:

- (i) Develop a comprehensive air quality management strategy that addresses locally produced air pollution and facilitates collaboration with the PRD in reducing regional air pollution

*General*

- ◆ Reduce total energy use through the promotion of energy efficiency and energy saving in all sectors and in the communities within the region.
- ◆ Tighten fuel and emission standards in Guangdong for different sectors (like power generation, road transport, manufacturing, marine, and construction), with the long-term goal of having uniform standards for the entire region (including Hong Kong).
- ◆ Facilitate the sourcing of cleaner fuel to Guangdong.
- ◆ Strengthen the implementation and enforcement of regulations and standards in Guangdong.

*Power Sector*

- ◆ Reduce reliance on coal in PRD’s power plants
- ◆ Improve the energy efficiency of PRD’s power plants to at least the level of Hong Kong’s power plants, in order to reduce the amount of energy input and pollutant emissions per unit of electricity produced.
- ◆ Promote the production and use of renewable energy in the region

*Road Transport*

- ◆ Promote the use of public transport – both railway and bus rapid transit – in the PRD as a means to dissuade people from over-relying on private cars.
- ◆ Promote the use of alternative fuel vehicles (both private cars and public transport) in order to reduce fossil fuel use and emissions.

### *Marine Sector*

- ◆ Set up an emission control zone in PRD's coastal waters, including Hong Kong waters, that regulates fuel quality and emissions from marine vessels that operates in the region.
- ◆ Set a timetable for the provision of shore power facilities in all PRD container terminals.
- ◆ Set a timetable to switch all diesel-powered shore-side equipments to ones driven by electricity.
- ◆ Tighten and enforce a more stringent standard for marine fuel used by river and coastal vessels.

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