

## Roadside Pollution and Public Health Legco Submission – 3<sup>rd</sup> April 2006

This paper aims to provide general background information on roadside pollution from vehicles to complement the presentation to be made on 3 April 2006.

We would be pleased to provide further information and also to give longer presentations to legislators and the political parties.

### I: Pollution from Motor Vehicles

Motor vehicles emissions is a significant source of volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>) that combine in the presence of heat and sunlight to form ground-level ozone.

In addition, heavy trucks and buses as well as off-road construction equipment are a significant source of particulate matter (PM) in urban areas.

### II: Hong Kong's Roadside Pollution

Hong Kong's road density is among the highest in the world at 265 vehicles per kilometre of road. About a quarter of these vehicles use diesel (mostly commercial vehicles), which is much more polluting (especially if they are old vehicles) and they contribute to about half of the vehicle mileage in Hong Kong.<sup>1</sup>

According to HKEPD air pollution emission inventories in 2004, road transport in Hong Kong contributed to:

- 27% of total NO<sub>x</sub>,
- 25% of total RSP (PM<sub>10</sub>)
- 86% of total combustion related VOCs.<sup>2</sup>

Motor vehicles also contributed over 90% of Hong Kong's total Carbon Monoxide in 2004.

### III: Roadside Air Monitoring

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<sup>1</sup> See <http://www.epd.gov.hk>

<sup>2</sup> Non-combustion VOCs made up over 80% of total NMVOCs and combustion VOCs made up 20% in 2004. See: <http://www.epd.gov.hk>

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Hong Kong measures roadside air quality at three stations, Causeway Bay, Central and Mongkok.

At all of these roadside stations, levels of NO<sub>2</sub> and RSP (PM<sub>10</sub>) regularly exceed the:

- maximum HOURLY objectives;
- maximum DAILY (24hr) objectives; and
- maximum ANNUAL AVERAGE objectives.

Since the beginning of measurement in 1998, including the most recent data available in 2004, roadside stations (including Central) have exceeded the annual average objectives for NO<sub>2</sub> and RSP (PM<sub>10</sub>). NO<sub>2</sub> concentration of all the roadside stations is above 90 ug/m<sup>3</sup>, which is related to heavy vehicular traffic and the impact of the street canyon effect.

Hong Kong's objectives are already much more lax than European Standards and Hong Kong's roadside pollution levels are often more than double that of the European Standards.

The Department of Community Medicine at the University of Hong Kong estimates that in Hong Kong:

- 46% of people live 5 minutes from a road with heavy traffic
- 26 hours per week is spent outdoors
- 12 hours (46%) near a busy road

As such, more than half the population is exposed regularly to roadside pollution levels.

#### **IV: Health Impacts of Vehicle Pollution**

There are extensive epidemiological studies from around the world examining the health impacts, especially on children, of direct exposure to one or more pollutants associated with motor vehicles. The vast majority of these studies suggest strong associations between health effects associated with worsening asthma and other acute respiratory health.<sup>3</sup> Long term exposure to high levels of motor vehicle pollution also suggests increases in the prevalence of asthma and chronic respiratory symptoms as well as reduced lung function.

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<sup>3</sup> For a summary of some of this research see:

[http://www.environmentaldefense.org/documents/2655\\_MotorAirPollutionAsthma.pdf](http://www.environmentaldefense.org/documents/2655_MotorAirPollutionAsthma.pdf)

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### **(a) Local Studies**

Local studies which reviewed the costs associated with short term exposure to air pollution focussed on the direct cost associated with utilization of health services as well as the monetary value for morbidity and mortality associated with increase in air pollutant levels.<sup>4</sup>

Using an increase in 10 ug/m<sup>3</sup> concentration of a pollutant (based on NO<sub>2</sub>) and taking the portion related to traffic, a local study showed that the direct cost of illness together with productivity loss amounted to HK\$0.2 billion. The study also estimated through the willingness to pay method that people would pay HK\$1.2 billion per year to avoid the risk of morbidity and premature death arising from a 10ug/m<sup>3</sup> increase, or HK\$6.9 billion arising from an increase to the mean concentration, for the portion which is related to traffic.

### **(b) Tamar - Quick Analysis**

For this meeting, we have asked our air quality scientists and public health professionals to make some quick calculations to add to the information stated above. Given more time and resources, much more can be done but we hope these numbers may show that local experts have developed methodologies to put monetary values in public health terms to air pollution from vehicular emissions.<sup>5</sup>

Local studies from Causeway Bay indicate about 85% of NO<sub>2</sub> variations are traffic related, and perhaps 50% of the RSP (PM<sub>10</sub>) are also traffic related.

To work out a monetary value of what this means in public health terms with the road plans in/around the Tamar location, assuming 100,000 people would be exposed and the correlation between NO<sub>2</sub> and RSP (PM<sub>10</sub>) is 0.77, the cost estimate would be HK\$218.4 million per annum. If however, all the NO<sub>2</sub> and (RSP) PM<sub>10</sub> variations are traffic related the upper bound cost estimated would be HK\$227 million per annum.

## **V: Policy Recommendations**

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<sup>4</sup> See: [http://www.epd.gov.hk/epd/english/environmentinhk/air/study/rpts/files/ap\\_health\\_impact\\_02.pdf](http://www.epd.gov.hk/epd/english/environmentinhk/air/study/rpts/files/ap_health_impact_02.pdf)

<sup>5</sup> The method used here is based on the EPD commissioned study "Short term health impact and costs due to road traffic-related air pollution" and conducted jointly by the Department of Community Medicine, the University of Hong Kong, and the Department of Community and Family Medicine, the Chinese University of Hong Kong.

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General policy recommendations arising from epidemiological studies involve (a) the reduction of ambient levels of ozone and particulate; and (b) reduction in exposures to truck exhaust and high density thoroughfares.

In addition to policies which reduce the amount of pollution emitted per vehicle miles travelled, policies should also focus on ways to reduce total vehicle miles travelled.

It must be stressed that the impact of vehicular pollution on the population is also influenced by town planning. How the authorities control land use, development density and traffic growth have a tremendous impact on air quality in the city, where people live and work. Thus, reducing the canyon effect would be helpful. Giving priority to public transport, especially rail in a city like Hong Kong, is essential.

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