

## Written Submission to the Legislative Council

12 February 2009

Honourable Members of the Legislative Council:

Professor Anthony Hedley has kindly forwarded me his comprehensive, high-quality submission for reference. Hence, I shall not reiterate what he has already mentioned to you. Instead, I shall highlight several areas not covered by him, and reinforce important points that will be useful to the discussion today. For clarity, I shall present these points in a question-and-answer format.

### **1. Is there a link between air pollution and health?**

The answer may seem obvious, but I am aware that some people remain sceptical even in the face of the evidence. There have been public remarks on the apparent paradox of Hong Kong people having one of the longest life expectancies in the world, despite living in a highly polluted environment, implying disbelief in the scientifically based finding that air pollution causes ill-health.<sup>1</sup>

There is no lack of scientific evidence that air pollution is linked to ill-health in humans and other animals (please see Sections 1.1, 1.2, and 3.5 of Prof. Hedley's submission).<sup>2</sup> Briefly, I can affirm that a large number of observational and experimental studies have shown that air pollution affects physical fitness. It causes premature deaths, diseases of the heart and lungs (including lung cancer), and poor lung function, which is an important determinant of overall health. These findings are robust. They are supported by the research of local academics, as well as by the large pool of literature from the developed world, such as the USA, Europe, Canada, and Australia.<sup>3,4,5</sup> Concurrent research has also been done in many Asian countries, including mainland China.<sup>6</sup>

Thus, the simple answer to this question is ‘yes’ – there is a cause-effect relationship between air pollution and ill-health.

## **2. Do we have an air pollution problem in Hong Kong?**

Again, the answer is an obvious ‘yes’. If you should ask a further question, ‘How bad is it?’, then you will need to be very careful which yardstick you are using to measure the severity of the problem. Hong Kong has Air Quality Objectives (AQOs) – set up in 1987, when our Environmental Protection Department (EPD) was formed – for a number of ‘criteria’ air pollutants.\* In 2007, the EPD commissioned a consultancy study to review the Hong Kong AQOs, and to recommend control measures. This was done in response to a World Health Organization (WHO) review of their Air Quality Guidelines (AQGs) in 2005. If you gauge the air pollution situation in Hong Kong by our 1987 AQOs, our air pollution situation does not seem too bad. If, on the other hand, you compare our air pollutant levels with the 2005 WHO AQGs, we have a very serious problem indeed. The administration would argue that the WHO guidelines are so stringent that no country is currently ready to adopt it. Yet even if we use the US National Ambient Air Quality Standard (NAAQS), the EU standard, or indeed the standards of some developing countries, we will realize how inadequate our own AQOs are as a benchmark for protecting our health from the harmful effects of air pollution.

## **3. What are Air Quality Objectives?**

I have not been able to find out the precise public health basis for the determination of the AQOs in Hong Kong when they were set in 1987. Nevertheless, they were supposedly ‘based on international standards’, and their values shared many similarities with the American NAAQS at the time.<sup>7</sup> According to the US Environmental Protection Agency (EPA), the NAAQS was established to protect the public’s health.<sup>8</sup> The EPA’s standards

---

\* These outdated AQOs are well known to some of the EPD staff, who in 1996 set up a Working Group to review them. Several professionals from different disciplines, including Prof. Hedley and I, were invited to join the Group. We all worked diligently for 18 months, and submitted a report to EPD. Unfortunately, the work of the Group was then stopped without explanation. Although the Working Group was never formally dissolved, nothing further has been done, and no changes have yet been made to the AQOs.

were originally set on the understanding that they provided a ‘safe threshold’, below which level no injurious effect on health would occur. The figures were determined without consideration to economic cost or technological capability, but were based simply on scientific evidence as to whether a certain level of exposure will incur health damage. This approach has a distinct advantage, in that the need to achieve these standards will drive technological innovation for pollution reduction.

Later research, however, has shown that the idea of a ‘safe threshold’ is a myth in the present-day urban environment. To put it simply, we have not been able to determine any threshold level of air pollution that can be considered ‘safe’. Any reduction in the current air pollutant concentration will result in some health benefit. This observation holds true for particulate matter and ozone, two very important air pollutants in many cities, including Hong Kong.

The no-threshold feature also prompted the WHO to introduce a ‘risk-based’ approach in determining its latest AQGs. In its previous report in 2000, the WHO did not recommend an AQG for particulates because of the absence of a threshold level.<sup>9</sup> In its 2005 report, it made recommendations for all air pollutants, including those without a threshold.<sup>10</sup> Here, it used the concept of ‘acceptable risks’. Inevitably, there is a subjective element in determining what is ‘acceptable’ and therefore what the AQGs should be, but the idea is to enable countries to achieve an ‘acceptable’ level of pollution: one which, when achieved, will ‘result in significantly reduced rates of adverse health effects’ to the general public. Nonetheless, even the new guidelines might not protect particularly sensitive individuals when they are exposed to air pollutant levels below those defined by the AQGs. Therefore, the WHO Report emphasised ‘the need to reduce exposure to non-threshold air pollutants *even where current concentrations are close to or below the proposed guidelines*’.<sup>10</sup>

#### **4. Why are there different AQO values for different time periods of exposure to an individual air pollutant?**

This can be explained by the observation of short-term and long-term effects on health that result from exposure to air pollutants. Most of these effects have been well-researched, and many studies have been duplicated in different countries and the results validated. Then again, more research will still be required before we can fully understand the more complex aspects of air pollution and ill-health, such as the pathological, physiological, and biochemical bases, and the air pollutants' mechanisms of interaction at the cellular level.

Short-term effects refer to short-term changes in air pollutant levels that are now known to be associated with many adverse health outcomes (please see Sections 4 and 5 of Prof. Hedley's submission).<sup>2</sup> Long-term effects refer to exposure over much longer time periods, and the results of several US studies have been used to demonstrate the damage to health caused by long-term exposure to a polluted environment.<sup>3,4</sup> These include a higher overall risk of death (and, more specifically, death due to lung cancer) and poor lung growth in children living in highly polluted areas.<sup>11</sup>

Hence, exposure to certain levels of air pollution in the *short-term* is associated with more *immediate* effects, such as developing respiratory symptoms, having to see a doctor, attending the hospital, or even dying. Data from studies of short-term effects have helped determine standards for short-term exposure, such as the 10-minute, 1-hour, 8-hour, and 24-hour guidelines. A part of this body of evidence was derived from experimental 'chamber studies' on human volunteers.<sup>5, 12, 13</sup>

By contrast, guidelines for *long-term* exposures are recommended to reduce the risk to health caused by long-term exposure to a polluted environment. Long-term follow-up studies – which are very labour intensive and expensive to carry out – in the US and other countries, and the local 'intervention study' on the effects of low sulphur fuel by Prof. Hedley's team (please see Section 5.3 of Prof. Hedley's submission), have contributed significantly to the WHO AQGs for longer term exposures, expressed in the annual mean concentrations of various air pollutants.<sup>2, 3, 4</sup>

## **5. What AQOs should we use in Hong Kong?**

The EPD has commissioned a study to review the AQOs and to make recommendations for Hong Kong. Prof. Hedley has already commented thoroughly on the merits of the WHO AQGs, and the inadequacies of the WHO Interim 1 target (please see Sections 10.3 and 10.4 of Prof. Hedley's submission).<sup>2</sup> I shall make two further points:

First, we need to think about the logic behind the argument that 'no country has adopted the WHO AQGs – therefore, we will not adopt it either.' Why can't we be bolder and lead other countries by our example? As 'Asia's world city' – affluent, technologically advanced, with an educated population – we ought to set the AQGs as our goal, and show the world that we are determined to tackle our air pollution problem. We must begin by acknowledging that we have a problem in the first place.

Regarding the argument that 'because we see little hope of achieving the WHO AQGs, we should adopt a less stringent but more pragmatic standard', we need to consider whether this 'pragmatic' approach is, in reality, a denial of the existence of a problem, or a means to console or even congratulate ourselves on a 'mission accomplished', when our air pollution control strategies have made only minor improvements in the air quality. Using the WHO IT-1 targets, even ineffective control measures would not result in too unsatisfactory a 'report card' on air pollution control performance. Are we more interested in the appearance of the 'report card', touched up by using a lax standard? Or are we genuinely making an effort to protect public health?

## **6. What should be done to control air pollution?**

I am aware of my limitations: I am a public health physician and environmental epidemiologist, not an authority on pollution emissions, nor an engineer, nor a mathematical modeller. Even so, I have worked with many different professionals throughout my years of research in air pollution and health, and gained valuable

experience from them. At the risk of venturing outside my area of expertise, I would like to offer the following for your consideration:

- (i) There is a need to review and amend the law. According to a researcher into the Air Pollution Control Ordinance, there are deficiencies in the current law that can best be tackled by your Council.<sup>14, 15</sup> There is no punitive action for emitting pollutants into the air, except for one case where an offender was punished for the nuisance caused by the smell of shark's fin emitting from his shop.
- (ii) I strongly urge the EPD to take the bold step and adopt the WHO AQGs.
- (iii) A lot of pollution is locally generated, and much can be done to reduce them. Possible measures include: electronic road pricing for districts like Central, Causeway Bay, Tsim Sha Tsui, and Mong Kok; pedestrianisation; extending the railway network to more districts (for example, the decision to scrap the MTR line to Happy Valley should be revised); forming policies that encourage the use of public transport; enforcing a punitive law against idling engines; replacing old diesel engines; and the use of less polluting hybrid or electric vehicles. The bureau in charge of transport policies should make an effort to explore, plan, implement, and evaluate measures to reduce air pollution.
- (iv) Marine emission is another important area for control. The prevailing argument against control is the short-sighted contention that our port will lose out to our competitors. In fact, we can and should discuss the problem with neighbouring governments, because air pollution control brings economic benefits that far outweigh its cost. These measures should be thoroughly studied by the EPD consultants in their commissioned study.
- (v) Finally, cross-border collaboration is vital in achieving air pollution control in both Hong Kong and the Pearl River Delta (PRD). How can we help reduce air pollution in the Mainland? Emissions from coal-fired power plants, factories,

traffic, mines, ports, heavy industry, and oil refineries are some of the obvious sources we should target. In the long run, the successful control of air pollution in Hong Kong and the PRD is a win-win situation for both jurisdictions.

The task of cleaning up our air is not easy, and cannot be done by the community alone. The Hong Kong government must work out a solution with our neighbours, and follow it through. As citizens of a world-class city, we should urge our government to take the lead.

Submitted by

Professor **Wong** Tze Wai

## References

1. Press release: *CE speaks at 'Business for Clean Air' Joint Conference*. Hong Kong: Government of the Hong Kong Special Administrative Region, 27 November 2006. (Last updated November 2006; website accessed February 2009)  
<http://www.info.gov.hk/gia/general/200611/27/P200611270129.htm>
2. Hedley AJ. *Air pollution and public health: The current avoidable burden of health problems, community costs and harm to future generations*. Hong Kong: The University of Hong Kong, 2009.
3. Pope CA 3rd, Burnett RT, Thun MJ, et al. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *JAMA* 2002; 287:1132-41.
4. Dockery DW, Pope CA 3<sup>rd</sup>, Xu X, et al. An association between air pollution and mortality in six U.S. cities. *New England Journal of Medicine* 1993 ; 329 : 1753-9.
5. Katsouyanni K, Touloumin G, Spix C, et al. Short term effects of ambient sulphur and particulate matter on mortality in 12 European cities: results from time series data from the APHEA project. *British Medical Journal* 1997; 314:1658-63.
6. *Health Effects of Outdoor Air Pollution in Developing Countries of Asia: A Literature Review Report: Special Report 15*. Boston: Health Effects Institute, 2004.
7. Environmental Protection Department. *API and air monitoring background information: Air quality objectives*. Hong Kong: Government of the Hong Kong Special Administrative Region, 2004. (Last updated December 2006; website accessed February 2009)  
<http://www.epd-asg.gov.hk/english/backgd/hkaqo.php>

8. US Environmental Protection Agency. *Technology Transfer Network: National Ambient Air Quality Standards (NAAQS)*. Washington DC: Environmental Protection Agency, 2008. (Last updated October 2008; website accessed February 2009)  
<http://www.epa.gov/ttn/naaqs>
9. World Health Organization Regional Office for Europe. *Air quality guidelines for Europe (second edition)*. WHO Regional Publications, European Series, No. 91. Copenhagen: World Health Organization, 2000.
10. World Health Organization Regional Office for Europe. *WHO air quality guidelines global update 2005: Report on a working group meeting, Bonn, Germany, 18–20 October 2005*. Copenhagen: World Health Organization, 2005.
11. Gauderman WJ, Gilliland GF, Vora H, et al. Association between air pollution and lung function growth in southern California children: results from a second cohort. *Am J Respir Crit Care Med* 2002 ; 166 : 76-84.
12. Desqueyroux H, Pujet JC, Prosper M, et al. Short-term effects of low-level air pollution on respiratory health of adults suffering from moderate to severe asthma. *Environ Res* 2002 ; 89 : 29-37.
13. Delfino RJ, Zeiger RS, Seltzer JM, et al. Symptoms in pediatric asthmatics and air pollution: differences in effects by symptom severity, anti-inflammatory medication use and particulate averaging time. *Environ Health Perspect* 1998 ; 106 : 751-61.
14. *Air Pollution Control Ordinance (Chapter 311)*. Hong Kong: Government of the Hong Kong Special Administrative Region, 1983. Last amended 18 July 2008. (Website accessed February 2009)  
<http://www.legislation.gov.hk/index.htm>

15. Da Roza AM. *The Air We Breathe – A Public Health Dialogue: A Look at the Air Pollution Control Ordinance*. 2009 (Personal communication).