To: Honourable Members of the Legco Panel on Environmental Affairs,
Legislative Council,
Hong Kong Special Administrative Region of the People's Republic of China,
Legislative Council Building,
8 Jackson Road, Central,
Hong Kong

Dear Honourable Members

17 November 2006

Re: Submission on the Review of Air Quality Objectives in Hong Kong

I would like to make my submission of the captioned subject in a 'question and answer' (Q & A) format. I hope this will facilitate the understanding of air pollution and its control, which are multi-disciplinary issues involving environmental sciences, health sciences, engineering, economics and politics.

1. What are Air Quality Objectives? Were they established with a view to protect the health of the public in Hong Kong?

According to the Air Pollution Control Ordinance, Air Quality Objectives (AQO) are set up to "*promote the conservation and best use of air in the public interest*".[1] This is a vague, all-embracing statement that does not refer specifically to the protection of public health. If I were to speculate on the law-drafters' real meaning of "the best use of air", it would mean that the air that we breathe should not be harmful to our health. Since many activities in an urban community pollute the air, it is the responsibility of the Government to ensure that such activities are regulated and controlled so that the air is safe for us to

[1] In Section 7 – Secretary to establish quality objectives, of Cap. 311 Air Pollution Control Ordinance: The air quality objectives for any particular air control zone or part thereof shall be the quality which, in the opinion of the Secretary, should be achieved and maintained in order to promote the conservation and best use of air in the zone in the public interest. Any air quality objective may be amended from time to time by the Secretary, after consultation with the Advisory Council on the Environment. (amended L.N. 165 of 1984; L.N. 57 of 1994)

breathe. There is reference to health in the Ordinance, in Section 2,[2] where "air pollution" is defined as "*an emission of air pollutant which either alone or with another emission of air pollutant, is prejudicial to health. …..*"

The commitment by the Government to improve air quality is stipulated in this Ordinance. In Section 8 - Authority to seek to achieve air quality objectives: "*The Authority shall aim to achieve the relevant air quality objectives as soon as is reasonably practicable and thereafter to maintain the quality so achieved*."

Numerically, AQOs in Hong Kong are expressed as concentrations of several specified air pollutants that are continuously monitored by the Environmental Protection Department (EPD) – the "criteria air pollutants", so-called because criteria (AQOs) have been set up by the Government.

2. Where did the values of our current AQOs come from?

According to a paper to the Advisory Council on the Environment, ACE Paper 14/2006 – *A Proposal for Reviewing the Air Quality Objectives and Developing a Long Term Air Quality Strategy*, AQOs were established in 1987 by "making references to research results done mainly in the United States". These AQOs have remained unchanged despite progressive changes in the direction of more stringent criteria in many developed countries. The research results obtained from studies in the U.S. and other countries were used by the U.S. Environmental Protection Agency (USEPA) to formulate Air Quality Standards in the United States almost two decades ago.

[2] In Section 2 – Interpretation, of Cap. 311 Air Pollution Control Ordinance: "air pollutant" (空氣污染物) means any solid, particulate, liquid, vapour, objectionable odour or gaseous substance emitted into the atmosphere (amended 13 of 1993 s. 2); "air pollution" (空氣污染) means an emission of air pollutant which either alone or with another emission of air pollutant- (a) is prejudicial to health; (b) is a nuisance; (c) imperils or is likely to imperil the safety of or otherwise interferes with the normal operation of aircraft; or (d) is determined to be air pollution under a technical memorandum; and, "air quality objective" (空氣質素指標) means an air quality objective established by the Secretary under section 7.

3. What are the Air Quality Standards as defined by USEPA? How are they determined?

Since the Hong Kong AQOs were derived by making references to U.S. studies, I shall describe the relevant laws and standards in the U.S. and explain the underlying principle in the setting of Air Quality Standards (AQS). In the U.S., the relevant law is the Clean Air Act. The Clean Air Act requires USEPA to set national air quality standards for particulate matter and five other pollutants considered harmful to **public health** and the **environment** (the other pollutants are ozone, nitrogen oxides, carbon monoxide, sulfur dioxide and lead). The Clean Air Act establishes two types of national air quality standards. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings. The law also requires USEPA to periodically review the standards and ensure that they provide adequate health and environmental protection, and to update those standards as necessary.[3]

From the most up-to-date scientific evidence on air pollution and health, the conclusion is that even at very low levels of air pollution currently experienced in the urban environment in many cities over the world, there is a significant effect on health. The evidence is derived from epidemiological studies – the study of the health of populations and the causes of diseases among them. Note that in the formulation of the AQS, the

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[3] The following is extracted from the USEPA website http://www.epa.gov/ttn/naaqs/standards/basic.html

EPA's Process for Updating the National Ambient Air Quality Standards: Reviewing the National Ambient Air Quality Standards is a lengthy undertaking. First, EPA's Office of Research and Development develops a "criteria document" a compilation and evaluation of the latest scientific knowledge useful in assessing the health and welfare effects of the air pollutants. Based on the criteria document, EPA also develops a "staff paper" that helps translate the science into terms that can be used for making policy decisions. The staff paper, prepared by staff in EPA's Office of Air Quality Planning & Standards, includes recommendations to the EPA Administrator about any revisions to the standards needed to ensure that they protect public health with an adequate margin of safety, and that they protect the environment and the public welfare.

Before either the criteria document or staff paper can be used as the basis for any policy decisions, they undergo rigorous review by the scientific community, industry, public interest groups, the general public and the Clean Air Scientific Advisory Committee (CASAC). Based on the scientific assessments in the criteria document and on the information and recommendations in the staff paper, the EPA Administrator determines whether it is appropriate to propose revisions to the standards.

economics (how much the community is prepared to pay for cleaner air?) and technology (can air quality be improved with existing technology?) involved to achieve these standards are not considered. Only scientific evidence of the effects on health and the environment caused by these air pollutants are reviewed in the process of setting the AQS. Moreover, the AQS are reviewed regularly and revised in the light of evidence derived from newer research.

4. In the past, has the Government done any work to review and revise AQOs in Hong Kong?

The Environmental Protection Department (EPD) established a Working Group on the Health Effects of Air Pollution which held its first meeting on 5 March 1997. This group was chaired by an Assistant Director of EPD and comprised officials from EPD, the Department of Health, the Hospital Authority, and university academics and professionals representing different organizations (Hong Kong College of Community Medicine, Hong Kong Institute of Occupational and Environmental Hygiene, Hong Kong Society of Occupational an Environmental Medicine, Hong Kong Medical Association and Hong Kong Thoracic Society). A review of the AQOs in Hong Kong was high on the agenda, and a Sub-Working Group on the Health Effects of Air Pollution was formed. After 18 months of work, a comprehensive report [4] was produced by the Sub-Working Group and submitted to the Working Group. No further meetings were convened either by the Sub- Working group or the Working Group thereafter. Nothing was heard about the fate of the report produced by the Sub-group. Nor were any follow-up discussions / actions taken until now. (The underlying reasons for the abrupt halt and subsequent inaction by the Government might be a subject for Legco members to follow-up, in the interest of the public.)

5. What are the deficiencies in the current AQOs in Hong Kong?

The most obvious deficiency is that they are grossly out of date, and have not been reviewed even when other developed countries (the U.S., the European Community,

[4] The 150-page-long report entitled "Health Effects of Air Pollution" was published and submitted to the EPD in July 1999. It is available from Prof. AJ Hedley of The University of Hong Kong or the author.

Australia, the U.K., and others) have progressively tightened their standards. There is still no explicit acknowledgement by the Government that AQOs should be set up for the protection of public health. Air pollutants like the fine suspended particulates ($PM_{2.5}$ – these are particulate matter with an aerodynamic diameter of less than 2.5 micrometres) are now considered by many researchers to be more harmful to health than the larger particles (PM_{10}) are. Levels of $PM_{2.5}$ have been monitored routinely in some developed countries. In a study commissioned by the EPD, data on $PM_{2.5}$ collected in some districts of Hong Kong have been used to assess its effects on health, and the findings are broadly in agreement with the conclusion that $PM_{2.5}$ are more harmful than PM_{10}. AQS for $PM_{2.5}$ have been established by many developed countries. The World Health Organization (WHO) has set up Air Quality Guidelines (AQGs) for the reference of member countries. These guidelines are also health-based.

6. What should be the rationale for setting up AQOs in Hong Kong?

The Hong Kong AQOs should be set with the sole purpose of protecting the public's health, without consideration of social and economic factors. This should be based on scientific evidence: evidence based on epidemiology (the study of the health of populations and the causes of disease among them) and toxicology (the study of toxic substances and their effects).

7. Is the time frame for the proposed review of AQOs reasonable?

There has been an unexplained delay in the process for 9 years already! The Hong Kong citizens have waited too long. There is no need to re-invent the wheel. References can readily be made from standards adopted by developed countries and the WHO guidelines, which has reviewed scientific studies on air pollution and health worldwide, including Hong Kong studies conducted by local academics.

There appears to be a mis-interpretation of the WHO statement that their AQGs should be used by each country according to its own circumstances. The point to note is that there are few racial differences in the human body's response to air pollution. Physiologically,

all humans are very similar, and the association between air pollution and ill-health is consistent in studies done in different countries. Moreover, these studies also show a similar magnitude of risk to health caused by a unit increase in the concentrations of air pollutants (i.e., a unit increase in air pollutant concentrations causes a similar increase in the risk of illness / death). My interpretation of the WHO statement is: how air pollution control measures should be implemented, and when the target of AQS should be achieved for an individual country, must be determined by the local situation – the technological advancement and economic strength of the country concerned. In Hong Kong, we are technologically advanced and affluent enough to afford to do more to improve our air quality, and to act quickly.

8. Who should be involved in the revision of AQOs?

The formulation of AQOs is a scientific process. While the Government is keen to consult the public, in particular the 'stakeholders' which may include many polluters, such as the power companies and the transport industry, the process must involve experts in this highly specialized field. There is sufficient expertise in academic and professional bodies that can be consulted for the task. The Government must take the lead in the process.

9. Re-writing the AQOs alone is not going to improve the air quality. What more needs to be done, and by whom?

To protect human health, and to reduce the illnesses and deaths due to air pollution, especially among the vulnerable groups in the community, the levels of air pollutants must be reduced both locally and regionally. The following are some useful suggestions:

Locally, we need to revamp our transport policies. We must discourage the use of motor vehicles and highways and encourage the development of railways and the mass transit. We need to control the population of motor vehicles. Public transport must be regulated in order to reduce the generation of air pollutants (e.g., the rationalization of bus routes and their frequencies of service). In districts where air pollution is extremely serious

(such as Central, Causeway Bay, Tsim Sha Tsui and Mong Kok), the traffic volume should be reduced, for example, by charging a road toll or by pedestrianization, or a combination of both. The emission of air pollutants by power companies must be controlled stringently. Policies that favour less polluting vehicles and cleaner fuels should be advocated. The use of highly polluting fuels by ships must be prohibited. Town planning, urban development and architectural design must take into consideration the generation of air pollutants by traffic and other sources, and the pollutant dispersion pattern. The conservation of energy, reduction of air pollution and the concept of sustainable development must be built into the school curriculum. For all of the above policies and strategies, the Government must take the lead. The desire for clean air, expressed so strongly by various sectors of the community, ensures that initiatives that will improve our air quality will have good community support.

Regionally, besides better communication and sharing of air pollution monitoring data, efforts must be made to discourage the more polluting practices in the manufacturing and power industries in the Pearl River Delta. Here, the Hong Kong SAR Government and the Guangdong Government, as well as the business sector (especially the pollution-producing industries), must work together.

Looking forward to cleaner air in Hong Kong,

Sincerely

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