Air pollution and Health
A Briefing Paper

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[A longer version of this paper is available on the Civic Exchange website]
Air pollution degrades the environment, reduces visibility and causes serious health effects globally.

I: Sources of air pollution

Air pollution comes from combustion of fossil fuels for industrial or domestic use and for transportation. In Hong Kong, diesel vehicles are the primary source of street level pollution. Other sources of ambient air pollution in Hong Kong include power stations, marine vessels and aircrafts. Air pollutants can travel a long way from their source. In winter months, the prevailing winds from the North and West bring emissions from mainland China to Hong Kong. Air pollution from Hong Kong can also affect mainland China.

Within the urban areas in Hong Kong, there are areas prone to have high pollution levels such as Causeway Bay and Mongkok. These two areas have very high traffic density. In addition, the density of high-rise buildings prevents the dispersal of emission generated by vehicles resulting in the “street canyon” effect.

Contrary to what people think, serious air pollution episodes in the city are not due to sudden increases in emission but are usually the result of meteorological conditions that reduce the ability of air pollutants to be dispersed.

II: Specific air pollutants

Table 1 shows the specific air pollutants, their sources and how they affect human health. They are usually classified into suspended particulate matter and gaseous pollutants. Exposure to these air pollutants can give rise to adverse health effects.

III: Adverse health effects of air pollution on health

Increase in air pollution levels has been shown to be associated with:

- Increase in overall death rate and death rates from heart and lung diseases with lag periods varying from 0 to 5 days
- Lower life expectancy of 2 to 3 years in communities with high pollution compared to those with low pollution
- Rise in hospital admission due to asthma and other lung diseases with lag periods from 1 to 5 days
- Increase in emergency room visits for treatment of acute asthma in children
- Reduction in lung function especially in children
- Exacerbation of asthma resulting in more medication use

Children and the elderly are more susceptible to the effects of air pollution.

There have been several studies on air pollution and health in Hong Kong. The results of these studies mirrored those in other countries.
### Table 1: Sources and health effects of specific air pollutants

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Where they are from?</th>
<th>Health and other effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particles: classified by size</td>
<td></td>
<td></td>
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<tr>
<td>• Total suspended particles (TSP)</td>
<td>Types: organic carbon (PAH); inorganic; acid or neutral sulphates; nitrates; acid aerosol; fine soil dust; residues of lead or other metals; asbestos and other fibres</td>
<td>TSPs are filtered by the nose; RSPs and UPs enter airways and deposited there; Cause inflammation of the lungs and airways</td>
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<tr>
<td>• Respirable suspended particles (RSP) &lt;10 um</td>
<td>Sources: Fuel for traffic - mostly diesel; construction; road dust; incineration</td>
<td></td>
</tr>
<tr>
<td>• Ultrafine particles (UP) &lt; 2.5 um</td>
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<tr>
<td>Sulphur dioxide (SO₂)</td>
<td>Industrial combustion of fossil fuels – coal and oil</td>
<td>Irritates airways and induces airway narrowing</td>
</tr>
<tr>
<td></td>
<td>Vehicular sources – diesel cars, buses and trucks due to sulphur content</td>
<td></td>
</tr>
<tr>
<td>Oxides of nitrogen (NOₓ)</td>
<td>Fossil fuels for transport, heating and power generation</td>
<td>Trigger attacks of asthma</td>
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<tr>
<td>Ozone (O₃)</td>
<td>Photochemical reaction between oxides of nitrogen and reactive hydrocarbons such as volatile organic compounds</td>
<td>Causes irritation of the eyes; Impairs lung function especially in children or people during exercise</td>
</tr>
<tr>
<td>Toxic hydrocarbons</td>
<td>Industrial and traffic combustion; Industrial processes involving solvents</td>
<td>Carcinogenic</td>
</tr>
<tr>
<td>Green house gases e.g. carbon dioxide</td>
<td>Industrial and traffic combustion</td>
<td>Global warming</td>
</tr>
</tbody>
</table>

### IV: Trends in air pollution

In many developed countries, successful control of air pollution from industrial and domestic sources resulted in major reductions in sulphur dioxide levels during the past decade.
However, levels of oxides of nitrogen and ozone have remained unchanged or increased from increasing traffic emissions. The trend in Hong Kong is similar. All pollutants increased progressively in Hong Kong over the past decade with the exception of sulphur dioxide. Since 1991, the mean roadside measurements of RSP and oxides of nitrogen have consistently exceeded the one-year Air Quality Objectives (AQO) set by the Environment Protection Department (EPD) of Hong Kong.

In 1998, among the 36 major cities in the world, Hong Kong ranked as 9th and 15th respectively for worst levels of RSP and oxides of nitrogen.

V: Are AQOs adequate to protect the health of Hong Kong citizens?

A working group on Air Pollution and Health was established to review the appropriateness of the current AQOs established in Hong Kong, based on evidence of local health studies. The group came to the conclusion that excessive health risks were noted even on days when the levels of air pollution were below the current set of AQOs. In order to achieve worthwhile health benefits, ambient air levels would have to be maintained at or below levels corresponding to only 50% or even 25% of the current AQOs.

VI: Science, Policy and Research

It is clear that the levels of air pollution in Hong Kong are too high and are harmful to the health of the citizens of Hong Kong. The levels should be lowered. The current AQOs set by the EPD are too high to be protective. The World Health Organization recently announced that there are no safe levels of air pollutants and that each country needs to set their own AQOs according to the level of risk it is willing to accept for its citizens. How low should the AQOs be in Hong Kong and how can the levels be reduced so that health protection can be cost-effective?

It is vital that these public health policies should be guided by good science. Data from other parts of the world, though important, are not entirely appropriate for local use as each locale is different because of geographical, topographical and meteorological influences on air pollution.

Future research should be done in collaboration with mainland China and international experts and involve stakeholders such as public health regulators and private sector polluters.

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