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Air Pollution

China's public health danger

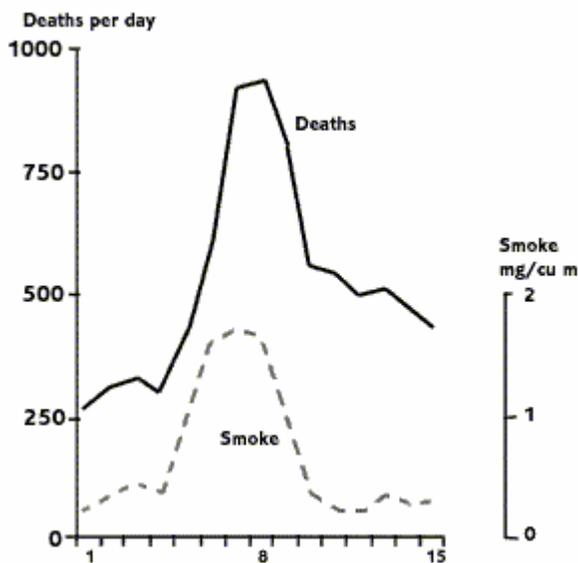
Air Pollution – China’s public health danger

The rapid pace of economic growth in the Asia Pacific region has been accompanied by resource depletion and environmental degradation. Air is the first element to get tainted by industrialization, with air quality becoming an increasingly important public health issue. China in particular has grappled with air pollution and frequent bouts of “haze” in recent years. Chinese smog has been recorded not only in Hong Kong but as far afield as America and Europe. Spire takes a look at how this impacts government, business and society.

Air raid

The Great Smog of London in December 1952 caused over 4,000 deaths, a result of rapid industrialization and urbanization. Dr Robert Waller, who worked at St Bartholomew’s Hospital in the early 1950s, believed that a shortage of coffins and high sales of flowers were the first indications that many people were being killed. “The number of deaths per day during and just after that smog was three to four times the normal level,” he said.

Figure 1: Death rate with concentrations of smoke



Source: Met Office, UK

The smog, which lasted for five days, was so bad that it infiltrated hospital wards. The death toll was not disputed by the authorities, but exactly how many people perished as a direct result of the fog is unknown. Many who died already suffered from chronic respiratory or cardiovascular complaints. Without the fog, though, they might not have died so early. Mortality from bronchitis and pneumonia increased more than seven-fold as a result of the fog (see Figure 1).

In an attempt to remedy the problem, tall smokestacks were built. However, the smokestacks only served to divert the contaminated air to the lakes and

forests of Scandinavia in the guise of acid rain.

It became apparent that air pollution could not be addressed by simply deflecting the route of the smoke. As long as the root causes persisted, the

problem would be manifested, albeit in varying forms. This realization finally prompted the government to introduce legislation to cut smoke emissions.

Half a century has passed since the Great Smog of London, yet the problem of global air pollution is actually worsening, brought about by industrialization and the growth of the emerging economies which house more than half of the world's population and account for 28 percent of global economic activity¹.

Clean air is an important prerequisite for sustainable economic development and is a basic requirement for human health and welfare. In addition, pollutants contribute to atmospheric problems such as acidification and global climate change, which have impacts on crop productivity, forest growth, biodiversity, buildings and cultural monuments.

WHO is today challenging governments around the world to improve air quality in their cities in order to protect people's health. The health consequences of exposure to polluted air are considerable – approximately 20 to 30 percent of all respiratory diseases appear to be caused by air pollution².

Air today, gone tomorrow

Some studies suggest that exposure to air pollution, from living near busy roads for example, is linked to respiratory problems that include reduced lung function, greater prevalence of asthma and respiratory symptoms such as wheezing, and even cardiovascular diseases.

Researchers have found that people living in cities face an increased risk of dying from a heart attack as a result of long-term exposure to air pollution. This increased risk was found to be as large as that associated with being a former smoker. These findings have been reported in the journal *Circulation*, published by the American Heart Association³.

Another 1994 report on the adverse effects of particulate air pollution, published in the *Annual Reviews of Public Health*, noted that for each 10 mg/m³ increase in particulate matter, cardiovascular mortality increased 1.4 percent and respiratory mortality increased at twice that level.

Premature deaths caused by air pollution are estimated at two million worldwide per year. More than half of this burden is borne by people in developing countries.

¹ United Nations Environment Program, Global Environment Outlook 2000

² Air Pollution in the Megacities of Asia (APMA) official website, 2007

³ Medical News Today, Air pollution's impact on the heart is as bad as having been a smoker , 16 Dec 2003

Urban air pollution in Asia

Air pollution is a chronic problem in many of Asia's megacities (ie. cities with a population of over ten million), such as Beijing, Delhi and Jakarta. Coal combustion in factories and power plants and the use of coal and wood for cooking and home heating are primarily to blame. However, automobiles are also an increasingly important contributor to air pollution in much of the world, with more than 600 million vehicles in use, a number that could double over the next 25 years.

A study by WHO has found that 12 of the 15 cities with the highest levels of particulate matter and half a dozen with the highest levels of sulphur dioxide are in Asia. In many countries in the region, the ambient concentration levels of suspended particulate matter and sulphur dioxide exceed WHO standards. Premature mortality and respiratory disease caused by poor air quality have been documented in 16 large metropolitan centres in the region (see Table 1).

Table 1: Impact of air pollution in large Asia Pacific cities

Health Benefits of Reducing Air Pollution in Large Asia Pacific Cities						
<i>Country</i>	<i>City</i>	<i>Population (millions)</i>	<i>Premature deaths (thousands)</i>	<i>Chronic bronchitis cases (thousand)</i>	<i>Respiratory symptoms (millions)</i>	<i>Health benefits from better air quality as a share of urban income (per cent)</i>
China	Beijing	7.0	10.3	81	270	28
	Chengdu	3.0	3.5	29	92	22
	Chongqing	4.0	6.3	44	172	30
	Guangzhou	3.8	2.0	16	51	10
	Harbin	3.1	4.0	34	102	24
	Jinan	2.5	5.0	38	135	38
	Shanghai	9.0	3.8	28	105	8
	Shenyang	4.0	4.9	38	129	23
	Tianjin	5.0	5.7	43	151	21
	Wuhan	4.0	2.0	17	51	9
	Xi'an	3.0	4.1	35	106	26
Indonesia	Jakarta	9.7	6.3	47	142	12
Korea, R. of	Seoul	11.3	2.4	24	72	4

Malaysia	Kuala Lumpur	1.5	0.3	4	11	4
Philippines	Manila	9.7	3.8	33	98	7
Thailand	Bangkok	7.5	2.8	28	82	7
Subtotal	China	48.4	51.6	403	1364	20
	Other countries	39.7	15.6	136	405	7
Total		88.1	67.2	539	1769	

Source: Hughes 1997

The problem is increasingly manifesting itself across national boundaries. Spiking air pollution in Asia has changed the atmosphere over the North Pacific. It is causing stronger-than-usual thunderstorms in winter and may even have wider effects on the global climate, according to a study published in the "Proceedings of the National Academy of Sciences"⁴. Pollution from China has been picked up in Lake Tahoe in the mountains of eastern California⁵. Satellite data has also tracked China's air pollution drifting towards Korea and Europe.

Being the world's most populous country and its fastest growing manufacturer, China's environmental problems are being closely watched by the international community.

Where there's smoke, there's fire – China's battle with air pollution

"If I work in your Beijing, I would shorten my life by at least five years," Zhu Rongji told city officials when he was Prime Minister in 1999. A year before, Beijing was announced the second runner-up for most polluted city in the world⁶. In 2005, satellite data revealed Beijing as air pollution capital of world⁷. China had 16 of the world's 20 most polluted cities in 2006, according to the World Bank.

Roughly two-thirds of the greenhouse gases (GHGs) in the earth's atmosphere are a result of coal and petroleum burning. China now burns more coal (one of the most pollutive of fossil fuels) than the US, Europe and Japan combined, as the country's economy expands. And unfortunately, around 70 percent of its mushrooming energy needs are supplied by coal-fired power stations. The pollution they generate, containing sulfur compounds, carbon and other coal byproducts, tend to cause respiratory damage, heart disease and cancer. The price paid for industrialization is the deaths of more than a hundred thousand people from heart and respiratory system diseases each year.

⁴ News Target Online, Asian pollution levels impact severity of Pacific storms, March 2007

⁵ The New York Times, 2007

⁶ Asian Economic News, Dec 2001

⁷ The Guradian, UK, Satellite data reveals Beijing as air pollution capital of world, 31 October, 2005

In 2006, China released 25.9 million tonnes of carbon dioxide. Consequently, over half of the 696 cities under the monitoring of the government have suffered from acid rain. It was estimated that acid rain covered one third of China's land area. From 2000 to 2005, the release of sulfur dioxide from steel companies and coal-fired power stations increased by 25 million tonnes, two-thirds higher than the goal set by the government.

The World Bank has concluded that pollution is costing China an estimated ten percent of its annual GDP in direct damage, such as the impact on crops of acid rain, medical bills, lost work from illness, money spent on disaster relief following floods and the implied costs of resource depletion. If nothing is done about the environment, economic growth could grind to a halt.

Certainly, awareness of China's environmental problems is rising among policymakers – reflected in a new package of right-sounding initiatives like a “green GDP” indicator to account for environmental costs. So is the pressure, from both internal and international sources, to fix them. But while all developing economies face this issue, there are historical, political and institutional reasons why resolving the crisis will be a long and complicated process in China.

Putting out the flames

Faced with severe air pollution driven by industrialization, the Chinese government is taking a proactive stance to tackle this problem. Its first step was signing the Kyoto Protocol to the United Nations Framework Convention on Climate Change in 2005.

Clean-up measures are now being announced thick and fast. In Beijing, after years of apparent inaction, a total ban on leaded petrol for cars was implemented within the space of just six months.

The authorities are also taking action against polluting factories. Some have been closed, and others are under threat if they do not drastically cut pollution by the end of 2007.

Beijing has plans to phase out coal use as well. "We're changing the energy structure of the whole city", said environment official Li Tiejun⁸. "First we tackled the small food stoves; now, in just two years, almost the whole catering industry has gone over to natural gas or electricity, and all small and medium size industrial boilers are using clean fuels... It's like London in the 1950s. Once you stop coal use the problem is solved."

The enthusiasm shown by the authorities has sparked a chain reaction among private companies. For example, the biggest taxi company in Shanghai, Dazhong, uses natural liquefied gas, rather than diesel, to eliminate black emission.

⁸ BBC News, China's Environmental Challenge, 17 November 2000

Recently, a 62-page climate change plan was unveiled and officials promised to put the issue at the heart of its energy policies.

There is some cause for optimism but progress on pollution is unlikely to be as rapid or uniform as the government and environmentalists desire.

Good intentions have so far had limited impact on the ground, due to China's vast, decentralized bureaucracy. As Ken Lieberthal, a China expert at the University of Michigan, explains: "Much of the environmental energy generated at the national level dissipates as it diffuses through the multi-layered state structure, producing outcomes that have little concrete effect."

The State Environmental Protection Administration (SEPA), the government's enforcement agency in the fight against pollution, is under-resourced with little funds and just a few hundred central staff. Around the country, SEPA's branches are tasked to monitor pollution, enforce standards and collect fines. But their salaries and pensions come from local governments – whose priorities are to maintain growth and employment in their jurisdiction – rather than from Beijing. This creates loyalty dilemmas. Typically, a bureau would impose a fine on a pollutive local enterprise but then pass the money on to the local administration, which refunds it to the company via a tax break. SEPA's impotence is the main reason why penalties, even when it can impose them, are absurdly light.

Chinese leaders have set tough new targets to reduce the use of energy per unit of economic output by 20 percent and pollution by 10 percent, between 2006 and 2010. However, China now accounts for almost half of the world's flat glass and cement production, more than a third of steel output and nearly as much of aluminium. Heavy industry consumes 54 percent of China's energy, up from 39 percent five years ago⁹. The rise of heavy industry explains why China failed to meet its pollution-cutting targets in 2006 and will find it hard to do so by the end of the decade.

In the final analysis, the Chinese government is reluctant to slow its rate of economic growth too much in order to meet environmental goals. In this regard, its stance is no different from that of most of the world's governments today. Moreover, it rightly points out that much of its air pollution is generated by the manufacture of cheap exports to developed countries, who should therefore bear part of the responsibility and costs.

Ma Kai, the chairman of the National Development and Reform Commission – the chief economic planning agency which also handles climate change – commented on China's stand when releasing the first national plan to combat global warming. He considered a country's stage of development, contribution to cumulative greenhouse gases in the atmosphere and per capita emissions the proper benchmarks. Measured by such indicators, China's contribution to the present problem was relatively small.

⁹ Financial Times online, China pollution fuelled by heavy industry, 1 May 2007

“Possible future emissions should not be used as an excuse to ask developing countries to undertake cuts and to do so in a way that is too early, too abrupt and too blunt,” he said. “The ramifications of limiting the development of developing countries would be even more serious than those from climate change.”¹⁰

A big green opportunity

But there is hope yet, as demonstrated by foreign companies flocking to China to build and sell environmental technologies. Vendors making everything from water purifiers to wind turbines and hydrogen-powered vehicles are flocking to China to sell their wares and services.

Business-to-business

Niche player Fuel Tech, global engineering firms Foster Wheeler and McDermott international, and industrial behemoths like General Electric (GE) are all positioning themselves to sell more low-emissions electric generation parts to China¹².

"If you're in the air pollution control business, you go to where the need is," said John Norris, chief executive of Fuel Tech, a company that makes products to reduce plants' nitrogen oxide emissions.

The National Development and Reform Commission (NDRC) has disclosed China's 15-year goal of shifting to renewable energy: by 2020, renewable energy sources are targeted to reach 16 percent of total energy capacity¹³. To reach this ambitious goal, the NDRC signed agreements in July with all provincial and municipal governments, as well as with 14 major state companies, laying out their specific responsibilities for energy saving. Industries involving hydro-energy, wind energy, solar energy, biomass energy and geothermal energy are highly-prepared for development.

China is currently encouraging leading companies like GE Power and Veolia of France to market technologies that will harness the methane gas produced from decomposing garbage and sewage, as well as the huge amounts of gas that escape from China's coal mines.

The other half of the air pollution equation is reducing harmful emissions from traditional energy usage. On this front, the China government has set ambitious targets.

Desulphurization technologies and facilities currently have a strong market in China, thanks to government initiatives. In 2005, the authorities unveiled a

¹⁰ Financial Times Limited 2007: China urges rich nations to lead on climate, 4 June 2007

¹² DowJones MarketWatch, China's smog + power demand = sales opportunity, June 2007

¹³ WordWatch Institute, China Needs to Move Quickly on Energy Savings, November 2006

detailed mandate mapping out how thousands of China's coal-fired power plants would be "desulphurized." The mandate encouraged power plants to equip themselves with desulphurization facilities and promised to defray the high costs.

One of the McDermott group's business units, Babcock & Wilcox, started supplying the Chinese market with industrial boilers in 1945 and large coal-fired steam generators in the 1980s. More recently, it entered the pollution abatement business by licensing its wet-fuel gas-desulphurization technology.

Foster Wheeler, a company that derives its revenues mainly from huge infrastructure projects, is selling Chinese power companies a type of boiler that cuts emissions of nitrogen oxide.

Indoor pollution could be an even greater contributor to respiratory diseases than outdoor pollutants. An estimated 64 percent of China's population use coal in their homes, and about 22 percent of rural homes rely on coal for domestic fuel¹⁴. China has, in fact, initiated ongoing programs to address the problems caused by household coal use. The government has also taken steps to promote energy-efficiency in buildings.

But it is likely to take years before China's appetite for cleaner power translates into sizeable earnings for firms that supply emissions-reducing power parts, say analysts. Among the hurdles, managers of China's centrally-planned economy are constantly weighing the increased costs of pollution controls against electricity demand. And sales to utilities take time.

Business-to-consumer

Short-term profits from fighting air pollution will mainly accrue in the consumer realm. For the second year in a row, an annual survey in 2006 showed that pollution was still the top complaint of expatriates in China¹⁵.

In China, there is a strong emphasis on preventative medicine – there is a large market for non-prescription products that promote overall health. The health supplement and pharmaceutical markets will benefit from preventive products and symptomatic treatments for respiratory diseases.

¹⁴ Environmental Health Perspectives, On a Different Scale: Putting China's Environmental Crisis in Perspective, October 2000

¹⁵ ChinaCSR.com, Annual Survey Shows Pollution Still Top Gripe of Expatriates in China, 2 February 2007

Table 2: China's Biggest Drug Sellers

Company	Sales (USD)*	YOY Growth*
Yangzijiang Pharmaceutical	\$215 million	38%
Pfizer	\$160 million	26%
AstraZeneca	\$133 million	32%
Roche	\$130 million	32%
Novartis	\$126 million	14%
Fresenius	\$112 million	18%
GlaxoSmithKline	\$103 million	-
*rolling 12 month period ending July 31, 200		

Source: IMS Health

US\$180m in China in that year¹⁸. "The growth in sales in the Chinese market was the highest of all L'Oreal companies in various parts of the world," said Paolo Gasparrini, President of L'Oreal (China).

The pharmaceutical market in China is currently worth an estimated US\$33.5 billion¹⁶, a profitable market that global pharmaceutical powerhouses can attest to (see Table 2).

The skincare industry, too, benefits from anti-oxidizing products. Cosmetics giant L'Oreal launched an initiative to fight pollution's effects on skin and hair back in 2003. The company's total sales reached

I do my part, you do yours

The China government clearly "gets it" when it comes to the environment. Numerous laws, regulations and targets have been issued by the government to address environmental issues and air pollution in particular. However China's current weak enforcement infrastructure means that its laws make too little impact on the ground. But there are signs that this will change in the coming years.

International agencies are increasingly tying funds to environmental criteria, while foreign governments are beginning to complain about China's dust storms and GHG emissions. An even bigger factor in accelerating change is the 2008 Olympics. Described as China's "coming-out party to the world", the Olympics have led to Beijing's government moving out factories and introducing clean-vehicle technology. In fact, the city has introduced natural gas in 2,100 buses and plans to have as many as 8,000 of such environmentally-friendly vehicles on the roads by the time the Olympic torch gets lit¹⁹.

On a macro scale, the Chinese Academy of Engineering and State Environmental Protection Administration has taken the lead to develop a study to explore and identify strategic guidelines, priorities and measures on the environmental protection of China. Formally launched in Beijing on May 11 2007, the implementation of this project is cited as a key step towards building an environmentally-friendly society.

¹⁶ Alberta Hong Kong Office official website, 2007

¹⁸ People's Daily Online, L'Oreal sales reached US\$180m in China last year, March 2004

¹⁹ Business Week, Cleaning up in China, June 2005

Although China has promised to put climate change at the heart of its energy policies, it says developed countries have an “unshirkable responsibility” to take the lead on the issue by cutting emissions. At the end of the day, China will make rapid progress in combating air pollution; it will improve the enforcement of laws and targets that have been promulgated by the authorities and this will provide growing opportunities to clean air technology vendors; however the pace of improvement will be dictated by the extent to which the world's rich nations are prepared to help shoulder the economic costs.