

# Pollution: China chokes under record levels of PM2.5

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In 2012, an estimated 8,572 premature deaths occurred in Shanghai, Guangzhou, Xi'an and Beijing. They were a direct result of high levels of PM2.5, according to a report co-authored by Peking University's School of Public Health and Greenpeace. Meanwhile, the World Health Organization estimates that air pollution caused approximately 470,000 premature deaths in 2008.

Continuous, large-scale pollution in the form of smog will create panic among the public and cause people to question the government's handling of environmental issues, according to the China Council for International Cooperation on Environment and Development.

The growth and severity of PM2.5 pollution in recent years is directly related to the rapid rise in coal consumption, allied to an increase in vehicle exhaust emissions. Although cities such as Beijing and Guangzhou are leading the way in the reduction of coal use in absolute terms, air pollution naturally moves with the air currents, meaning some cities share each other's polluted air. The Ministry of Environmental Protection is encouraging places such as the Beijing-Tianjin-Hebei region, the Yangtze River Delta and the Pearl River Delta to unite to combat pollution.

Since the start of the month, 74 large cities in China have provided daily readings of PM2.5 that are available to the public. As the data becomes more widely available, China is working on a national surveillance and risk-assessment network on the health impact of PM2.5, said Xu Dongqun, deputy director of the institute of environmental health and related product safety at the Chinese Center for Disease Control and Prevention.

"The planned network, the first of its kind on the mainland, will study the exact links between major pollutants, particularly PM2.5 and help the authorities to issue public health warnings ahead of the worst days whenever possible," she said.

By studying data from air-quality monitoring stations and records of hospital visits, plus medical and mortality records, the system will provide specific warnings and advice to help the public to protect themselves, explained Xu, although she was unable to provide an exact timetable.

The network will start in Beijing, before being rolled out nationwide as the air-quality monitoring data become more widely available across the mainland, she said. "The health impact of the fine particulates varies regionally and among differing population groups."

## Red light spells danger

"My friends and I have started to make jokes along the lines of 'Right now, it's healthier to smoke in Beijing than to breathe the air,'" said Camille Chanlair, a French national who has lived in the city since 2008. "They all avoid going out when they see the pollution. Some have bought air purifiers," he added.

"This is no joke, people! This is serious stuff. You should not be outside right now with your children. Everyone should be taking it easy and avoid

going outside," wrote Richard Saint Cyr, a general practitioner at a private hospital in Beijing, in a warning posted on his micro blog before he left work on Saturday evening.

Saint Cyr, who has lived in China for six years, said his clinic has a good air filter system. His 200-square-meter home is also equipped with three air purifiers. "Honestly, with this high level (of pollution) even three purifiers won't really be effective. But at least I can close my bedroom door overnight," said the US national.

Zhang Bo, general manager of Beijing Jijian Science & Technology Development Co, said the three air purifiers at his home in Beijing are so overloaded that the red lights (indicating heavy pollution) can't be disarmed.

"It usually takes each machine an average of one hour to purify the air (in one room). When that's done, the red light turns green. Now, it stays red all the time," he said, adding that the pollution is so bad that he won't venture out of doors if he can avoid it.

Saint Cyr said he has seen an unusually high number of people arriving at the clinic complaining of bad coughs and breathing and pulmonary problems. Most feel better after being treated with cough syrup, but the doctor emphasized that the best treatment is to avoid exposure to the pollutants.

"At these levels, people of all ages should really avoid going outside, if possible. These types of pollution spikes can be deadly for very sick and fragile people who are already weak from illness. Anyone with a normal cold or flu will find it much harder to

recover quickly in this polluted atmosphere," he said.

He recommended N95 filter respirators, a type of mask designed to combat PM2.5 and intended for those with no alternative to going outdoors. "They definitely stop PM2.5. The definition of N95 literally means it filters 95 percent of particulate matter — as small as PM0.3 microns, much smaller than PM2.5."

Unsurprisingly, sales of N95 masks surged tenfold on Friday and Saturday compared with the daily averages, according to data provided by Taobao and Tmall, two online marketplaces that together hold more than 70 percent of China's online retail market.

Local media in Beijing also reported that the capital's pharmacies have almost sold out of face masks, PM2.5-proof or not.

Saint Cyr emphasized that children and the elderly are especially vulnerable to spikes in air pollution and suggested that all school systems create air pollution "action plans" based on the science once the official hourly monitoring of PM2.5 begins nationwide.

## Emergency plans

In fact, there are no official guidelines or emergency plans specifically designed for schools, although some international schools in Beijing have formulated their own.

Officially, only Beijing and Shaanxi province have announced their own emergency plans for heavily polluted days. Friday's high level of pollution prompted Beijing's municipal government to put its emergency plan, unveiled on Dec 14, into action for the first time.

"Warnings have been released to the public through channels such as micro blogs, television and radio, urging people to reduce the amount of time they spend out of doors and to increase their use of public transport. Schools are being advised to arrange fewer outdoor activities for the kids," said a post on the official micro blog of the Beijing Municipal Environmental Protection Bureau.

It also emphasized that the government will "strengthen law enforcement and the frequency of inspections, ask the relevant plants to reduce emissions and arrange a 30 percent reduction in the use of official vehicles."

According to data released by the bureau on Sunday evening, 54 businesses in Beijing have cut their emis-

sions by 30 percent, 28 construction sites have stopped foundation work, Beijing Hyundai Motor Co temporarily halted production on Sunday and one production line has been suspended at Beijing Cement Plant Co.

While experts praised the warning as timely and precise, they also criticized the preventive measures for being too lax.

"I feel the restrictions on motor vehicles are still too light," said Pan Xiaochuan, a professor at Peking University's School of Public Health. "As the pollution occurred in the weekend instead of during the working week, the use of official vehicles had already been reduced naturally."

Pan emphasized that the current plan has no legal backup. "In some countries in Europe, at least half of the motor vehicles are barred from using the roads on heavily polluted days, according to law," he said.

Zhou Rong, director of the Greenpeace climate and energy project in Beijing, added that the smog has enveloped many provinces and therefore emergency plans employed by individual cities are unlikely to be satisfactory.

"A regional emergency action plan is required," she said. "We can expect a better solution, if the government will is there."

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Beijing saw PM2.5 density climb higher than 900 micrograms per cubic meter on Saturday. The World Health Organization considers 25 micrograms per cu m to be a safe daily level.



Visitors to Tian'anmen Square wearing face masks as protection against the heavy pollution.



ZOU HONG / CHINA DAILY

A man examines an air purifier in Beijing. During the weekend the capital and other cities in the Beijing-Tianjin-Hebei region were hit by severe air pollution.

## HAZARDOUS AIR

PM2.5 is easily inhalable and can penetrate deep into the lungs. PM2.5 allows many chemicals harmful to human health to be carried to the internal organs, causing a wide range of illnesses, including cancer (especially lung cancer), stroke and damage to unborn children. They have a strong association with most types of respiratory illnesses, heart disease and even deaths.

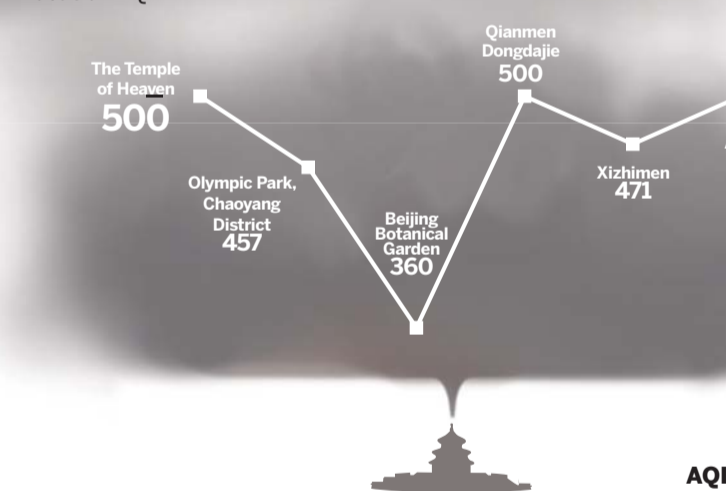
### BEIJING'S AIR QUALITY INDEX DATA IN THE PAST WEEK

(the AQI number when pollution peaks)



### AQI DATA IN BEIJING ON JAN 12

Location AQI



### THE UNFORTUNATE 500 JAN 12

Beijing Shijiazhuang Xingtai Hengshui Tangshan Nantong Zhengzhou



### GLOBAL ENERGY USAGE

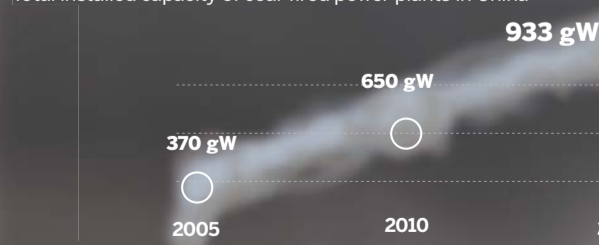
China accounted for 20.3 percent of global energy consumption in 2010, and this is likely to rise considerably.

### POLLUTION CONTROL

China plans to reduce emissions of nitrogen oxide and ammonia nitrogen by 10 percent below 2010 levels, and cut sulfur dioxide and chemical oxygen demand by 8 percent between 2011 and 2015, all of which is expected to create a market worth \$30 billion.

### LARGEST COAL CONSUMER

Total installed capacity of coal-fired power plants in China



### 2011 ELECTRICAL GENERATION

Hydro 14.03% Coal 82.54% Nuclear 1.85% Wind 1.55%



### AQI SCALE



**PM2.5:** Particles less than 2.5 micrometers in diameter are called "fine" particles. These particles, approximately 1/30 the average width of a human hair, can lodge deep in the lungs. Sources of fine particles include all types of combustion, including power plants, motor vehicles and residential wood burning.

### PM2.5 vs. Visibility

- 5-10 km**  
No special protection required
- 3-5 km**  
Reduce outdoor activities
- 2-3 km**  
Reduce outdoor activities, especially for respiratory patients; wear a mask outdoors; stop outdoor physical exercise
- Less than 2 km**  
Avoid all outdoor activities, especially for patients with respiratory ailments, however if outside wear a mask

### Groups sensitive to PM2.5:

People with cardiac or respiratory diseases, the elderly, pregnant women and children.

**Cardiovascular system:** Causes cardiotoxicity and severe irritation to the autonomic nervous system, which regulates the activity of the cardiac muscle.

**RESPIRATORY SYSTEM:** The soluble part of PM2.5 directly enters the bloodstream, while the insoluble part accumulates in the alveoli in the lungs, causing inflammation.

**BLOOD SYSTEM:** Causes blood toxicity, coagulation abnormalities and can trigger heart disease.

**REPRODUCTIVE SYSTEM:** PM2.5 are attached to various types of pollutants such as heavy metals and PAHs (a group of notable organic pollutants), causing placental blood toxicity that can harm fetuses, retardation of intrauterine growth and low birth weight in babies, especially when PM2.5 exposure happens in the first month of pregnancy.

GUILLERMO MUNRO / CHINA DAILY