AQLI Air Quality Life Index®

China Fact Sheet

For almost two decades, China remained one of the top five most polluted countries in the world. But after launching a successful "war against pollution" in 2014, China was able to reduce its particulate pollution by 39 percent—dropping the country from its top five ranking in recent years. In fact, from 2013 to 2018, almost three-quarters of the global reduction in particulate pollution came from China. If the reductions are sustained, China's people can expect to live 2.1 years longer. The Beijing-Tianjin-Hebei area, one of China's most polluted areas in 2013, saw a 41 percent reduction in particulate pollution, translating to a gain of 3.4 years of life expectancy for its 108 million residents, if sustained.

KEY TAKE-AWAYS

- Despite significant progress over a short time, China's particulate pollution is still three times the WHO guideline, making it the seventh most polluted country in the world.
- Ninety-nine percent of China's 1.4 billion people live in areas where the annual average particulate pollution level exceeds the WHO guideline. Forty-three percent live in areas where particulate pollution exceeds the national standard.
- If pollution were reduced to meet the WHO guideline, Chinese people could gain an additional 2.3 years onto their lives
- In parts of Hebei and Henan provinces, home to much of the country's coal and steel industries, residents could see their life expectancies rise by up to an additional 5 years if pollution levels met the WHO guideline.
- While Beijing saw a 37 percent reduction in particulate pollution from 2013-2018—gaining 2.7 years in life expectancy if the reduction is sustained—residents could further gain 1.2 years if the city's pollution met China's national standard, or 3.5 years if it met the WHO guideline.

Figure 1 · Change in Potential Gain in Life Expectancy Through Reducing PM2.5 to the WHO Guideline, 2013-2018

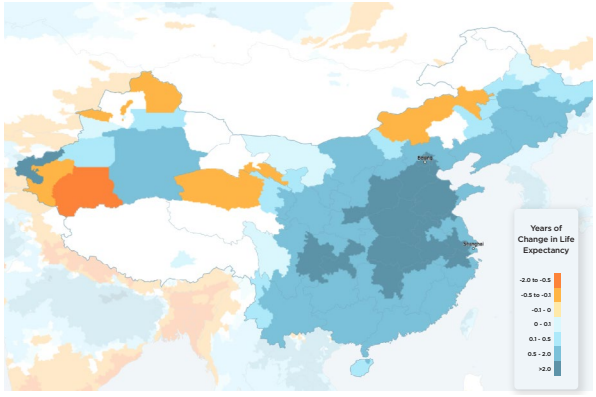
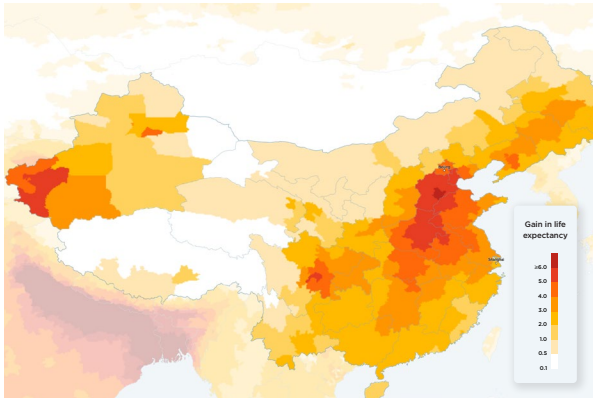


Figure 2 · Potential Gain in Years of Life Expectancy Through Permanently Reducing PM2.5 from 2018 Concentrations to the WHO Guideline



"The legacy of environmental improvement in former pollution capitals is evidence that today's pollution does not need to be tomorrow's fate. As countries navigate the dual challenges of sustaining economic growth and protecting the environment and public health, the AQLI shows not only the damage caused by pollution but also the enormous gains that can be made with policies to address it."

Michael Greenstone, The Milton Friedman Distinguished Service Professor in Economics, the College, and the Harris School; Director, EPIC

$PM_{2.5}$ Concentration and Potential Life Expectancy Gains in 25 Most Populous Prefectures.

		2013-2018		2018		
Prefectures	Population (Millions)	Percent Decrease in $PM_{2.5}$	Years of Life Expectancy Gained Due to $PM_{2.5}$ Reduction	$PM_{2.5}$ Concentration ($\mu g/m^3$)	Years of Life Expectancy Gain if $PM_{2.5}$ is Further Reduced to WHO Guideline	Years of Life Expectancy if $PM_{2.5}$ is Further Reduced to National Standard
Chongqing	**29.9**	**44%**	**2.5**	33	2.3	0.2
Shanghai	24	40%	2	30	1.9	0
Beijing	20.4	37%	2.7	46	3.5	1.2
Chengdu, Sichuan	13.9	42%	3.4	48	3.7	1.2
Tianjin	13.6	41%	3.5	51	4	1.6
Guangzhou, Guangdong	13.1	37%	1.5	26	1.6	0
Baoding, Hebei	11.6	37%	3.3	58	4.7	2.2
Harbin, Heilongjiang	11.1	30%	1.4	33	2.3	0.1
Suzhou, Jiangsu	10.8	41%	2.4	35	2.5	0.1
Shenzhen, Guangdong	10.8	40%	1.4	21	1.1	0
Nanyang, Henan	10.7	43%	3.4	45	3.4	1
Shijiazhuang, Hebei	10.6	46%	4.9	59	4.8	2.3
Linyi, Shandong	10.4	39%	2.6	42	3.1	0.7
Wuhan, Hubei	10.1	44%	3.3	43	3.2	0.7
Handan, Hebei	9.5	46%	4.8	57	4.6	2.2
Weifang, Shandong	9.5	38%	2.4	41	3	0.6
Wenzhou, Zhejiang	9.4	41%	1.5	22	1.2	0
Zhoukou, Henan	9.2	34%	2.8	56	4.5	2.1
Hangzhou, Zhejiang	9.1	41%	2.2	33	2.2	0.1
Qingdao, Shandong	9	37%	2	35	2.4	0.1
Zhengzhou, Henan	8.9	41%	3.9	56	4.5	2.1
Xi'an, Shaanxi	8.9	45%	2.8	36	2.6	0.2
Xuzhou, Jiangsu	8.8	38%	2.8	47	3.6	1.1
Ganzhou, Jiangxi	8.7	36%	1.3	24	1.4	0
Heze, Shandong	8.6	39%	3.3	54	4.3	1.9

POLICY IMPACTS

To achieve further improvements, the Chinese government announced in July 2018 a new plan to reduce pollution from 2018 to 2020. Regions that did not meet the national air quality standard of 35 µg/m3 would need to reduce particulate pollution by 18 percent relative to 2015 levels. Though the national targets are less ambitious than those set for 2013-2017, some prefectures set more stringent targets for themselves in their local five-year plans. For example, Beijing committed itself to a 30 percent reduction from 2015 levels by 2020.

THE SPEED OF CHINA'S PROGRESS

To put the scale and speed of China's progress into context, it's useful to compare it to the United States and Europe after their periods of industrialization. In the United States, following the passage of the Clean Air Act, it took almost three decades and five recessions to achieve about the same percent decline. In Europe, after their environment agency was created, it took about two decades and two recessions to achieve approximately China's percent reduction. To put it another way, the 2.1 years of life expectancy that China would gain if its recent reductions are sustained is larger than the 1.6 years of gain in life expectancy that the United States achieved from 1970 all the way to the present, and the 9-month gain Europe achieved from 1998 onward (more on the United States and Europe in the next section). At the same time, while China reduced its pollution by 39 percent, real per capita gross domestic product grew by 36 percent.

ABOUT THE AIR QUALITY LIFE INDEX (AQLI)

The AQLI is a pollution index that translates particulate air pollution into perhaps the most important metric that exists: its impact on life expectancy. Developed by the University of Chicago's Milton Friedman Dinstinguished Service Professor in Economics Michael Greenstone and his team at the Energy Policy Institute at the University of Chicago (EPIC), the AQLI is rooted in recent research that quantifies the causal relationship between long-term human exposure to air pollution and life expectancy. The Index then combines this research with hyper-localized, global particulate measurements, yielding unprecedented insight into the true cost of particulate pollution in communities around the world. The Index also illustrates how air pollution policies can increase life expectancy when they meet the World Health Organization's guideline for what is considered a safe level of exposure, existing national air quality standards, or user-defined air quality levels. This information can help to inform local communities and policymakers about the importance of air pollution policies in concrete terms.

Methodology: The life expectancy calculations made by the AQLI are based on a pair of peer-reviewed studies, Chen et al. (2013) and Ebenstein et al. (2017), co-authored by Michael Greenstone, that exploit a unique natural experiment in China. By comparing two subgroups of the population that experienced prolonged exposure to different levels of particulate air pollution, the studies were able to plausibly isolate the effect of particulates air pollution from other factors that affect health. The more recent of the two studies found that sustained exposure to an additional 10 µg/m3 of PM10 reduces life expectancy by 0.64 years. In terms of PM2.5, this translates to the relationship that an additional 10 µg/m3 of PM2.5 reduces life expectancy by 0.98 years. To learn more about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology