

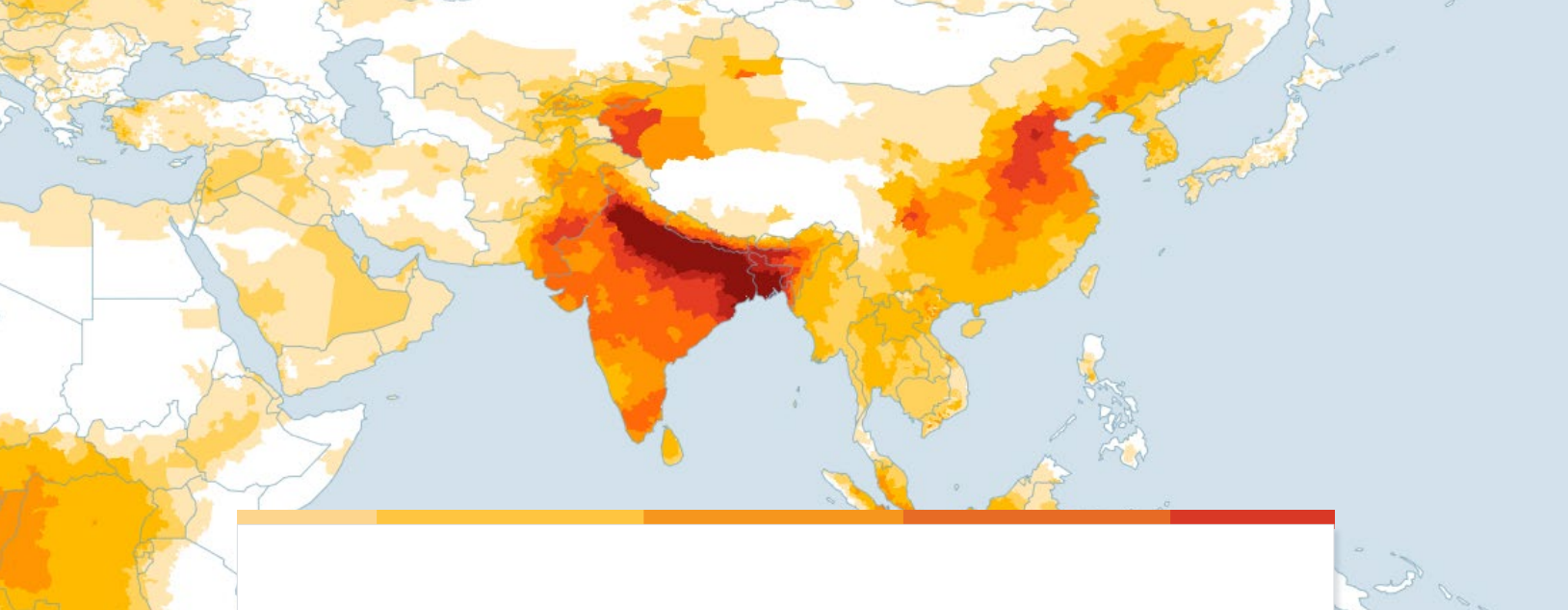


AIR QUALITY LIFE INDEX® | JULY 2020

Is China Winning its War on Pollution?

By Michael Greenstone and Claire Fan





SUMMARY

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 about 40 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 some 2 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.

INTRODUCTION

A New Age of Environmental Protection?

In China, public concern about worsening air pollution began rising in the late 1990s. Beginning in 2008, the U.S. embassy in Beijing began publicly posting readings from its own air quality monitor on Twitter and the State Department website, and residents quickly pointed out discrepancies with the local government’s air quality reports. In 2013, China experienced some of its highest pollution levels to that point, and public criticism reached new heights. At the same time, in the summer of 2013, EPIC Director Michael Greenstone and three co-authors published a study in the Proceedings of the National Academy of Sciences that found high air pollution had cut the lifespans of people living in northern China short by about five years compared to those living in the south. The severity of the problem was clear.

With the Chinese public growing increasingly concerned about the pollution problem and demanding action, China responded with concrete policy initiatives. The couits National Air Quality Action Plan in the fall of 2013, laying out specific targets to improve air quality by the end of 2017. Included in the mammoth \$270 billion initiative were plans to reduce annual average PM_{2.5} concentrations in the densely populated Beijing-Tianjin-Hebei area by 25 percent and by 15 percent and 20 percent in the Pearl and Yangtze River Delta regions, respectively. Beijing, which had additionally set aside \$120 billion to fight pollution, would need to reduce PM_{2.5} levels to below 60 µg/m3, or a 34 percent decline from its 2013 average of 91 µg/m3. Across all urban areas, concentrations of PM₁₀would need to fall by at least 10 percent relative to 2012 levels.

At the next annual meeting of the National People’s Congress, in January 2014, Premier Li Keqiang declared a “war against

pollution.” The timing of the declaration—at the kickoff of a nationally televised conference typically reserved for discussing key economic targets—marked an important shift in the country’s long-standing policy of prioritizing economic growth over concerns about environmental protection. It also marked an important change in the government’s official rhetoric about the country’s air quality. In the past, state media had deflected concerns about air quality by claiming poor visibility was due to “fog” and that emissions had no effect on levels of smog. Now, the government stressed environmental responsibility, stating the country could not “pollute now and clean up later” and would fight pollution with “an iron fist.”

The government’s strategies for achieving its goals included building pollution reduction into local officials’ incentives so promotions depended on both environmental audits and economic performance; prohibiting new coal-fired plants in some regions and requiring existing coal plants to reduce emissions or be replaced with natural gas; increasing renewable energy generation; reducing iron and steel making capacity in industry; restricting the number of cars on the road in large cities; and increasing transparency and better enforcing emissions standards. In 2013-2014, the government rolled out a nationwide network of air quality monitors that report pollution readings automatically. Statistical analysis shows that this network has alleviated the problem of underreporting of pollution concentrations by government officials, hence making accurate real-time air pollution information available to the public so they can take appropriate defensive measures.

Table 1: China National Action Plan on Air Pollution Prevention and Control

Goal 1	Lower urban concentrations of PM ₁₀ by 10 percent relative to 2012 levels; gradually increase the number of days with fairly good air quality.
Goal 2	Reduce concentrations of PM _{2.5} In the Beijing-Tianjin-Hebei, Pearl River Delta, and Yangtze River Delta by 25 percent, 20 percent, and 15 percent, respectively.
Goal 3	Reduce the annual PM _{2.5} concentrations in Beijing to below 60 µg/m³.

RESULTS

Unprecedented Progress

Due to a robust set of actions, all of the targets set by the National Air Quality Action Plan were achieved. As a result, between 2013 and 2018, particulate pollution exposure declined by an average of 39 percent across the Chinese population. If that reduction is sustained, it would equate to a gain in life expectancy of 2.1 years. In fact, almost three-quarters of the global reduction in particulate pollution from 2013 to 2018 came from China. China was among the five most polluted countries in the world each year from 1998 to 2016, but fell out of the top five in 2017 and 2018. 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.

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.

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Michael Greenstone, Milton Friedman
Distinguished Service Professor in Economics;

The Next Battle

China’s government remains acutely aware that the country’s air pollution is still a serious problem—the average particulate pollution concentration in 2018 was more than three times the WHO guideline. To achieve further improvements, the government announced in July 2018 a new plan for 2018-2020. 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.

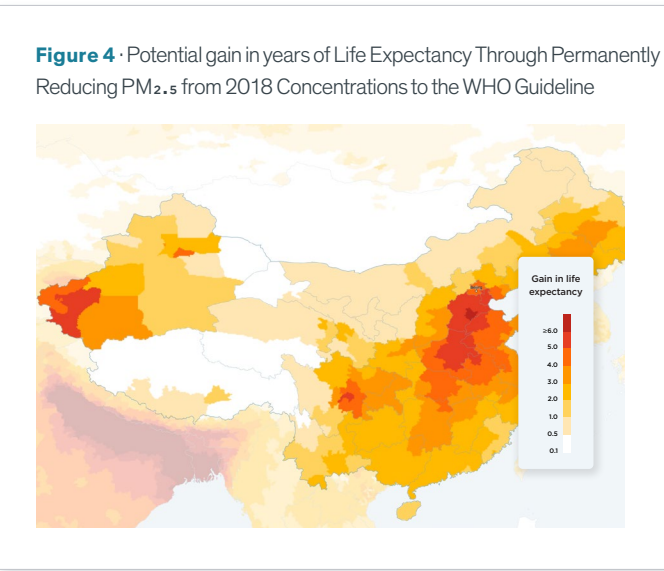
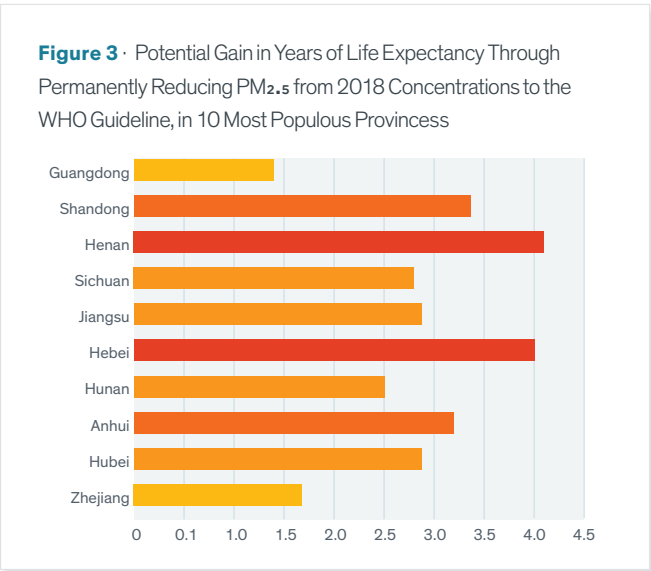
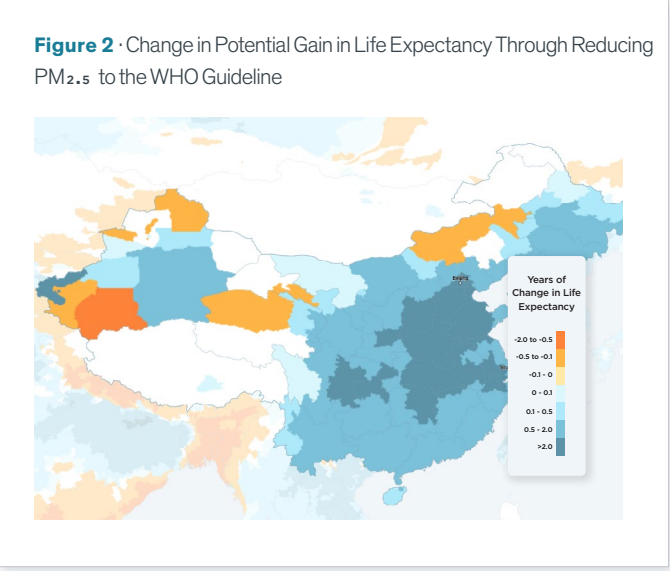
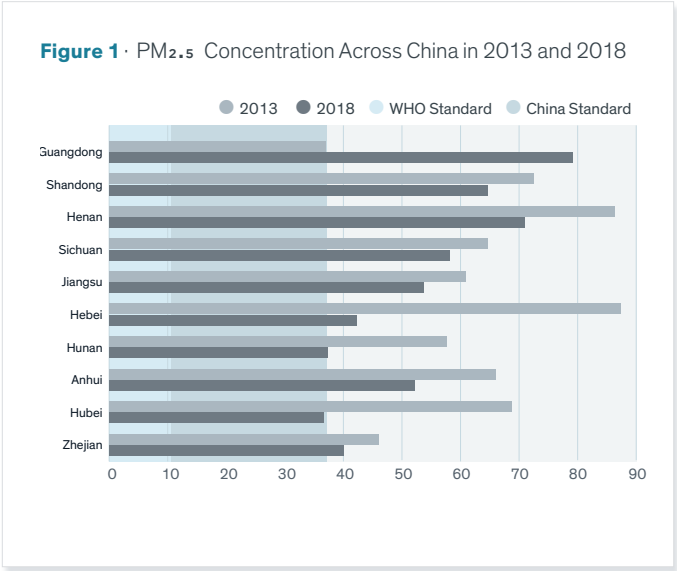
As the seventh most polluted country in the world as of 2018, meeting the new set of pollution targets is critical to the health of the Chinese people. Ninety-nine percent of China’s 1.4 billion people live in areas where the annual average particulate pollution level exceeds the WHO guideline. Forty-three 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, the impact could be even greater. 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. Further, 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 gain an additional 1.2 years if the city’s pollution met China’s national standard, or 3.5 years if it met the WHO guideline.

CONCLUSION

The National Action Plan of 2013 aimed for a future of clean air and blue skies. While China’s particulate pollution is still three times the WHO guideline, the country has seen an unprecedented improvement in air quality and has met its air quality goals under the 2013 plan. Existing gains have already made a significant impact on public welfare—if these new pollution levels are sustained, residents of China can expect to live on average 2.1 years longer. The 39 percent reduction

in particulate pollution in just five years is truly remarkable by any measure. By comparison, in the United States it took almost three decades and five recessions to achieve about the same percent decline after the passage of the Clean Air Act.

Looking forward, it is apparent that longer-term solutions are still needed. Indeed, the Ministry of Environmental Protection has set a new three-year air quality plan to win what the central government considers one of “the three tough battles” China faces in the years ahead (poverty alleviation also being one). With economic growth remaining a priority in China, there are great opportunities to embrace market approaches—like taxes and cap-and-trade markets for pollution. These approaches would better facilitate growth than the engineering-style fiat tactics used frequently thus far in China’s “war against pollution.”



Appendix Table I Pollution and Life Expectancy Gains in China’s Most Populated Prefectures

Prefecture	2013-2018			2018		
	Population (Millions)	Percent Decrease in PM	Years of Life Expectancy Gained Due to PM Reduction	PM Concentration (µg/m ³)	Years of Life Expectancy Gain if PM is Further Reduced to WHO Guideline	Years of Life Expectancy if PM 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

About the Authors



Michael Greenstone

Michael Greenstone is the Milton Friedman Distinguished Service Professor in Economics, the College, and the Harris School, as well as the Director of the Becker Friedman Institute and the interdisciplinary Energy Policy Institute at the University of Chicago. Greenstone’s research, which has influenced policy globally, is largely focused on uncovering the benefits and costs of environmental quality and society’s energy choices. As the Chief Economist for President Obama’s Council of Economic Advisers, he co-led the development of the United States Government’s social cost of carbon. Additionally, he has been researching the impacts of particulate pollution on human well-being for more than two decades, including work that plausibly quantified the causal relationship between long-term human exposure to particulate pollution and life expectancy. This work is the basis of the Air Quality Life Index.



Qing (Claire) Fan

Qing (Claire) Fan is a Pre-Doctoral Fellow with the Energy Policy Institute at the University of Chicago (EPIC), where she works for Director Michael Greenstone on a variety of energy and environmental economics projects. She earned her bachelor’s in mathematics with a minor in economics in 2018 from Pomona College in California. While at Pomona, Claire conducted a field study on attitudes toward sustainable agriculture in farming communities in Punjab, India, and worked on research in applied mathematics and on the economics of social enterprise. Claire is interested in the intersection of environmental and development economics, including the social impacts of climate change, and food and agriculture.

ABOUT THE AIR QUALITY LIFE INDEX®

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 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.

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ABOUT EPIC

The Energy Policy Institute at the University of Chicago (EPIC) is confronting the global energy challenge by working to ensure that energy markets provide access to reliable, affordable energy, while limiting environmental and social damages. We do this using a unique interdisciplinary approach that translates robust, data-driven research into real-world impacts through strategic outreach and training for the next generation of global energy leaders.

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