# AQLI Air Quality Life Index®

# China Fact Sheet

China's pollution has been decreasing since the country began a "war against pollution" 7 years ago. This decline continued through 2020, with pollution levels down about 40 percent compared to 2013. Due to these improvements, the average Chinese citizen can expect to live 2 years longer, provided the reductions are sustained. Nevertheless, work remains. While China's overall $PM_{2.5}$ pollution average is in compliance with its national average (35 µg/m³), pollution levels still significantly exceed the WHO guideline of 5 µg/m³.

## KEY TAKE-AWAYS

- Despite tremendous progress over the past few years, China is still the 9th most polluted country in the world. And, Beijing is still 3 times more polluted than Los Angeles, the most polluted city in the United States.
- Even though China's overall $PM_{2.5}$ average is in compliance with the national standard, 37.9 percent of the population still lives in areas where the pollution levels don't comply with the country's own national standard.
- Of China's 1.4 billion people, 99.9 percent still live in areas that exceed the WHO particulate pollution guideline. If the current pollution levels persist, China stands to lose 3.6 billion life years.
- If China were to bring its particulate pollution down to the level recommended by the WHO, it would lead to an increase in average life expectancy of a Chinese citizen by 2.6 years.
- In Shijiazhuang, the most polluted prefecture of China, an average person stands to gain 5 years of life expectancy on average if $PM_{2.5}$ pollution is reduced to the WHO guideline.
- The Beijing-Tianjin-Hebei (BTH) region continues to be the most polluted region in Mainland China, a record that it has held since 1998 (see Figure 3).[1]

**Figure 1** · Potential Gain in Years of Life Expectancy through Permanently Reducing $PM_{2.5}$ from 2020 Concentrations to the WHO Guideline

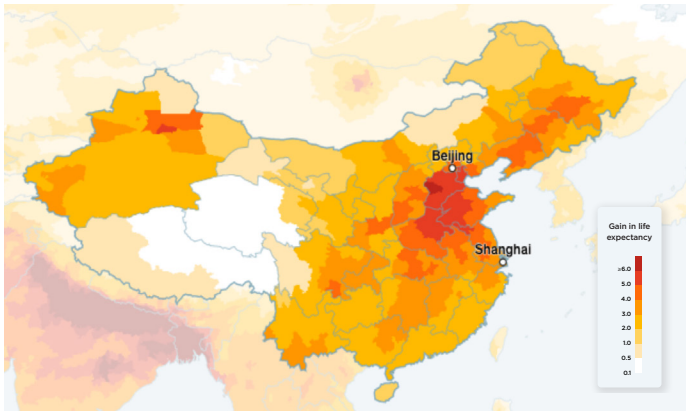
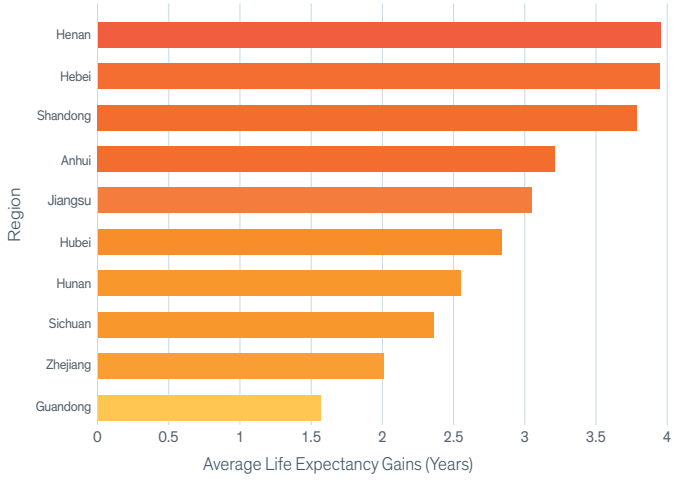



**Figure 2** · Potential Gain in Life Expectancy from Reducing $PM_{2.5}$ to the WHO Guideline in 10 most populous regions of China




## POLICY IMPACTS

China has made tremendous progress in reducing its pollution but still has a long way to go. More than a third of China' population, 37.9 percent, still lives in areas where the pollution levels don't comply with the country's own national standard. If these areas were to comply with the national standard that would result in 404.7 million life years saved. An individual living in these areas would gain 9.1 months of life expectancy on average if the pollution is brought down to the levels as prescribed by the national standard. Furthermore, if these areas were to comply

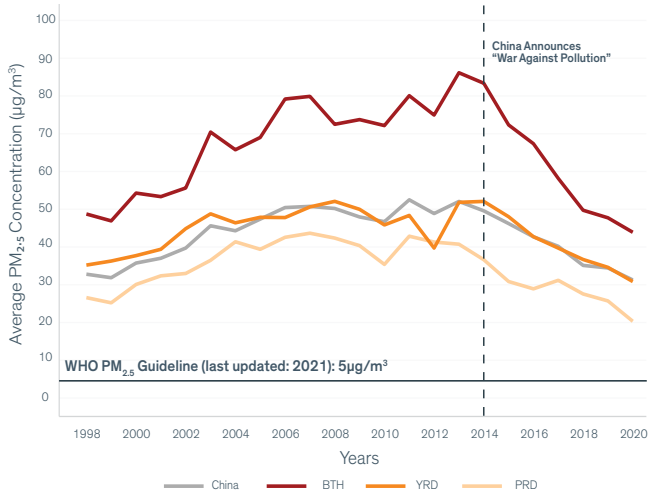
1 PRD stands for Pearl River Delta and it includes the dense network of cities that covers nine prefectures of the province of Guangdong, namely Dongguan, Foshan, Guangzhou, Huizhou, Jiangmen, Shenzhen, Zhaoqing, Zhongshan and Zhuhai and the Special Administrative Regions of Hong Kong and Macau. YRD stands for Yangtze River Delta and it includes Shanghai, Jiangsu and Zhejiang. BTH stands for Beijing-Tianjin-Hebei. It is important to note that our definition of the YRD region includes the entire Jiangsu and Zhejiang areas. Others may define the YRD region differently than how we have defined it in this report.

# Potential Life Expectancy Impacts of Particulate Pollution Reductions in the 25 Most Populous Regions of China:

with the WHO guideline of 5 μg/m³, an average individual in these areas could see 3.7 years added to their lives on average over their lifetime.

To this point, China has relied on command-and-control measures to swiftly reduce pollution. While the measures have worked, they have come with significant economic and social costs. As China now enters the next phase of its "war against pollution," the long-run durability of its actions will be enhanced by minimizing the costs. Relying on market-based approaches (e.g. an emissions trading scheme) is a possible solution that can effectively and inexpensively reduce pollution.

**Figure 3** · $PM_{2.5}$ Concentrations in Major Regions in Mainland China Over Time (1998 to 2020)




| Prefectures | Population Millions | $PM_{2.5}$ Concentration, 2020 μg/m³ | Years of Life Expectancy Gain Through Reducing $PM_{2.5}$ Concentration: From 2014 to 2020 Concentrations | From 2020 to WHO Guideline of 5μg/m³ | From 2020 to National Standard of 35μg/m³ |
|---|---|---|---|---|---|
| Chongqing | 30 | 29 | 2.1 | 2.3 | 0 |
| Shanghai | 24.1 | 28.1 | 1.7 | 2.3 | 0 |
| Beijing | 20.5 | 37.9 | 4.1 | 3.2 | 0.3 |
| Chengdu | 13.9 | 35.4 | 2.1 | 3 | 0 |
| Tianjin | 13.6 | 47.4 | 3.2 | 4.2 | 1.2 |
| Guangzhou | 13.2 | 22.8 | 1.9 | 1.7 | 0 |
| Baoding | 11.6 | 46.2 | 5.4 | 4 | 1.1 |
| Harbin | 11.1 | 40.7 | 1.9 | 3.5 | 0.6 |
| Suzhou | 10.8 | 31.2 | 2.4 | 2.6 | 0 |
| Shenzhen | 10.8 | 19.1 | 1.3 | 1.4 | 0 |
| Nanyang | 10.7 | 39 | 1.8 | 3.3 | 0.4 |
| Shijiazhuang | 10.6 | 56 | 4.8 | 5 | 2.1 |
| Linyi | 10.5 | 43.5 | 1.6 | 3.8 | 0.8 |
| Wuhan | 10.1 | 36.9 | 3.6 | 3.1 | 0.2 |
| Handan | 9.5 | 48.5 | 3.5 | 4.3 | 1.3 |
| Weifang | 9.5 | 42.8 | 1.3 | 3.7 | 0.8 |
| Wenzhou | 9.5 | 24.3 | 1.5 | 1.9 | 0 |
| Zhoukou | 9.3 | 47 | 1.4 | 4.1 | 1.2 |
| Hangzhou | 9.1 | 28.6 | 2.8 | 2.3 | 0 |
| Qingdao | 9.1 | 34 | 1.4 | 2.8 | 0 |
| Zhengzhou | 9 | 47.3 | 2.5 | 4.1 | 1.2 |
| Xuzhou | 8.9 | 48.9 | 1.3 | 4.3 | 1.4 |
| Xi'an | 8.9 | 44.5 | 1.2 | 3.9 | 0.9 |
| Ganzhou | 8.7 | 21.3 | 1.7 | 1.6 | 0 |
| Heze | 8.6 | 51.2 | 1.4 | 4.5 | 1.6 |

## 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 Distinguished 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 $PM_{10}$ reduces life expectancy by 0.64 years. In terms of $PM_{2.5}$, this translates to the relationship that an additional 10 μg/m³ of $PM_{2.5}$ reduces life expectancy by 0.98 years. To learn more about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology