South Korea Fact Sheet

AQLI Air Quality Life Index®

Fine particulate air pollution ($PM_{2.5}$) shortens the average South Korean's life expectancy by 1.5 years, relative to what it would be if the World Health Organization (WHO) guideline of 5 µg/m³ was met.[1] Some areas of South Korea fare much worse than average, with air pollution shortening lives by 2.1 years in Gyeyang.

KEY TAKEAWAYS

- All of South Korea's 51.4 million people live in areas where the annual average particulate pollution level exceeds the WHO guideline; 98 percent of the population lives in areas that exceed the country's own national air quality standard of 15 µg/m³.
- From 1998 to 2021, average annual particulate pollution increased by 9 percent. Particulate pollution has declined by 15.4 percent since 2014. In 2021, particulate pollution was the lowest it has been in the last eighteen years. Still, average particulate pollution is 4 times the WHO guideline.
- In the most polluted regions of the country—Gyeyang, Bucheon and Bupyeong—residents are on track to lose 2 years of life expectancy on average relative to the WHO guideline and 1.1 years relative to the national standard if the current pollution levels persist.
- If Seoul—the capital city of South Korea—were to reduce particulate pollution to meet the WHO guideline, its residents would gain 15.5 million total life years.

Figure 1 · Potential gain in life expectancy from permanently reducing $PM_{2.5}$ from 2021 concentration to the WHO guideline

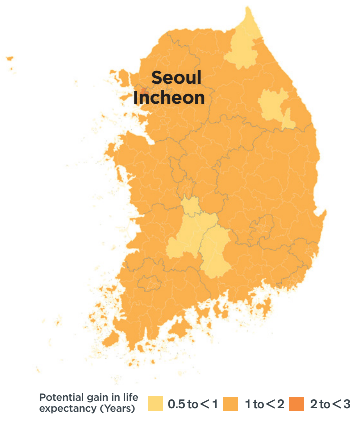
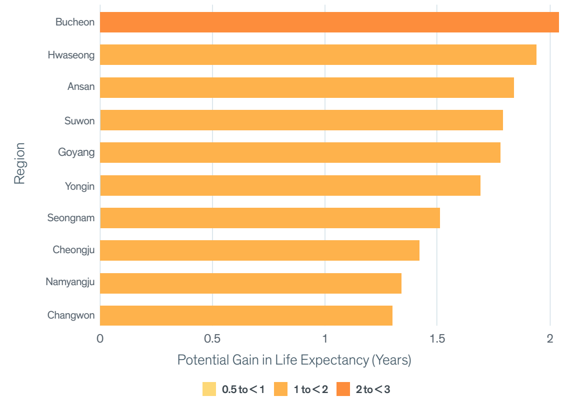


Figure 2 · Potential gain in life expectancy from reducing $PM_{2.5}$ from 2021 levels to the WHO guideline in the 10 most populous regions of South Korea

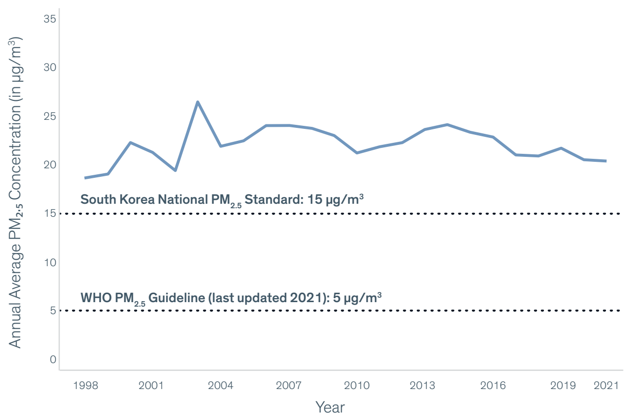


1 This data is based on the AQLI 2021 dataset. All annual average $PM_{2.5}$ values (measured in micrograms per cubic meter: µg/m³) are population weighted.

Potential life expectancy impacts of particulate pollution reductions in the 25 most populous regions of South Korea

Region	Population (millions)	$PM_{2.5}$ concentration 2021 (in µg/m³)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentrations to the WHO guideline of 5 µg/m³ (years)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentrations to the national guideline of 15 µg/m³ (years)
Suwon	1.3	23.2	1.8	0.8
Goyang	1	23.2	1.8	0.8
Changwon	1	18.3	1.3	0.3
Yongin	1	22.3	1.7	0.7
Seongnam	1	20.4	1.5	0.5
Bucheon	0.9	25.8	2	1.1
Cheongju	0.8	19.5	1.4	0.4
Ansan	0.8	23.8	1.8	0.9
Hwaseong	0.7	24.8	1.9	1
Namyangju	0.7	18.7	1.3	0.4
Jeonju	0.6	19.2	1.4	0.4
Cheonan	0.6	20.2	1.5	0.5
Songpa	0.6	20.1	1.5	0.5
Anyang	0.6	22.6	1.7	0.8
Dalseo	0.6	18.3	1.3	0.3
Gangseo	0.6	24.2	1.9	0.9
Bupyeong	0.5	25.7	2	1
Nowon	0.5	19.2	1.4	0.4
Namdong	0.5	25.2	2	1
Gimhae	0.5	19.1	1.4	0.4
Gangnam	0.5	20.5	1.5	0.5
Seo	0.5	25	2	1
Gwanak	0.5	23.1	1.8	0.8
Pyeongtaek	0.5	24.5	1.9	0.9
Pohang	0.5	17.8	1.3	0.3

Figure 3 · Annual average $PM_{2.5}$ concentration in South Korea, 1998-2021



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 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, satellite measurements of global particulate matter ($PM_{2.5}$), yielding unprecedented insight into the true cost of 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 particulate air pollution from other factors that affect health. Ebenstein et al. (2017) 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. This metric is then combined with sea-salt and mineral dust removed satellite-derived $PM_{2.5}$ data. All 2021 annual average $PM_{2.5}$ values are population-weighted and AQLI's source of population data is https://landscan.ornl.gov/. We are grateful to the Atmospheric Composition Analysis Group, based at the Washington University in St. Louis for providing us with the satellite data. The original dataset can be found here: https://sites.wustl.edu/acag/datasets/surface-pm2-5/. To learn more deeply about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology.