AQLI Air Quality Life Index® | Nepal Fact Sheet

An average Nepalese resident could live 3.3 years longer if particulate pollution ($PM_{2.5}$) was reduced to meet the World Health Organization (WHO) guideline of 5 µg/m^3.[1,2] In Nepal's most polluted regions, the districts of Rautahat, Mahottari, and Bara, individuals could gain more than 5.2 years of life expectancy (Figure 1).

KEY TAKE-AWAYS

- Particulate pollution is the greatest external threat to life expectancy in Nepal. While particulate pollution takes 3.3 years off the life of the average Nepalese resident, tobacco use and dietary risks reduce average life expectancy by 1.9 and 1.3 years, respectively (Figure 2).
- The entire population of Nepal is exposed to air with particulate concentrations that exceed the WHO guideline. In Madesh, the most polluted province in Nepal, an average resident could gain 5.2 years of life expectancy if particulate pollution were reduced to meet the WHO guideline. In Koshi, the second most polluted province, residents could gain 3.6 years (Figure 3).
- Residents in the mid and eastern Terai region, where nearly 40 percent of Nepal's population lives, could gain 4.7 years of life expectancy if the WHO guideline was met.[3] In the capital city of Kathmandu—Nepal's most populous city—residents could gain 2.6 years of life expectancy.
- From 1998 to 2023, particulate concentrations in the country increased by 74 percent, further reducing life expectancy by 1.6 years (Figure 4).

Figure 1 · Potential gain in life expectancy from permanently reducing $PM_{2.5}$ from 2023 concentration to the WHO guideline

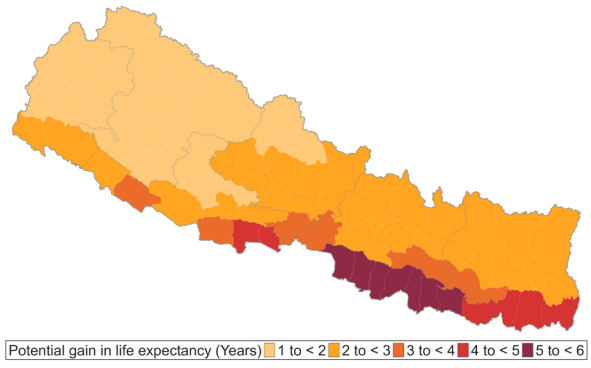
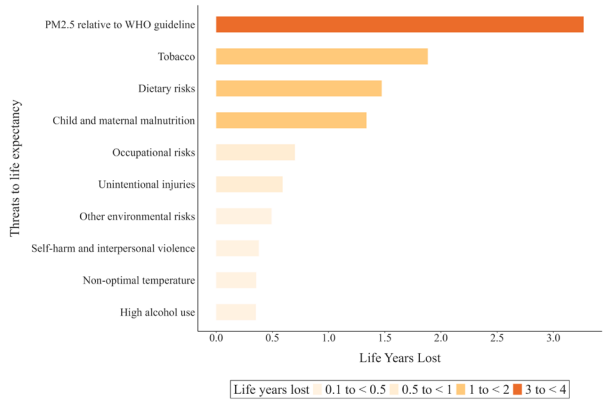


Figure 2 · Top 10 external threats to life expectancy in Nepal



Sources: Global Burden of Disease (https://vizhub.healthdata.org/gbd-results/) level-2 causes and risks data and WHO Life Tables (https://apps.who.int/gho/data/node.main.LIFECOUNTRY?lang=en) were combined with the Life table method to arrive at these results. "PM2.5 relative to WHO Guideline" bar displays the reduction in life expectancy relative to the WHO guideline as calculated by the latest AQLI (2023 PM2.5 concentrations) data.

1 This data is based on the data used in AQLI Annual Update 2025 and considers $PM_{2.5}$ concentrations for 2023. All annual average $PM_{2.5}$ values (measured in micrograms per cubic meter: µg/m^3) are population weighted.

2 World Health Organization. WHO Global Air Quality Guidelines: Particulate Matter ($PM_{2.5}$ and PM_{10}), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. Geneva: World Health Organization, 2021. https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1.

3 We define the mid and eastern Terai region as the following districts : Kapilbastu, Rupandehi, Nawalparasi West, Nawalparasi East, Parsa, Bara, Rautahat, Sarlahi, Mahottari, Dhanusha, Siraha, Saptari, Sunsari, Morang, Jhapa.

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

District	Population (Millions)	Annual Average 2023 $PM_{2.5}$ Concentration (µg/m³)	Life Expectancy Gains from reducing $PM_{2.5}$ from 2023 concentration to WHO $PM_{2.5}$ guideline of 5 µg/m³ (years)	Life Expectancy Gains from reducing $PM_{2.5}$ from 2023 concentration by 30 percent (years)
Kathmandu	2	31.8	2.6	0.9
Morang	1.1	50.2	4.4	1.5
Rupandehi	1	48.8	4.3	1.4
Jhapa	1	46.5	4.1	1.4
Sarlahi	0.9	56.6	5.1	1.7
Kailali	0.9	34.1	2.9	1
Dhanusha	0.9	58.6	5.3	1.7
Sunsari	0.9	50.4	4.4	1.5
Bara	0.8	58.9	5.3	1.7
Rautahat	0.8	59.5	5.3	1.7
Siraha	0.8	56.2	5	1.7
Saptari	0.8	54.3	4.8	1.6
Mahottari	0.7	59.2	5.3	1.7
Parsa	0.7	58.7	5.3	1.7
Chitawan	0.7	42.8	3.7	1.3
Kapilbastu	0.7	44.3	3.9	1.3
Dang	0.6	25.8	2	0.8
Banke	0.6	35.8	3	1.1
Kaski	0.6	29	2.4	0.9
Kanchanpur	0.5	32.7	2.7	1
Lalitpur	0.5	29.3	2.4	0.9
Bardiya	0.5	35.5	3	1
Makawanpur	0.5	34.1	2.9	1
Kabhrepalanchok	0.4	29.2	2.4	0.9
Surkhet	0.4	21.8	1.6	0.6

Figure 3 · Potential gain in life expectancy from reducing $PM_{2.5}$ from the 2023 levels to the WHO guideline in all provinces of Nepal

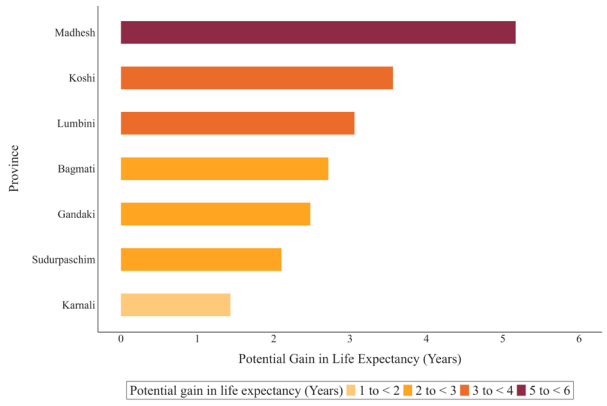
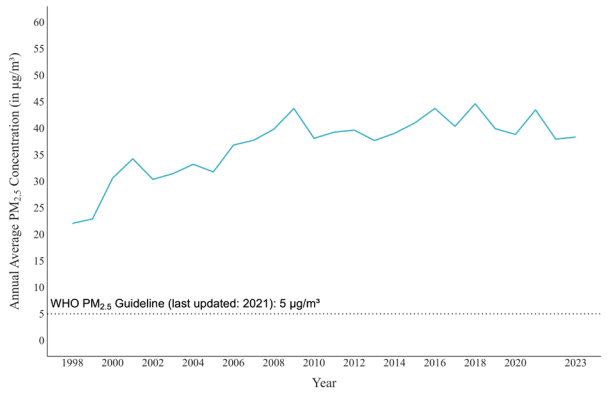


Figure 4 · Annual average $PM_{2.5}$ concentration in Nepal, 1998-2023



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 2023 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 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.