Southeast Asia Fact Sheet

AQLI Air Quality Life Index®

Virtually all of Southeast Asia's 673.7 million people live in areas where fine particulate air pollution ($PM_{2.5}$) exceeds the World Health Organization (WHO) guideline of 5 µg/m³.[1] Particulate pollution reduces the life expectancy of the average resident of Southeast Asia by 1.6 years relative to what it would be if the WHO guideline was met.[2] Combined, the 11 countries that comprise this region lose 1.1 billion total life years to air pollution.

KEY TAKEAWAYS

- **Myanmar:** Myanmar is the most polluted country in Southeast Asia. Air pollution shortens the average resident's life expectancy by 2.9 years relative to the WHO guideline. In the country's most populated regions, Yangon and Mandalay, the average resident loses 2.7 and 3.4 years of life expectancy, respectively. In the union territory of Nay Pyi Taw, the country's capital, the average resident loses 3.3 years of life expectancy.
- **Cambodia:** From 1998 to 2021, particulate pollution increased 41.4 percent in Cambodia—making Cambodia the country in Southeast Asia with the largest increase in pollution during this time period. If Cambodia were to reduce pollution to meet the WHO guideline, the average resident would gain 1.5 years of life expectancy. In Phnom Penh, the capital of Cambodia and its largest city, residents would gain 1.6 years.
- **Indonesia:** At 272 million residents, Indonesia is the most populated country of Southeast Asia. The average resident of Indonesia loses 1.4 years of life expectancy relative to if the WHO guideline was met. In the Special Capital Region of Jakarta, which is also the most polluted province of the country, residents lose 2.4 years of life expectancy relative to the WHO guideline.[3] In Deli Serdang and Bogor, residents are losing an average of 2.9 and 2.5 years of life expectancy, respectively.
- **Vietnam:** Vietnam is the third most polluted country in Southeast Asia. The average resident of Vietnam loses 2 years of life expectancy due to particulate pollution levels that exceed the WHO guideline. If air quality were improved to meet the WHO guideline, life expectancy would increase by 2.6 years in Hồ Chí Minh City, the most populated city in the country. In Hà Nội, the capital of Vietnam and its second largest city, 8.6 million residents would see their life expectancy increase by 3 years on average.
- **Thailand**: The average resident of Thailand loses 1.8 years of life expectancy relative to if the WHO guideline was met. If the country were to reduce particulate pollution to meet the WHO guideline, the 9.1 million residents in Bangkok Metropolis, the capital of Thailand, would gain 1.5 years of life expectancy on average.

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

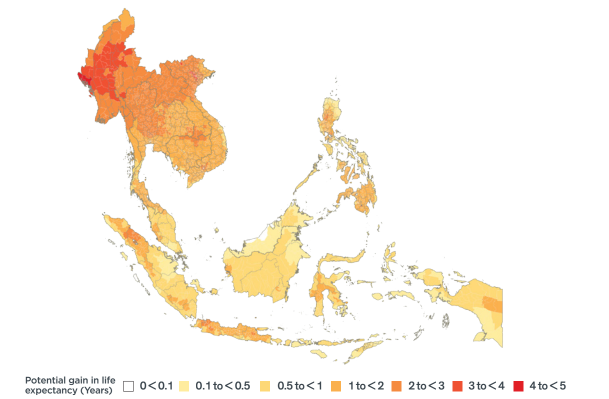
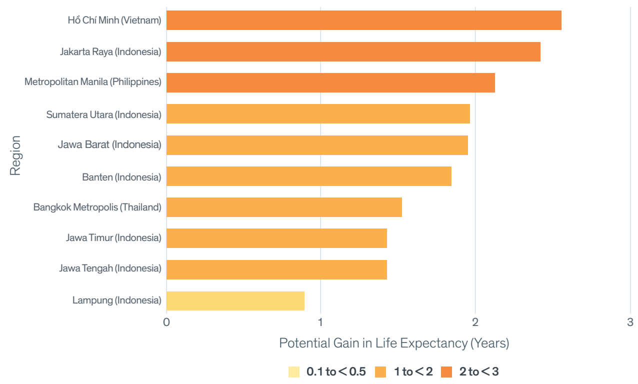


Figure 2 · Potential gain in years of life expectancy from 2021 levels to the WHO guideline in 10 most populous regions of Southeast Asia



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1 Southeast Asia includes the following countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, The Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

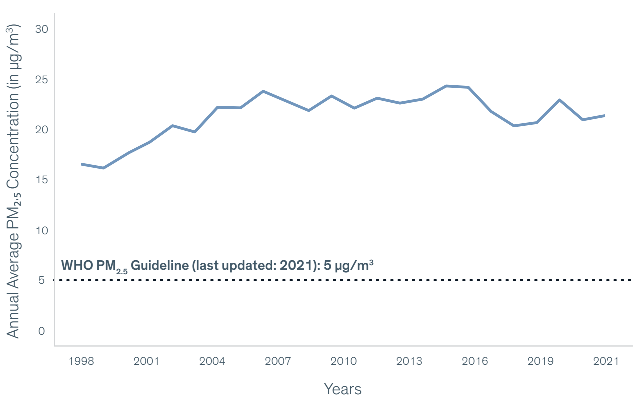
2 This data is based on the AQLI 2021 dataset. All annual average $PM_{2.5}$ values (measured in micrograms per cubic meter: µg/m³) are population weighted.

3 Special Capital Region of Jakarta is called Jakarta Raya in the AQLI data.

Potential life expectancy impacts of particulate pollution reduction in the 5 most populous regions of each country in Southeast Asia

Country	Region	Population (hundred thousands)	Annual average 2021 $PM_{2.5}$ concentration (µg/m³)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentration to WHO $PM_{2.5}$ guideline of 5 µg/m (years)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentration by 30 percent (years)
Brunei	Berakas A	0.5	6.1	0.1	0.2
Brunei	Berakas B	0.5	5.9	0.1	0.2
Brunei	Kianggeh	0.5	6.6	0.2	0.2
Brunei	Gadong 'B'	0.4	6.5	0.1	0.2
Brunei	Kuala Belait	0.4	5.2	0	0.2
Cambodia	Siem Reap	2.8	21	1.6	0.6
Cambodia	S'ang	2.5	20.7	1.5	0.6
Cambodia	Mean Chey	2.4	22	1.7	0.6
Cambodia	Chamkar Mon	2.3	21.6	1.6	0.6
Cambodia	Tboung Khmum	2.2	17.9	1.3	0.5
Indonesia	Bogor	55.3	30.4	2.5	0.9
Indonesia	Bandung	36.8	28.9	2.3	0.8
Indonesia	Tangerang	33	27.4	2.2	0.8
Indonesia	Bekasi	31.7	29.4	2.4	0.9
Indonesia	Jakarta Timur	30.9	31.4	2.6	0.9
Laos	Xaythany	1.9	29.2	2.4	0.9
Laos	Chanthabuly	1.7	29.8	2.4	0.9
Laos	Khanthabouly	1.5	23.3	1.8	0.7
Laos	Songkhone	1.3	23.6	1.8	0.7
Laos	Saravane	1.2	24.3	1.9	0.7
Malaysia	Kuala Lumpur	24	18.2	1.3	0.5
Malaysia	Petaling	17.6	18.2	1.3	0.5
Malaysia	Johor Baharu	15.8	13.3	0.8	0.4
Malaysia	Hulu Langat	14.3	19	1.4	0.6
Malaysia	Klang	10.6	17.4	1.2	0.5
Myanmar	Yangon (North)	30.1	33.7	2.8	1
Myanmar	Yangon (East)	27.1	33.3	2.8	1
Myanmar	Mandalay	19.2	45.4	4	1.3
Myanmar	Bago	19	33.3	2.8	1
Myanmar	Pathein	18.3	30.9	2.5	0.9
Philippines	Quezon City	29.1	27.7	2.2	0.8
Philippines	Davao City	18	18.9	1.4	0.6
Philippines	Manila	16.5	27.1	2.2	0.8
Philippines	Kalookan City	16.4	25.8	2	0.8
Philippines	Cebu City	9.9	18.1	1.3	0.5
Singapore	Northeast	13.5	13.2	0.8	0.4
Singapore	Central	13.4	13.1	0.8	0.4
Singapore	West	13.3	12.9	0.8	0.4
Singapore	East	9.9	12.8	0.8	0.4
Singapore	North	8.3	13.1	0.8	0.4
Thailand	Muang Samut Prakan	9.8	20.6	1.5	0.6
Thailand	Muang Nonthaburi	6	20.3	1.5	0.6
Thailand	Muang Samut Sakhon	4.8	19.9	1.5	0.6
Thailand	Bang Khen	4.6	19.9	1.5	0.6
Thailand	Phra Pra Daeng	4.5	21.3	1.6	0.6
Timor-Leste	Dili Barat	2	12.1	0.7	0.4
Timor-Leste	Dili Timur	1.1	11.4	0.6	0.3
Timor-Leste	Baucau	0.6	8.5	0.3	0.2
Timor-Leste	Suai Kota	0.5	10.2	0.5	0.3
Timor-Leste	Hatólia	0.4	10.7	0.6	0.3
Vietnam	Biên Hòa	10.3	29.8	2.4	0.9
Vietnam	Bình Tân	7.7	30.9	2.5	0.9
Vietnam	Gò Vấp	7.1	32.7	2.7	1
Vietnam	Thuận An	6.6	32.1	2.7	0.9
Vietnam	Bình Thạnh	6.1	31.8	2.6	0.9

Figure 3 · Annual average $PM_{2.5}$ concentrations in Southeast Asia, 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.