AQLI Air Quality Life Index®

Southeast Asia Fact Sheet

Ninety-two percent of Southeast Asia's 650 million people live in areas where particulate pollution exceeds the World Health Organization (WHO) guideline. This pollution cuts short the life expectancy of the average person by 1.4 years, relative to what it would be if the WHO guideline was met. That's a total of 905 million person-years lost to pollution in the 11 countries that make up this region.

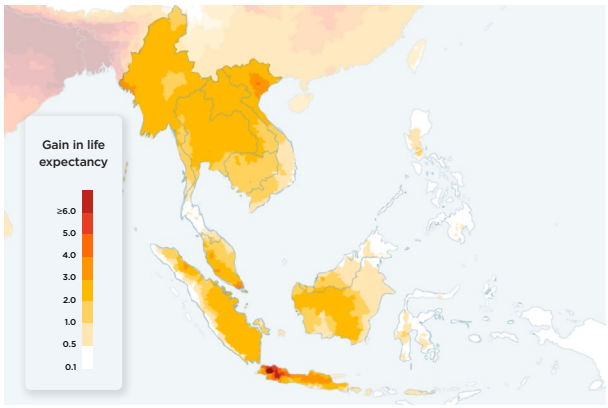
KEY TAKE-AWAYS

- **Singapore:** In the city-state of Singapore, particulate pollution levels are similar to those in Beijing and Mumbai. This makes it the sixth most polluted country in the world. Singapore's 6 million residents would gain 3.0 years in life expectancy if air quality complied with the WHO guideline.
- **Indonesia:** On Indonesia's island of Java, the country's population and industrial center, the 11 million residents of Jakarta would gain an average of 5.2 years in life expectancy if particulate pollution met the WHO guideline. In the cities of Bogor, South Tangerang, Bandung, and Bekasi, residents would similarly gain about 5 years. The average resident of Indonesia would gain 2 years.
- **Vietnam:** On mainland Southeast Asia, Vietnam has the highest levels of particulate pollution. In Ho Chi Minh City, the largest city in the country, life expectancy would rise by 2.2 years if air quality were improved to comply with the WHO guideline. The average resident of Vietnam would gain 1.3 years in life expectancy.
- **Thailand:** In Thailand's capital Bangkok, residents would gain 1.7 years if pollution levels met the WHO guideline. The average resident of Thailand would gain 1.2 years.
- **Myanmar and Cambodia:** Though the current health toll of particulate pollution is not as severe in Myanmar and Cambodia, pollution there is on the rise. From 1998 to 2018, pollution in Myanmar and Cambodia increased by 22 percent and 19 percent, respectively, cutting short life expectancy by 0.4 and 0.3 years relative to 1998 levels.

Aside from vehicles, coal, and industrial plants, biomass burning is a source of intense seasonal air pollution for much of the region. On the Indonesian islands of Sumatra and Kalimantan, forest and peatland fires, often set illegally to clear land for agricultural plantations, create annual haze events.

Though fire intensity and hotspots vary across time, the recurrence of fires in these areas each year means that residents are exposed to a high long-term average pollution concentration. In the cities of Palangka Raya in Central Kalimantan and Palembang in South Sumatra, and their surrounding areas, the 10-year average particulate concentration is about three times the WHO guideline. Life expectancy for the residents of these cities is two years lower than what it would be if the long-term average particulate matter exposure were instead at the WHO guideline. Moreover, the fires create transboundary pollution with especially significant repercussions in Indonesia's neighboring downwind countries. In 2006 and 2015, years with particularly severe fires exacerbated by El Niño, average particulate pollution spiked visibly in Malaysia and Singapore. Amidst the 2015 Southeast Asian Haze event, Malaysia closed 7,000 schools as well as businesses and government offices.[1] Particulate pollution in Malaysia was about 39 and 43 percent higher in 2006 than in 2005 or 2007; in 2015, it was 12 and 35 percent higher than in 2014 and 2016, respectively.[2]

Figure 1 · Potential Gain in Life Expectancy through Permanently Reducing PM2.5 from 2018 Concentration to the WHO Guideline



"The legacy of environmental improvement in former pollution capitals is evidence that today's pollution does not need to be tomorrow's fate. As countries navigate the dual challenges of sustaining economic growth and protecting the environment and public health, the AQLI shows not only the damage caused by pollution but also the enormous gains that can be made with policies to address it."

Michael Greenstone, The Milton Friedman Distinguished Service Professor in Economics, the College, and the Harris School; Director, EPIC

1 Straits Times, 2015
2 In addition to local and transboundary air pollution, the burning of forests and carbon-rich peatlands in Indonesia are a significan contributor to climate change. For example, the 2015 fire are calculated to have emitted more CO2 per day than the European Union (Huijnen et al., 2016).

$PM_{2.5}$ Concentrations and Potential Life Expectancy Gains by Country and in Most Polluted Region and Most Populous City of Each Country.

Location	$PM_{2.5}$ Concen-tration 2018 (µg/m³)	Years of Life Expectancy Gain through Reducing $PM_{2.5}$ from 2018 Concentration To the WHO Guideline of 10 µg/m3	By 30%	Percent of Population in Areas above WHO Guideline
Brunei	12	0.2	0.4	88
Brunei and Muara	13	0.3	0.4	
Cambodia	19	0.8	0.5	100
Phnom Penh	21	1.1	0.6	
Indonesia	30	2	0.9	91
Depok, Jawa Barat	75	6.4	2.2	
Laos	23	1.3	0.7	100
Bokeo	26	1.6	0.8	
Malaysia	23	1.3	0.7	94
Johor Baharu, Johor	43	3.2	1.3	
Myanmar	23	1.3	0.7	100
Maungdaw, Rakhine	37	2.6	1.1	
Philippines	10	0.3	0.3	46
Rizal	22	1.2	0.6	
Singapore	40	3	1.2	100
North	43	3.2	1.3	
Thailand	22	1.2	0.7	98
Pathum Thani	29	1.9	0.9	
Timor-Leste	9	0	0.3	
Vietnam	24	1.3	0.3	100
Hải Phòng	41	3	0.7	

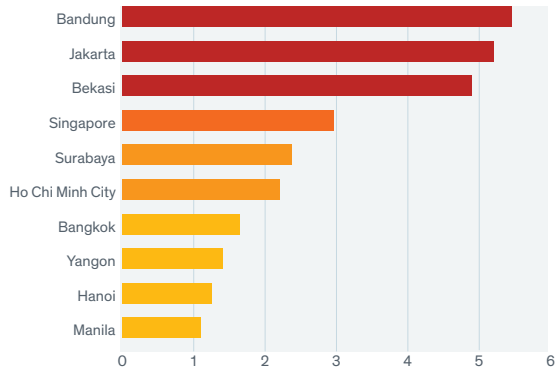
POLICY IMPACTS

Thedual challenges of economic growth and environmental quality faced by Southeast Asia today are no different from those once confronted by other countries and regions during periods of industrialization. Nor is this dynamic limited to the world's wealthiest countries.

China has made tremendous progress since declaring a "war against pollution" in 2014, with cities cutting particulate pollution by almost 30 percent—improving life expectancy by 1.4 years if the reductions persist. India, having declared its own war against pollution in January 2019, has set an ambitious target to reduce pollution by 20-30 percent. If it achieves a 25 percent reduction in pollution nationwide, it has the potential to improve life expectancy by 2 years.

Southeast Asia has the opportunity to experience the same progress. If Southeast Asia were to achieve the same reduction in pollution experienced by China, its residents could live 0.7 years longer. Some countries in Southeast Asia would see even greater gains. For example, if Indonesia were to achieve China's reduction, its residents could live 0.9 years longer. Singaporeans would gain 1.2 years, and Malaysians would gain 0.7 years.

Figure 2 Potential Gain in Years of Life Expectancy Through Permanently Reducing $PM_{2.5}$ from 2018 Concentrations to the WHO Guideline, in 10 Largest Cities in Southeast Asia



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 Dinstinguished 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 PM10 reduces life expectancy by 0.64 years. In terms of PM2.5, this translates to the relationship that an additional 10 µg/m3 of PM2.5 reduces life expectancy by 0.98 years. To learn more about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology

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*This document replaces an earlier version that erroneously used satellite data that did not include PM2.5 from biomass burning sources.