AQLI Air Quality Life Index®

Europe Fact Sheet

Though most of Europe meets the European Union's air pollution standard of 25 µg/m3, nearly three-quarters of the European population live in areas that do not meet the World Health Organization's (WHO) stronger guideline of 10 µg/m3. The average European was exposed to a particulate pollution concentration of 12 µg/m3 in 2019. If particulate pollution were to meet the WHO guideline, average life expectancy across Europe would improve by 3 months. Life expectancy would improve more in Europe's most polluted areas (See Figure 1).

KEY TAKE-AWAYS

- The entire populations of the Eastern European countries of Poland, Belarus, Slovakia, the Czech Republic, Slovenia, Hungary, Lithuania, Armenia, Belgium, Germany, Moldova, Cyprus, and Ukraine, as well as in the Netherlands and San Marino, are exposed to air quality that does not meet the WHO guideline.
- Poland is the most polluted country in Europe. Particularly, the cities of Warsaw and Łódź, and their surrounding areas, see high levels of particulate pollution. If pollution were to improve to meet the WHO guideline, residents in Warsaw would gain 11 months onto their life expectancy.
- Italy's Po Valley, including the city of Milan, is also a highly polluted part of Europe. Residents there would gain 1 year and 2 months if particulate pollution levels met the WHO guideline.
- Turkey's industrial center of Bursa experiences high particulate pollution as well. Residents there would gain 1 year and 1 month if pollution improved to meet the WHO guideline.

POLICY IMPACTS

Though work remains to improve air quality across Europe, much progress has been made in reducing particulate pollution. Over the last two decades, particulate pollution has declined by 15 percent across the continent. On average, a European exposed to today's pollution over the long-term would live 3 months longer than someone exposed to 1998's pollution levels over the long-term (See Figure 2).

This improvement came with the introduction of strong pollution policies starting with the creation of the European Environment Agency in the mid-1990's. In the subsequent years, the European Union set emissions targets, created a pollution standard, and introduced a comprehensive clean air program to reduce the effect of air pollution on human health.

Figure 1 · Change in Life Expectancy due to Change in $PM_{2.5}$ Concentration, 1998-2019

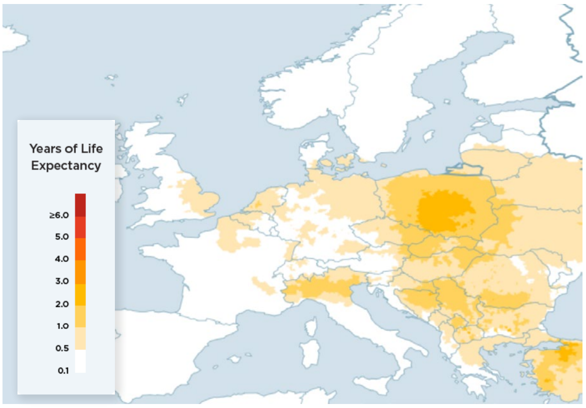
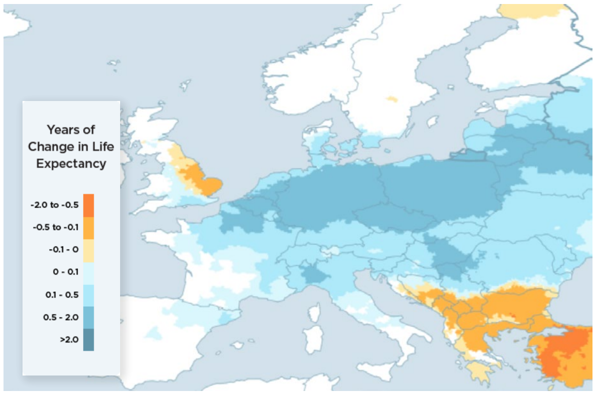


Figure 2 · Potential Gains in Life Expectancy from Permanently Reducing PM Concentrations from the 2019 Levels to the WHO Guideline



"The legacy of environmental improvement in much of Europe over the last two decades is evidence that people living in today's pollution hot spots can see brighter skies. A demand for change from citizens and subsequent strong policies have helped to clear the air in parts of Europe before, and can continue to do so to ensure that high pollution today does not need to be tomorrow's fate."

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

Note: The WHO changed its particulate pollution guidance on September 22, 2021. The data here reflects the previous guidance.

$PM_{2.5}$ Concentrations and Life Expectancy Impacts in European Countries and the Most Polluted Region in Each Country.

Country	$PM_{2.5}$ Concentration 2019 (μg/m³)	Months of Life Expectancy Gained if $PM_{2.5}$ is Reduced to WHO Guideline	Percent of Population in Areas Above WHO Guideline	Regions with Highest $PM_{2.5}$ Concentration, 2019	2019 $PM_{2.5}$ Concentration in Most Polluted Region	Months of Life Expectancy Gained if $PM_{2.5}$ is Reduced to WHO Guideline in Most Polluted Region
Europe	12	3.4	63			
Albania	13	3.5	95	Shkodrës, Shkodër	15	6.2
Andorra	6	0.0	0		6	0.0
Armenia	17	7.8	100	Erevan	21	12.6
Austria	14	4.8	98	Wien	17	7.8
Azerbaijan	10	1.3	52	Nakhchivan	16	6.7
Belarus	14	4.4	100	Brest, Brest	16	7.2
Belgium	14	4.3	100	Oost-Vlaanderen,	15	5.9
Bosnia and Herzegovina	17	7.9	100	Brčko, Brčko	19	11.2
Bulgaria	13	4.3	77	Grad Sofiya	18	9.6
Croatia	15	5.7	99	Brodsko-Posavska	18	9.7
Cyprus	12	1.8	100		12	1.8
Czech Republic	16	7.2	100	Moravskoslezský	21	12.7
Denmark	11	1.7	79	Sjælland	13	3.7
Estonia	8	0.1	13	Tartu	10	0.6
Finland	6	0.0	0	Uusimaa, Southern Finland	8	0.0
France	10	1.6	52	Nord, Hauts-de-France	15	5.5
Georgia	13	3.5	75	Tbilisi	17	7.8
Germany	13	3.3	100	Berlin	15	5.5
Greece	11	1.5	78	Central Macedonia,	13	3.5
Hungary	14	5.2	100	Baranya	16	6.5
Iceland	2	0.0	0	Höfuðborgarsvæði	3	0.0
Ireland	4	0.0	0	Dublin	6	0.0
Italy	14	5.1	80	Milan, Lombardia	23	14.8
Kosovo	16	6.5	100	Prizren	17	8.6
Latvia	11	1.6	96	Daugavpils, Latgale	13	3.1
Lithuania	13	3.1	100	Vilniaus, Vilniaus	13	4.1
Luxembourg	11	0.8	90	Luxembourg,	11	1.7
Macedonia	16	7.6	96	Šuto Orizari	24	16.7
Malta	8	0.0	0			
Moldova	12	2.4	100	Bălți	14	4.8
Monaco	10	0.0	0		10	0.0
Montenegro	12	2.9	94	Podgorica	14	4.8
Netherlands	13	4.0	100	Zeeland	15	6.2
Norway	6	0.1	1	Finnmark	13	8.2
Poland	19	10.9	100	Łódzkie	23	15.1
Portugal	5	0.0	0	Porto	6	0.0
Romania	13	3.5	99	Bucharest	15	5.3
Russia	12	2.5	72	Primor'ye	18	9.8
San Marino	12	2.7	100		12	2.6
Serbia	16	7.5	100	Grad Beograd	19	10.1
Slovakia	16	6.5	100	Trenčiansky	17	8.0
Slovenia	15	6.2	100	Osrednjeslovenska	16	7.3
Spain	7	0.1	0	Barcelona, Cataluña	10	1.0
Sweden	7	0.2	12	Skåne	11	1.1
Switzerland	12	2.3	92	Ticino	15	6.0
Turkey	15	5.9	97	Bursa	21	12.8
Ukraine	13	3.9	100	Kiev City	15	5.8
United Kingdom	10	1.0	49	Southend-on-Sea,	13	3.5

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 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