AQLI Air Quality Life Index®

Europe Fact Sheet

Thanks to sustained enforcement of strong policies, Europeans are exposed to 24.1 percent less particulate pollution than they were two decades ago, gaining 4 months of life expectancy because of it. Despite this success, the latest scientific evidence on the impact of air pollution at even the low levels that exist in much of Europe reveals that 95.5 percent of the population are now living in areas with unsafe levels of pollution, according to the World Health Organization's (WHO) updated 5 µg/m^3 guideline. That's up from 47.2 percent under the WHO's previous guideline of 10 µg/m^3.[1]

KEY TAKE-AWAYS

- Europe was exposed to a particulate pollution concentration of 11.2 µg/m^3 in 2020, meeting the European Union's air pollution standard of 25 µg/m^3 but falling short of the revised WHO guideline. If particulate pollution were to meet the WHO guideline, average life expectancy across Europe would improve by 7.3 months, equivalent to 527 million total life years.
- The entire populations of the Eastern European countries of Poland, Belarus, Slovakia, Hungary, Lithuania, Armenia, Moldova, Cyprus, as well as Bosnia and Herzegovina, are exposed to air quality that does not meet the WHO guideline.
- Bosnia and Herzegovina are the most polluted countries in Europe. Particularly, the cities of Tuzla and Zenica-Doboj, and their surrounding areas, see high levels of particulate pollution. If pollution were to improve to meet the WHO guideline, residents in Tuzla would add 2.5 years onto their life expectancy.
- Italy's Po Valley, including the city of Milan, is also a highly polluted part of Europe. Residents would gain 1.6 years if particulate pollution levels met the WHO guideline.
- Turkey's industrial center of Bursa experiences high particulate pollution as well. Residents there would gain 1.9 years 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 24 years, particulate pollution has declined by 29.5 percent across the continent. On average, a European exposed to today's pollution over the long-term would live 5.5 months longer than someone exposed to 1998's pollution levels over the long-term.

Figure 1 · Potential Gain in Years of Life Expectancy through Permanently Reducing $PM_{2.5}$ from 2020 Concentrations to the WHO Guideline

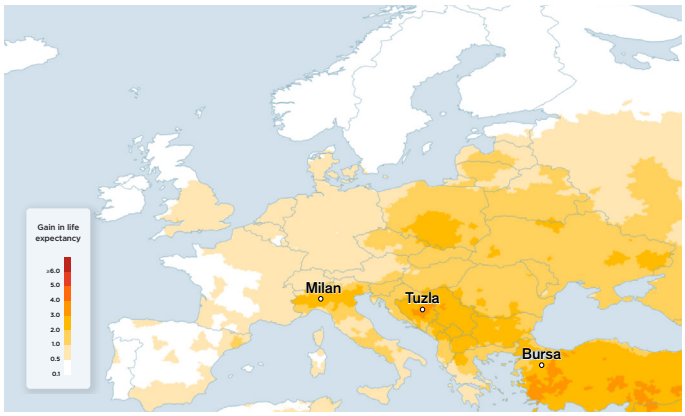


Figure 2 · Impact of the Revised WHO Guideline on Europe

Note: **White** regions correspond to those places that are in compliance with the WHO guideline. **Dark Grey** regions correspond to those places that were categorized as polluted under the previous WHO guideline. **Light Grey** regions correspond to regions that are newly out of compliance with the updated WHO guideline.

1 The WHO changed its particulate pollution guidance (from 10 µg/m^3 to 5 µg/m^3) on September 22, 2021.

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

Country	$PM_{2.5}$ Concentration, 2020 (µg/m³)	Years of Life Expectancy Gained if $PM_{2.5}$ is Reduced to WHO Guideline	Percent of Population in Areas Above WHO Guideline	Region with Highest $PM_{2.5}$ Concentration, 2020	2020 $PM_{2.5}$ Concentration in Most Polluted Region	Years of Life Expectancy Gained if $PM_{2.5}$ is Reduced to the WHO Guideline in the Most Polluted Region
Albania	12.7	0.8	100	Kukës	19.1	1.4
Andorra	6.4	0.1	100	Escaldes-Engordany	6.6	0.2
Armenia	19.1	1.4	100	Armavir	22.5	1.7
Austria	9.6	0.5	100	Wien	10.7	0.6
Azerbaijan	11.7	0.7	100	Nakhchivan	17	1.2
Aelarus	11.1	0.6	100	Brest	12.3	0.7
Belgium	7.9	0.3	100	Vlaanderen	8.3	0.3
Bosnia and Herzegovina	23.8	1.8	100	Brčko	27.5	2.2
Bulgaria	18	1.3	100	Pernik	21.9	1.7
Croatia	13.8	0.9	100	Vukovarsko-srijemska	20.1	1.5
Cyprus	12.3	0.7	100	Limassol	12.8	0.8
Czech Republic	11.9	0.7	100	Moravskoslezský	16.4	1.1
Denmark	6.9	0.2	100	Sjælland	7.2	0.2
Estonia	5.2	0	38.6	Võru	8.1	0.3
Finland	4.1	-0.1	0	Southern Finland	4.4	-0.1
France	7.2	0.2	100	Île-de-france	8.6	0.4
Georgia	14.3	0.9	100	Kvemo kartli	15.5	1
Germany	8	0.3	100	Berlin	9.6	0.5
Ggreece	11.1	0.6	100	Aegean	14.6	0.9
Hungary	12.8	0.8	100	Csongrád	14.6	0.9
Iceland	2.1	-0.3	0	Höfuðborgarsvæði	2.2	-0.3
Ireland	4.6	0	34.6	Louth	5.1	0
Italy	12.7	0.8	100	Veneto	18.6	1.3
Kazakhstan	14.1	0.9	100	South Kazakhstan	23.4	1.8
Kosovo	20.9	1.6	100	Prizren	22.7	1.7
Latvia	11.2	0.6	100	Riga	12.4	0.7
Liechtenstein	8.5	0.3	100	Mauren	9.3	0.4
Lithuania	10.1	0.5	100	Šiauliai	11.2	0.6
Luxembourg	7.2	0.2	100	luxembourg	7.4	0.2
Macedonia	20.3	1.5	100	saraj	24.8	1.9
Malta	6.5	0.1	100	xlokk	6.6	0.2
Moldova	12.8	0.8	100	Ungheni	14	0.9
Monaco	9.5	0.4	100	NA	9.5	0.4
Montenegro	16	1.1	100	Pljevlja	19.7	1.4
Netherlands	7.8	0.3	100	Zeeuwse meren	8.5	0.3
Norway	3.8	-0.1	3.2	Åstfold	5	0
Poland	15	1	100	Śląskie	20.2	1.5
Portugal	5	0	56.1	Aveiro	6.1	0.1
Romania	13.8	0.9	100	Timiş	16.1	1.1
Russia	10	0.5	98.1	Yevrey	14.8	1
San marino	10.7	0.6	100	Faetano	10.7	0.6
Serbia	19.4	1.4	100	Mačvanski	24	1.9
Slovakia	12.9	0.8	100	Žilinský	14.7	1
Slovenia	12.8	0.8	100	Osrednjeslovenska	14	0.9
Spain	6.7	0.2	89	Cataluña	9.8	0.5
Sweden	4.6	0	36.5	Skåne	6	0.1
Switzerland	7.8	0.3	100	Ticino	11.2	0.6
Turkey	21.6	1.6	100	Aydin	29.8	2.4
Ukraine	13.7	0.9	100	Donets'k	17.6	1.2
United Kingdom	7.2	0.2	92.4	Wales	8.2	0.3
Vatican city	10.9	0.6	100	NA	10.9	0.6

Figure 3 · Potential Gain in Life Expectancy through Reducing $PM_{2.5}$ to the WHO Guideline in 10 Most Populous Regions of Europe

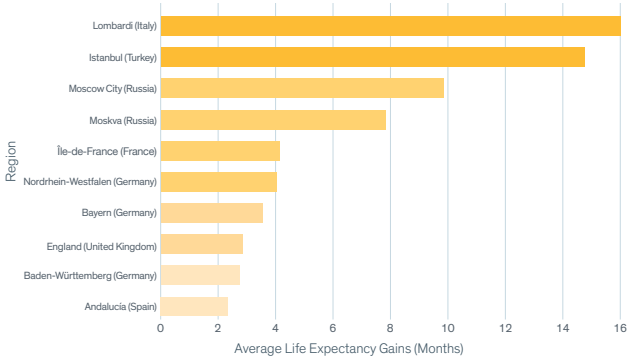
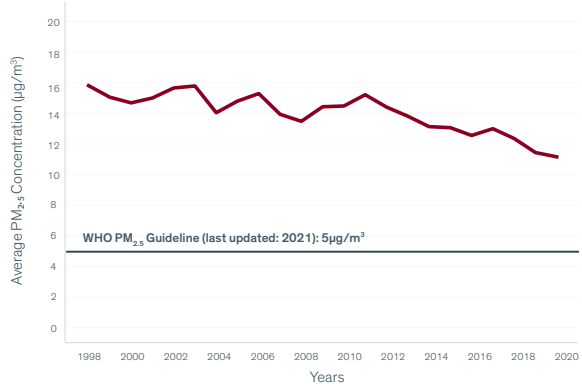


Figure 4 ·Average $PM_{2.5}$ Concentrations in Europe, 1998-2020



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 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. To learn more about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology

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