German Environment Agency

18. January 2023

Comparison of the current European ambient air limits/target values and the World Health Organization (WHO) air quality guidelines for the protection of human health

(compiled by UBA, 18 January 2023)

Table 1: Evaluation standards for air quality assessment according to EU and WHO guidelines

	EU Limit/Target Values [1]	WHO Recommendations [2], [3]
	Limits	**Guidelines**
Particulate matter PM_{10} annual mean value	40 µg/m³	15 µg/m³
Particulate matter PM_{10} daily mean value	50 µg/m³, 35 exceedances permitted per year	45 µg/m³, 99th percentile[4]
Particulate matter $PM_{2.5}$ annual mean value	25 µg/m³ [5]	5 µg/m³
Particulate matter $PM_{2.5}$ daily mean value		15 µg/m³, 99th percentile[4]
Nitrogen dioxide NO_2 annual mean value	40 µg/m³	10 µg/m³
Nitrogen dioxide NO_2 daily mean value		25 µg/m³, 99th percentile[4]

[1] EU limit / target values for the protection of human health according to the EU Directive 2008/50/EC and 2004/107/EC
[2] WHO recommendations for the protection of human health according to the Air Quality Guidelines for Europe 2nd edition 2000
[3] 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
[4] Correlates with 3-4 exceedances, e.g.
[5] Target values should be reached by 1st January 2010, from 1st January 2015 mandatory

	EU Limit/Target Values [1]	WHO Recommendations [2], [3]
Nitrogen dioxide NO_2 hourly mean value	200 µg/m³, 18 exceedances permitted per year	200 µg/m³
Sulphur dioxide SO_2 daily mean value	125 µg/m³, 99th percentile	40 µg/m³, 99th percentile[4]
Sulphur dioxide SO_2 hourly mean value	350 µg/m³, 24 exceedances permitted per year	
Carbon monoxide CO max. daily 8-hourly mean value	10 mg/m³	10 mg/m³, 99th percentile[4]
Lead in PM_{10} Pb annual mean value	0.5 µg/m³	0.5 µg/m³
	Targets	**Guidelines**
Ozone Peak season[6]		60 µg/m³
Ozone O_3 max. daily 8-hourly mean value	120 µg/m³	100 µg/m³, 99th percentile[4]
Cadmium in PM_{10} Cd annual mean value	5 ng/m³	5 ng/m³

[6] Average of daily maximum 8-hour mean O_3 concentration in the six consecutive months with the highest six month running-average O_3 concentration.

	EU Limit/Target Values for carcinogenic substances	WHO: additional lifetime risk of developing cancer [7]
	Limit	
Benzene annual mean value	5 µg/m³	1.7 µg/m³ (risk 1:100,000)
	Target values	
Arsenic in PM_{10} As annual mean value	6 ng/m³	6.6 ng/m³ (risk 1:100,000)
Nickel in PM_{10} Ni annual mean value	20 ng/m³	25 ng/m³ (risk 1:100,000)
Benzo(a)pyrene in PM_{10} BaP annual mean value	1 ng/m³	0.12 ng/m³ (risk 1:100,000)

[7] as no health safe level of exposure can be recommended the WHO does not provide any guideline values for carcinogenic substances. For orientation purposes, the WHO issues the concentration values derived from occupational medical studies for the additional lifetime risk of developing cancer. The table shows the concentrations, risk of 1:100,000 accordingly (one additional case of cancer based on an exposed population of 100,000).

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II 1.5 Environmental Medicine and Health Effects Assessment
II 4.2 – Air Quality Assessment

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