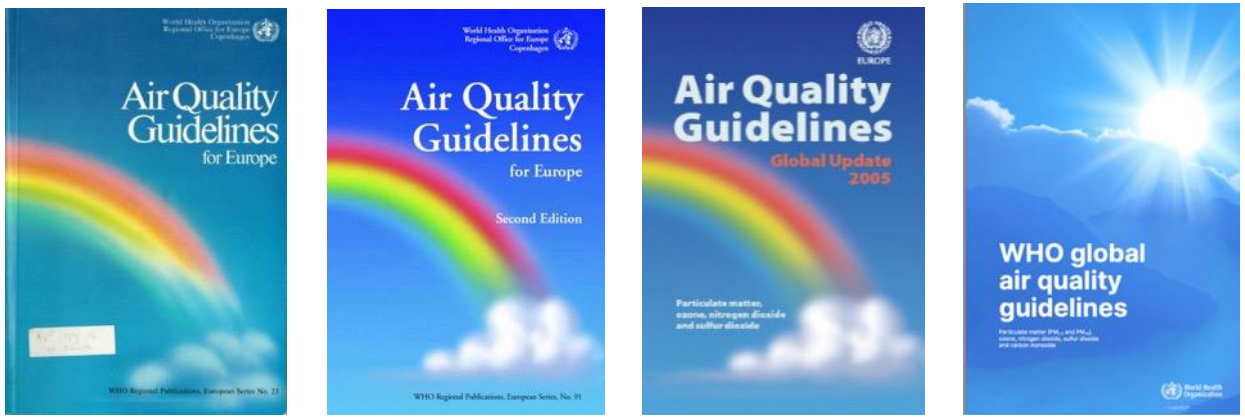
WHO Global Air Quality Guidelines 2021

Setting ambitious goals for air quality to protect public health

UNECE Air Convention (LRTAP), 51st Session of the Task Force on Integrated Assessment Modelling (TFIAM), 6 April 2022

WHO Air Quality Guidelines

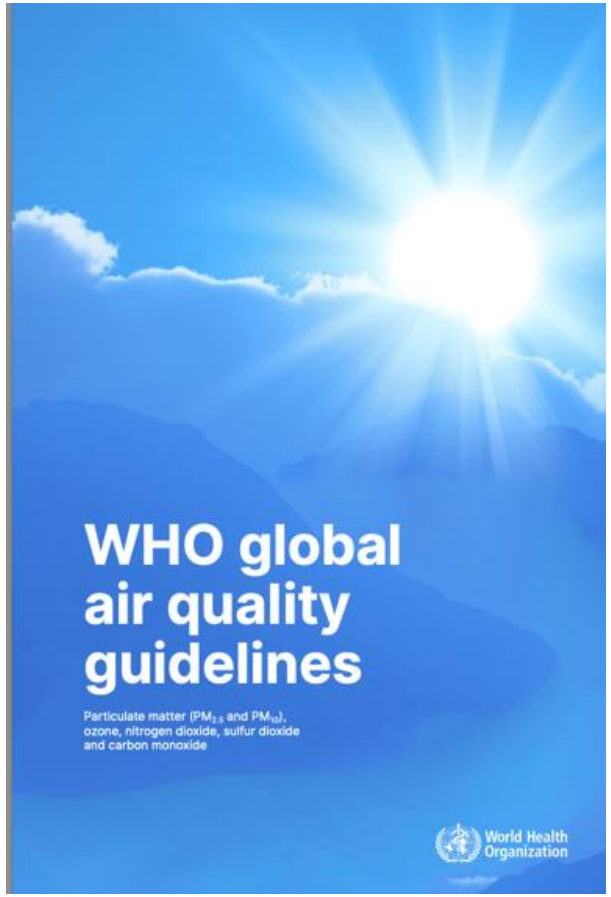


- Robust public health recommendations
- Support informed decision-making
- Intended for worldwide use
- Comprehensive assessment of the evidence

What are the WHO Global Air Quality Guidelines?

- Based on extensive scientific evidence, the AQGs identify the levels of air quality necessary to **protect public health worldwide.**
- They provide recommendations on **air quality guideline levels** (and interim targets) for **$PM_{2.5}$, PM_{10}, O_3, NO_2, SO_2** and **CO,** and qualitative good practice statements for certain types of particulate matter.
- Guideline levels can be used as an **evidence-informed reference** to help decision-makers in setting legally binding standards and goals for air quality management.
- They are an **instrument to design effective measures** to achieve reduction of air pollution and, therefore, protect human health.

What is new in these AQGs 2021?



- Since the *global update 2005*, there has been a marked increase in the quality and quantity of evidence that shows how air pollution affects different aspects of health.
- There are also now clearer insights about global concentrations, sources of emissions, inequities and the contribution of air pollutants to the global burden of disease.
- For that reason, and after a systematic review of the accumulated evidence, **several of the updated AQG levels are now lower than 15 years ago**.
- New features include new AQG levels for peak-season O_3 and 24-h NO_2 and CO, as well as new interim targets.

What do the AQGs provide?

Summary of recommended AQG levels and interim targets

Pollutant	Averaging time	IT1	IT2	IT3	IT4	AQG level
$PM_{2.5}$, µg/m³	Annual	35	25	15	*10*	5
$PM_{2.5}$, µg/m³	24-hour[a]	75	50	37.5	*25*	15
PM_{10}, µg/m³	Annual	70	50	30	*20*	15
PM_{10}, µg/m³	24-hour[a]	150	100	75	*50*	45
O_3, µg/m³	Peak season[b]	100	70	–	–	60
O_3, µg/m³	8-hour[a]	160	120	–	–	100
NO_2, µg/m³	Annual	*40*	30	20	–	10
NO_2, µg/m³	24-hour[a]	120	50	–	–	25
SO_2, µg/m³	24-hour[a]	125	50	–	–	40
CO, mg/m³	24-hour[a]	7	–	–	–	4

Air quality guideline levels for both long- and short-term exposure in relation to critical health outcomes.

Interim targets to guide reduction efforts for the achievement of the air quality guideline levels.

Good practice statements in the management of certain types of particulate matter for which evidence is insufficient to derive quantitative air quality guideline levels, but points to their health relevance.

Interim targets to guide continuous improvement of air quality

Good practice statements

For the management of certain types of particulate matter for which evidence is insufficient to derive quantitative AQG levels, but points to a health risk.

SAND AND DUST STORMS

- Maintain suitable air quality management and dust forecasting programmes.
- Maintain air quality monitoring programmes and reporting procedures.
- Conduct epidemiological and toxicological studies.
- Implement wind erosion control through carefully planned expansion of green spaces.
- Clean streets in urban areas with high population density and low rainfall to prevent resuspension by road traffic.

BLACK/ELEMENTAL CARBON

- Make systematic measurements, in addition to existing monitoring of pollutants covered by AQGs.
- Undertake the production of emission inventories, exposure assessments and source apportionment.
- Take measures to reduce emissions, and, where appropriate, develop standards (or targets) for ambient concentrations.

ULTRAFINE PARTICLES

- Quantify ambient UFP in terms of PNC for a size range with a lower limit of ≤ 10 nm and no restriction on the upper limit.
- Expand the common air quality monitoring strategy by integration of UFP monitoring.
- Distinguish between low and high PNC to guide decisions on the priorities of UFP source emission control.
- Utilize emerging science and technology for the assessment of exposure.

Guideline development

Main steps

1. Systematic review process
2. Grading the evidence
3. Developing recommendations

Involved Groups

Systematic Review Team

- External Review Group

Guideline Development Group

- External Review Group

WHO Steering Group

Members of the main groups

World Health Organization
REGIONAL OFFICE FOR Europe

Guideline Development Group

Marwan Al-Dimashki
Emmanuel K.-E. Appoh
Kalpana Balakrishnan
Michael Brauer
Bert Brunekreef
Aaron J. Cohen
Francesco Forastiere
Lu Fu
Sarath K. Guttikunda
Mohammad Sadegh Hassanvand
Marie-Eve Héroux
Wei Huang
Haidong Kan
Nguyen Thi Kim Oanh
Michał Krzyżanowski
Nino Künzli
Thomas J. Luben
Lidia Morawska
Kaye Patdu
Pippa Powell
Horacio Riojas-Rodríguez
Jonathan Samet
Martin Williams
Caradee Y. Wright
Xia Wan
André Zuber

Systematic Review Team

Jie Chen
Gerard Hoek
Richard Atkinson
Peijue Huangfu
Ariel Bardach
Agustin Ciapponi
Pablo Orellano
Nancy Quaranta
Julieta Reynoso
Wei-jie Guan
Mei Jiang
Hua-liang Lin
Xue-yan Zheng
Kuan Ken Lee
Mark R. Miller
Nicholas L. Mills
Anoop S.V. Shah
Nicholas Spath

Rebecca Morgan
Jos Verbeek

External Review Group

65 individual experts provided input at different stages of the process

14 stakeholder organizations participated in the consultation of the document

The scope of the AQGs

Scoping of the guidelines

The GDG selected air pollutants and critical health outcomes for each air pollutant in relation to durations of exposure

The GDG considered different criteria

The GDG decided to develop AQGs levels (with interim targets) for particulate matter PM_{10} and $PM_{2.5}$, O_3, NO_2, SO_2 and CO, and good practice statements for black/elemental carbon, ultrafine particles and sand & duststorms

What the AQGs do not include

- They do not apply to occupational settings, but all others (including outdoor and indoor)
- They do not include recommendations about multiple exposures
- They do not address specific recommendations on interventions
- They do not cover all air pollutants, but all previous WHO guidelines not updated remain valid

Systematic reviews of evidence

World Health Organization
REGIONAL OFFICE FOR Europe

Short-term exposure to O_3, NO_2 and SO_2 and asthma

Long-term exposure to O_3 and NO_2 and all-cause and cause-specific mortality

Long-term exposure to PM and all-cause and cause-specific mortality

Short-term exposure to SO_2 and all-cause and cause-specific mortality

Short-term exposure to CO and ischaemic heart disease

Short-term exposure to PM, NO_2 and O_3 and all-cause and cause-specific mortality

https://www.sciencedirect.com/journal/environment-international/special-issue/10MTC4W8FXJ

From evidence to recommendations in a nutshell

Procedure to move from the evidence in systematic reviews to AQG levels

Step	Description
Step 1	Assess RR estimates and, when available, CRF for each critical health outcome per pollutant as provided by the systematic review
Step 2	Determine the lowest level of exposure measured in the studies included in the systematic review or in the subset of studies in the systematic review that estimate risk at this lowest level. For individual studies that used statistical models to evaluate the shape of the CRF, ensure that the lowest level of exposure is associated with a monotonic increase of the CRF curve
Step 3	Determine the minimal relevant increase in health outcomes
Step 4	Determine the starting point for AQG level determination as the long-term concentration of pollutant from which the minimal relevant amount of the health outcome will result
Step 5	Compare the AQG levels for a specific pollutant across critical health outcomes. Take as the final AQG level the lowest AQG level found for any of the critical health outcomes
Step 6	Assess the certainty of the evidence at low levels of exposure. The adapted GRADE assessment is for the entire body of evidence, not the subset of studies conducted at the lowest exposure levels. The evidence provided by these latter studies needs to be discussed, starting from the RoB assessment that was conducted at individual study level
Step 7	Consider new relevant evidence not included in the systematic reviews in a qualitative or, where possible, quantitative manner
Step 8	Reconsider causality of associations between pollutants and outcomes, taking into account whether or not associations have been classified as causal or likely causal in recent reviews by authoritative bodies

Long-term AQG levels

Means of lowest 5th percentiles of study population distributions.

After evaluating the certainty of evidence at those low exposure levels and comparing these values across critical health outcomes, the AQG level was set.

Short-term AQG levels

Slight modifications in steps 2 and 3.

99th percentiles of distributions of 24-h mean concentrations matching the long-term AQG levels.

If a long-term AQG level was not set for a given pollutant, its specified and justified low concentration.

How can the updated AQGs be used?

AS A TOOL FOR POLICY-MAKING

The AQGs are an evidence-informed tool for decision-makers to guide legislation and policies, to reduce levels of air pollutants and decrease the health burden that results from air pollution exposure worldwide.

Everybody has a role to play

TO STIMULATE RESEARCH

Air pollution researchers and academics can use it to help identify critical data gaps that future research agendas could address to better protect the population from the harmful effects of air pollution.

TO ENHANCE CLIMATE ACTION

Efforts to improve air quality can enhance climate change mitigation, and climate change mitigation efforts can, in turn, improve air quality. All this enhance people's health.

AQGs are a powerful tool for climate action

Solutions require intersectoral cooperation

World Health Organization
REGIONAL OFFICE FOR Europe

How does WHO support this process?

- In the European Region, 94% of countries have standards for at least one pollutant. AQGs can help to update standards and add more pollutants to the list.

- Dissemination: ExSum translated into 10 languages (ARA, BUL, CZE, FRE, GER, ITA, POL, POR, RUS, SPA)
- Communication and advocacy to promote the uptake of AQGs
- Resource package including tools and materials to support implementation of the guidelines
- Science-policy dialogues within and among Member States and with sectors and stakeholders
- Capacity building training in health and other sectors

World Health Organization

Our Planet Our Health

Clean our air, water & food

#HealthierTomorrow

World Health Day – 7 April

World Health Organization
REGIONAL OFFICE FOR Europe

Thank you

Funding and in-kind support provided by:

European Commission
Swiss Federal Office for the Environment
German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
German Federal Ministry of Health
United States Environmental Protection Agency
Government of the Republic of Korea

https://www.euro.who.int/en/media-centre/events/events/2022/04/world-health-day-2022