WHO Global Air Quality Guidelines 2021

Setting ambitious goals for air quality to protect public health

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Based on extensive scientific evidence, the AQGs identify the levels of air quality necessary to protect public health worldwide.

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, to protect human health.
What were the steps taken to develop the AQGs?

1. formulation of the **scope** and **key questions** of the guidelines,
2. **systematic review** of the relevant evidence,
3. **assessment of the certainty level** of the body of evidence resulting from systematic reviews,
4. formulation of the **AQG levels**, and
5. formulation of **other supporting guidance**.
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65 individual experts provided input at different stages of the process

14 stakeholder organizations participated in the consultation of the document
Since the 2005 global update, 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 clearer insights about sources of emissions and the contribution of air pollutants to the global burden of disease.

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 O₃ and 24-h NO₂ and CO, as well as new interim targets.
What the AQGs provide...

Summary of recommended AQG levels and interim targets

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging time</th>
<th>IT1</th>
<th>IT2</th>
<th>IT3</th>
<th>IT4</th>
<th>AQG level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM$_{2.5}$, µg/m³</td>
<td>Annual</td>
<td>35</td>
<td>25</td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>PM$_{2.5}$, µg/m³</td>
<td>24-hour$^a$</td>
<td>75</td>
<td>50</td>
<td>37.5</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>PM$_{10}$, µg/m³</td>
<td>Annual</td>
<td>70</td>
<td>50</td>
<td>30</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>PM$_{10}$, µg/m³</td>
<td>24-hour$^a$</td>
<td>150</td>
<td>100</td>
<td>75</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>O$_3$, µg/m³</td>
<td>Peak season$^b$</td>
<td>100</td>
<td>70</td>
<td>–</td>
<td>–</td>
<td>60</td>
</tr>
<tr>
<td>O$_3$, µg/m³</td>
<td>8-hour$^a$</td>
<td>160</td>
<td>120</td>
<td>–</td>
<td>–</td>
<td>100</td>
</tr>
<tr>
<td>NO$_2$, µg/m³</td>
<td>Annual</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>–</td>
<td>10</td>
</tr>
<tr>
<td>NO$_2$, µg/m³</td>
<td>24-hour$^a$</td>
<td>120</td>
<td>50</td>
<td>–</td>
<td>–</td>
<td>25</td>
</tr>
<tr>
<td>SO$_2$, µg/m³</td>
<td>24-hour$^a$</td>
<td>125</td>
<td>50</td>
<td>–</td>
<td>–</td>
<td>40</td>
</tr>
<tr>
<td>CO, mg/m³</td>
<td>24-hour$^a$</td>
<td>7</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
</tbody>
</table>

**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
Some AQG recommendations in previous guidelines remain valid

AQGs for nitrogen dioxide, sulfur dioxide and carbon monoxide (short averaging times) that were not re-evaluated and remain valid

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging time</th>
<th>Air quality guidelines that remain valid</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂, µg/m³</td>
<td>1-hour</td>
<td>200</td>
</tr>
<tr>
<td>SO₂, µg/m³</td>
<td>10-minute</td>
<td>500</td>
</tr>
<tr>
<td>CO, mg/m³</td>
<td>8-hour</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>1-hour</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>15-minute</td>
<td>100</td>
</tr>
</tbody>
</table>

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.
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 their health relevance.

**SAND AND DUST STORMS**

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

**BLACK CARBON/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 source emission control.
- Apply emerging science & technology for the assessment of exposure.
The importance of AQGs for health

• Around 7 million premature deaths are attributable to the joint effects of ambient and household air pollution and, of these, more than 1 million are estimated in the WHO African Region.

• Air pollution is now recognized as the single biggest environmental threat to human health, along with climate change.

• Air pollution affects:
  • NCDs,
  • cardiovascular and respiratory diseases,
  • lower respiratory tract infections,
  • preterm birth,
  • other causes of death in children and infants.
How many premature deaths could be avoided in the African Region?

• WHO performed a rapid scenario analysis to explore the reductions in the disease burden attributed to ambient PM$_{2.5}$ globally that would occur if the 2016 concentrations were reduced to the new AQG level and interim targets (2021).

• Over 400 000 million premature deaths attributed to ambient PM$_{2.5}$ would have been avoided if the 2021 AQG level had been achieved in the WHO African Region.

• On the path to reducing the health burden, the gradual achievement of the interim targets brings about substantial benefits. For example, 60% of premature deaths (over 285 000) would have been avoided if IT-4 (the 2005 AQG) had been achieved.
How can the updated AQGs be used?

**AS AN EVIDENCE-INFORMED TOOL**

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

**TO STIMULATE RESEARCH**

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

**FOR 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 enhances people’s health.

Everybody has a role to play

AQGs are a powerful tool for climate action
What can countries do with the AQGs?

Key points

- Countries can **use the AQGs as a tool** to guide, drive and support the selection and adoption of measures to reduce exposure to air pollution through:
  - Establishing or **updating legally binding air quality standards and develop policies.**
  - **Strengthening multisectoral cooperation** at national, regional, and international levels, and advocating for air quality.
  - Taking effective steps to **reduce health inequities** related to air pollution.
  - Actions to reduce air pollution require **cooperation** of various sectors and stakeholders.
What is needed to implement the guidelines?

- Key institutional / technical tools and human capacity
- Existence and operation of air pollution monitoring systems
- Public access to air quality data
- Legally binding, globally harmonized AQ standards
- Air quality management systems
- Capacities to conduct health risk assessment to set priorities for action
- Cooperation among different sectors and stakeholders, including the health sector
Air quality standards are the cornerstone of air quality management.

Air quality standards may be based solely on scientific evidence and public health considerations.

For example, 36% of countries in the African Region had standards for at least 1 pollutant and averaging time aligned with 2005 AQGs (Kutlar Joss et al, 2017)

Other factors that may be considered in the policy process include:
- Legal aspects
- Cost–benefit /cost–effectiveness
- Technological feasibility
- Infrastructural measures
- Socio-political considerations, including equity
The health sector has a crucial role

The health sector has a role in:

• raising awareness of the impact of air quality on health

• advising the public and patients about how the impact of air pollutants can be mitigated at an individual level;

• gathering evidence on health effects from air pollution;

• and joining advocacy efforts at the national and international levels to ensure that the health arguments are heard.

Engagement of the health community is crucial.
Solutions require multisectoral cooperation
Thank you

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