Aria, clima e salute: dall'evidenza scientifica all'azione

Inquinamento atmosferico e responsabilità sanitaria: focus Trentino ed Europa

XV Giornate Italiane Mediche per l'Ambiente (GIMA)

14 November 2026

Dr Samantha Pegoraro, WHO Climate Change, Air Quality, Energy and Health Unit, WHO headquarters

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World Health Organization



ENVIRONMENTAL IMPACTS ON HEALTH

WHAT IS THE BIG PICTURE?

FACT:

24% of all

global deaths are linked to the environment. (2016)

That's roughly **13.7 million deaths** a year.



WHERE IS IT HAPPENING?



- **4.1 million** in South-East Asia Region
- **3.6 million** in Western Pacific Region
- **2.5 million** in Africa Region
- **1.4 million** in European Region
- **1.1 million** in the Region of the Americas
- **984 000** in Eastern Mediterranean Region

World Health Organization

#EnvironmentalHealth

…this % will likely **increase** in the context of the **triple planetary crisis**:



Climate change

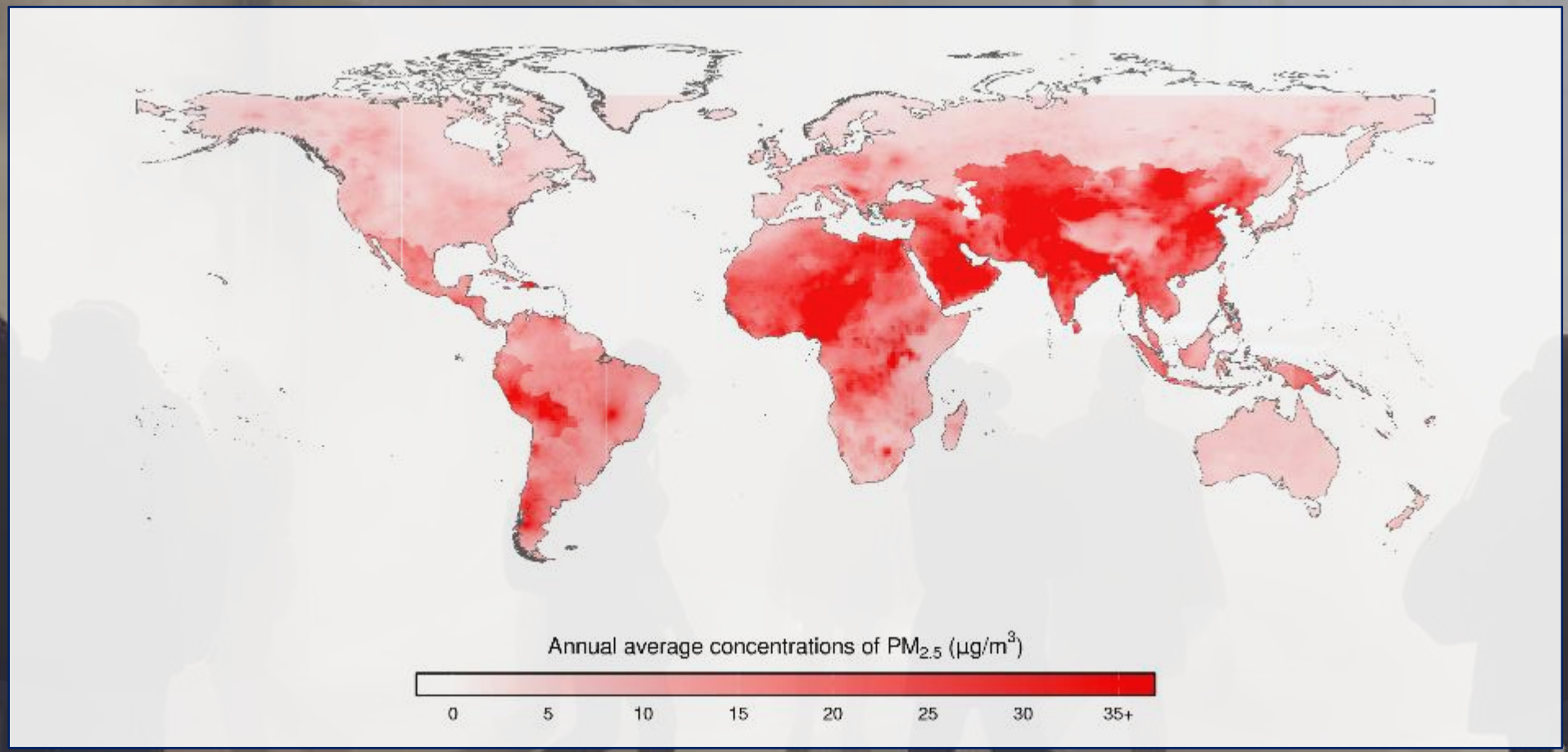


Pollution



Biodiversity loss

In 2023, 99.9% of the world's population is exposed to unhealthy air



Air Pollution Exposure, WHO (2023)

Air Pollution – The Silent Risk

Every year, around

6.6 MILLION DEATHS

Are due to exposure to both outdoor and household air pollution



Air pollution, mainly arising from inefficient energy use, is a major environmental risk to health.

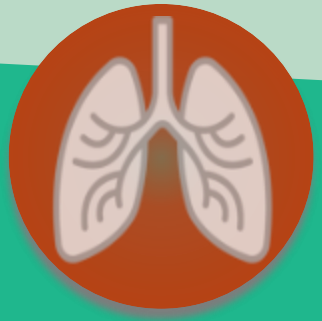
By reducing air pollution levels, countries can reduce:



Stroke



Heart disease



Lung cancer, chronic obstructive pulmonary disease, pneumonia and asthma

Global Burden of Disease: risk factors

Global rank in 2023 for deaths per 100 000 (both sexes, all ages)

1	High blood pressure
2	Particulate matter
3	Smoking
4	High fasting plasma glucose
5	Kidney dysfunction
6	High body mass index
7	High LDL
8	Lead
9	Low fruits
10	High sodium
11	Second-hand smoke
12	Low birth weight and short gestation
13	Low temperature
14	High alcohol use
15	Low wholegrains

- Air pollution is a leading risk factor for both mortality and morbidity worldwide.
- Comparable or worsen than other major risk factors such as high blood pressure, smoking and high BMI.
- Disproportionally harms low- and middle-income countries—90% of air pollution related deaths occur in LMICs.

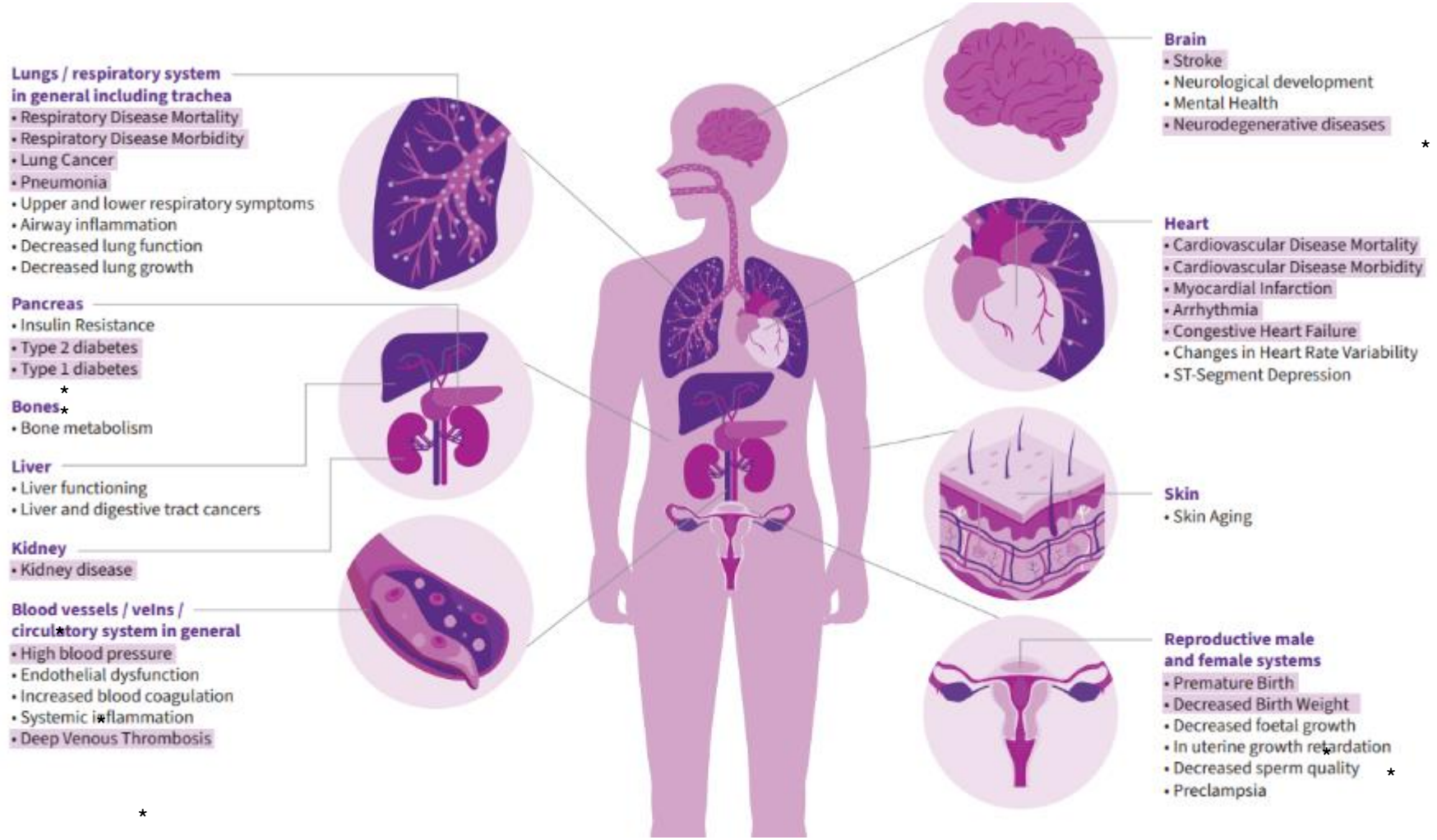
Metabolic risks

Environmental/occupational risks

Behavioural risks

Source: Institute for Health Metrics and Evaluation. Used with permission. All rights reserved.

Air pollution impacts organ systems across the body



The disease outcomes that are highlighted reflect the American Thoracic Society/European Respiratory Society assessments of established adverse effects of air pollution. It also includes those diseases currently in WHO assessments (highlighted in pink) *Source:* Adapted from Thurston et al.; 2017.

WHO efforts and timeline

WHO consolidates evidence and strengthens the capacity of the health and other sectors take action to protect public health from air pollution:

Long-range transboundary air pollution convention **(1979)**

SDG indicators on air pollution & health **(2015)**

Most recent version of air quality guidelines published **(2021)**



1958 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | 2025

WHO's first report on air pollution & health **(1958)**

1st WHO guidelines published **(1987)**



1st global conference on air pollution **(2018)**

Revised air pollution roadmap WHA 78 **(2025)**

WHO AQGs 2021: the global benchmark for clean air

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 on 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

World Health Organization
European Region

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

Progress matters

Every step towards cleaner air brings health gains



World Health Organization
European Region

Ultrafine particles, black carbon and desert dust

Good practice statements signal where future guideline development may be heading

ULTRAFINE PARTICLES



- Monitoring based on particle number count, PNC (≤10 nm lower size limit)
- Low vs. high PNC differentiation for source-control prioritization.
- Advanced exposure assessment

BLACK/ELEMENTAL CARBON



- Monitoring
- Emission inventories, exposure assessment and source apportionment
- Emission reduction measures, standards/targets.

SAND AND DUST STORMS



- Monitoring, forecasting
- Evidence generation
- Nature-based solutions, road dust management

World Health Organization
European Region

Health evidence shapes clean air policy in Europe



Official Journal of the European Union

EN

L series

2024/2881

20.11.2024

DIRECTIVE (EU) 2024/2881 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 23 October 2024

on ambient air quality and cleaner air for Europe

(recast)

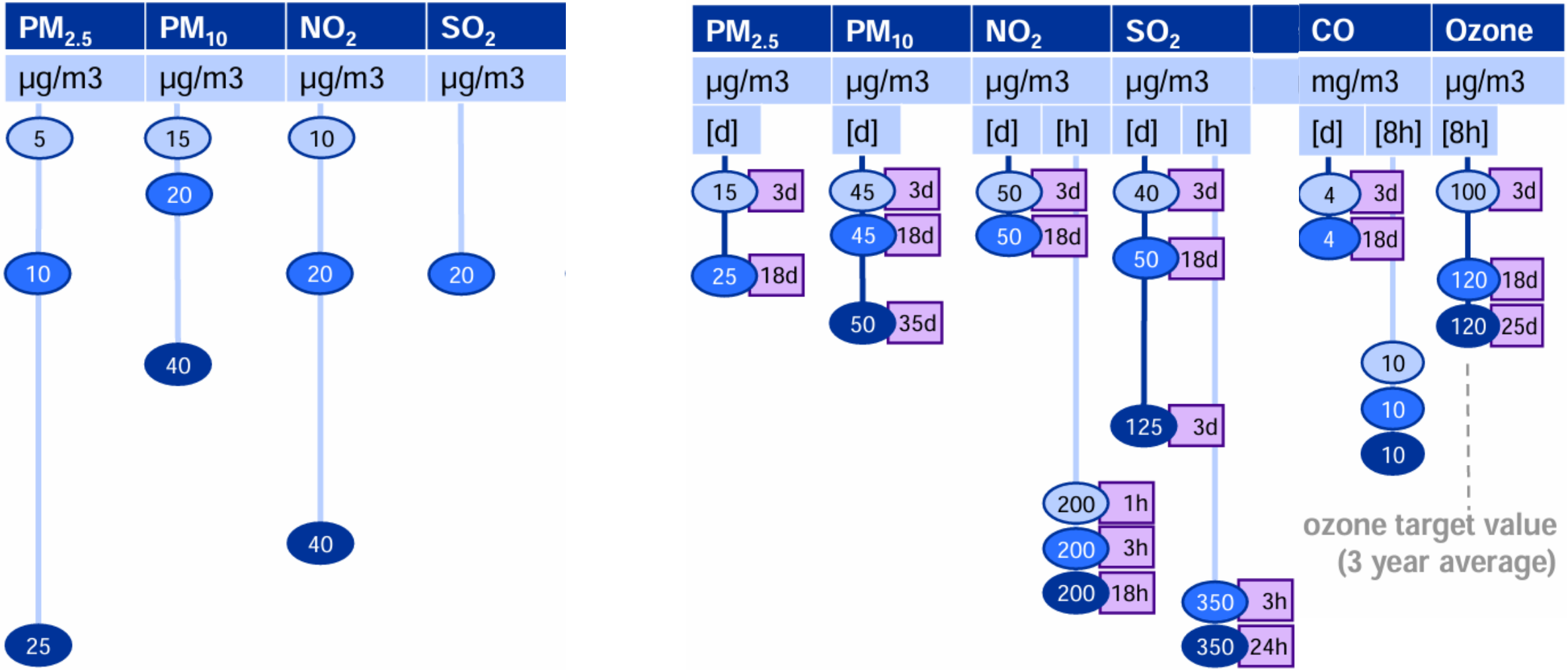
(4) The Zero Pollution Action Plan also sets out a vision for 2050, where air pollution is reduced to levels no longer considered harmful to health and natural ecosystems. To that end, a staged approach towards setting current and future Union air quality standards should be pursued, establishing air quality standards for 2030 and beyond, and developing a perspective for alignment with the most up-to-date WHO Air Quality Guidelines at the latest by 2050

World Health Organization
European Region

Directive (EU) 2024/2881

AAQD: substantial progress, remaining gap

World Health Organization
REGIONAL OFFICE FOR Europe



x WHO guidance levels x EU limit value as of 2030 x EU limit/target value until 2030

Adapted from: 3_20250305-FAIRMODE.pdf

From WHO governance to actions on air pollution



World Health Assembly

The World Health Assembly is the decision-making body of WHO. It is attended by delegations from all WHO Member States and focuses on a specific health agenda prepared by the Executive Board. The main functions of the World Health Assembly are to determine the policies of the Organization, appoint the Director-General, supervise financial policies, and review and approve the proposed programme budget.



Executive Board

The Executive Board is composed of 34 technically qualified members elected for three-year terms. The annual Board meeting is held in January when the members agree upon the agenda for the World Health Assembly and the resolutions to be considered by the Health Assembly.

2015 WHA Resolution on air pollution and health

2016 Road Map for an enhanced global response to the health effects of air pollution

2025 Updated Road Map for an enhanced global response to the health effects of air pollution

New goal :

50% reduction in health impacts from anthropogenic sources of air pollution by 2040

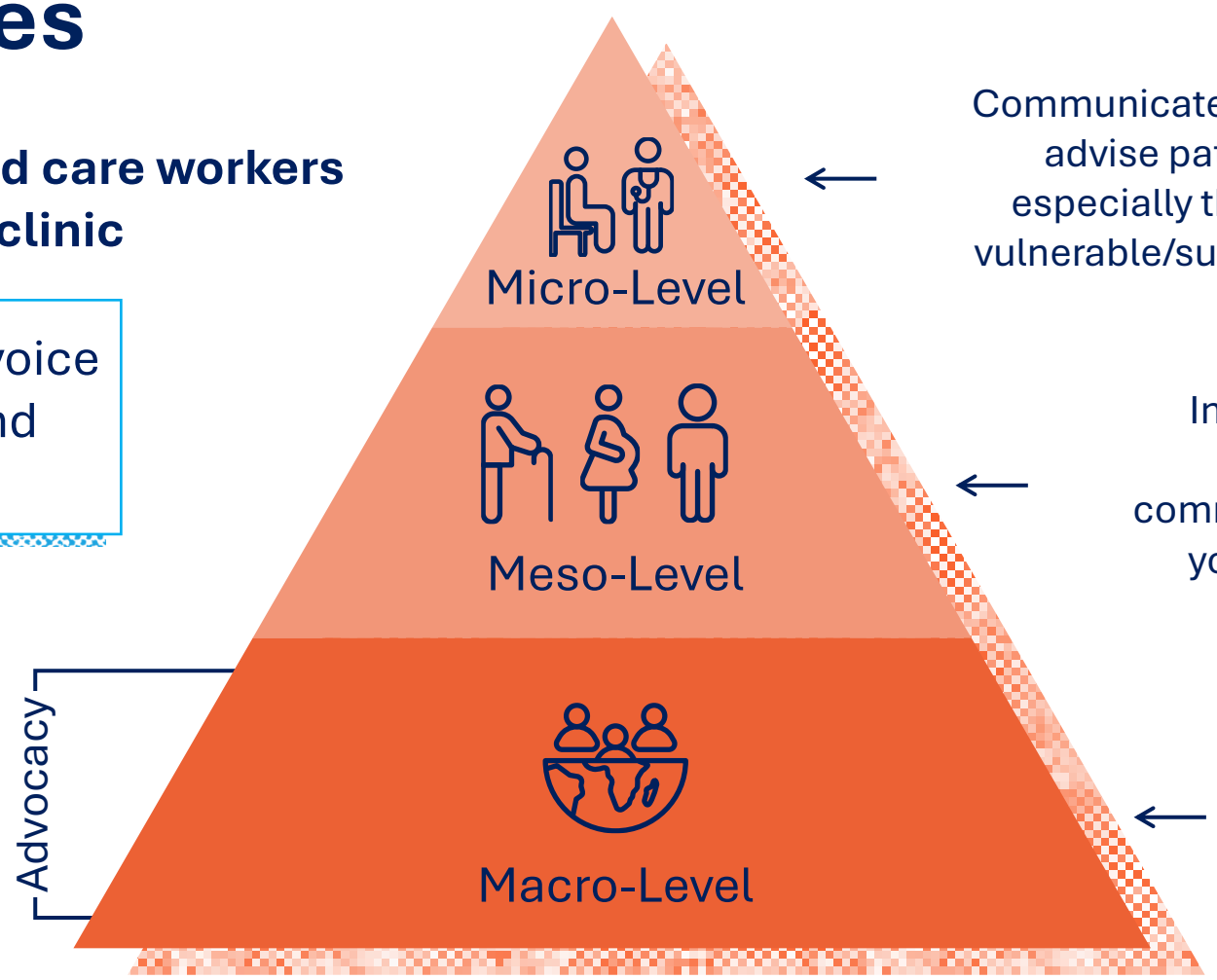


What is the health sector response?

The role of health and care workers as clean air advocates

The role of health and care workers extends beyond the clinic

They are a trusted voice for their patients and communities



Communicate risks and advise patients, especially the most vulnerable/susceptible.

Involve patients, families and communities. Educate your colleagues.

Engage with the community as a whole and influence policy-making.
Use the health argument to advocate for clean air.

Source: WHO Air Pollution and Health Training toolkit www.who.int/tools/air-pollution-and-health-training-toolkit-for-health-workers

Air pollution and health training toolkit for health workers (APHT)



Training toolkit: a snapshot

Training modules:

- ✓**Introduction to ambient air pollution**
- ✓**Introduction to household air pollution**
- ✓**Health effects of air pollution**
- ✓**Role of public health workforce**

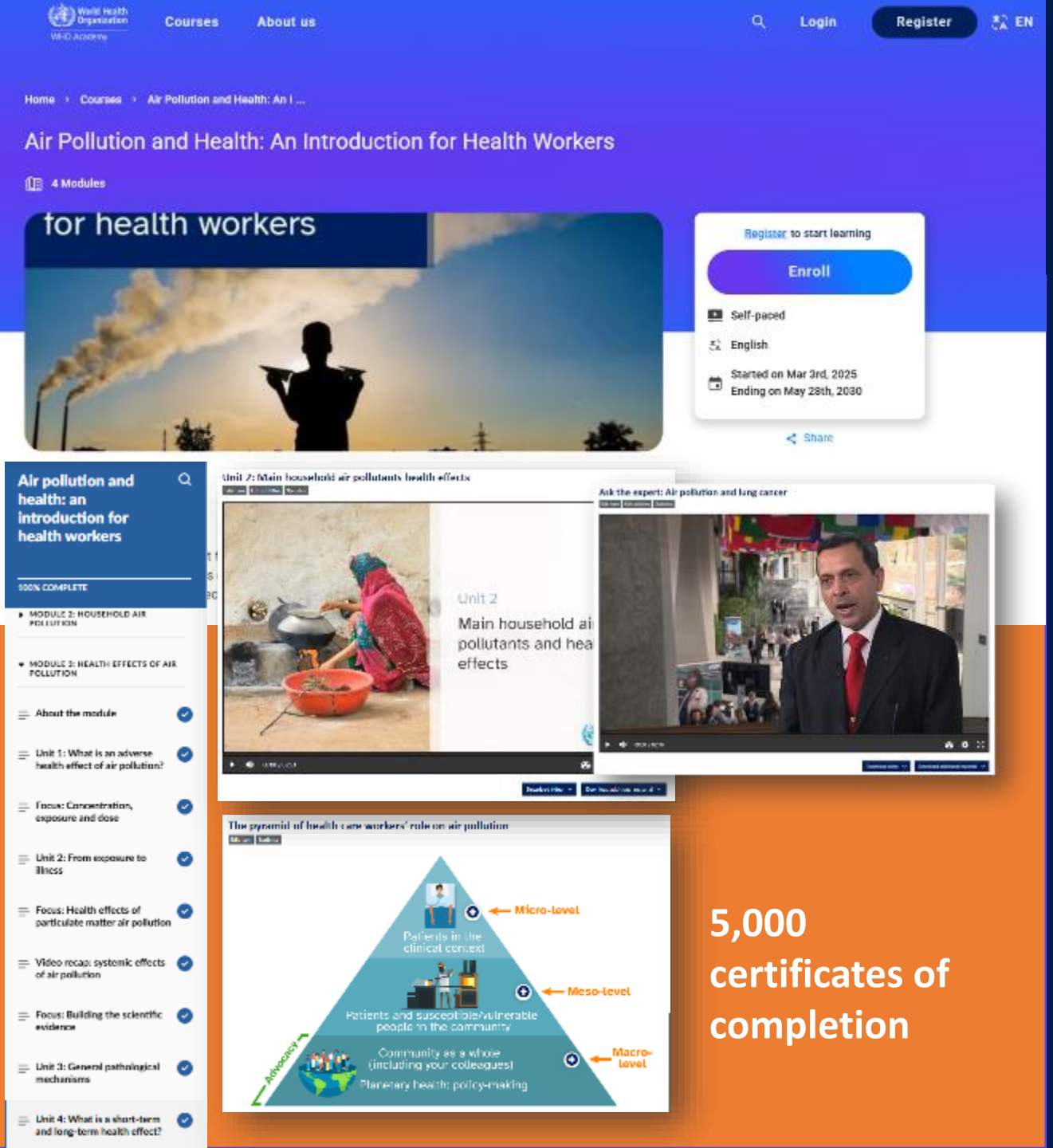
Training-the-trainers manual

Clinical case scenarios on air pollution and health

WHO Academy online course to boost your knowledge

Modules can be downloaded as PDF or requested as PPT from: hiips://www.who.int/tools/air -pollution-and-health-training-toolkit-for-health-workers

A WHO Academy online course to boost your knowledge and skills



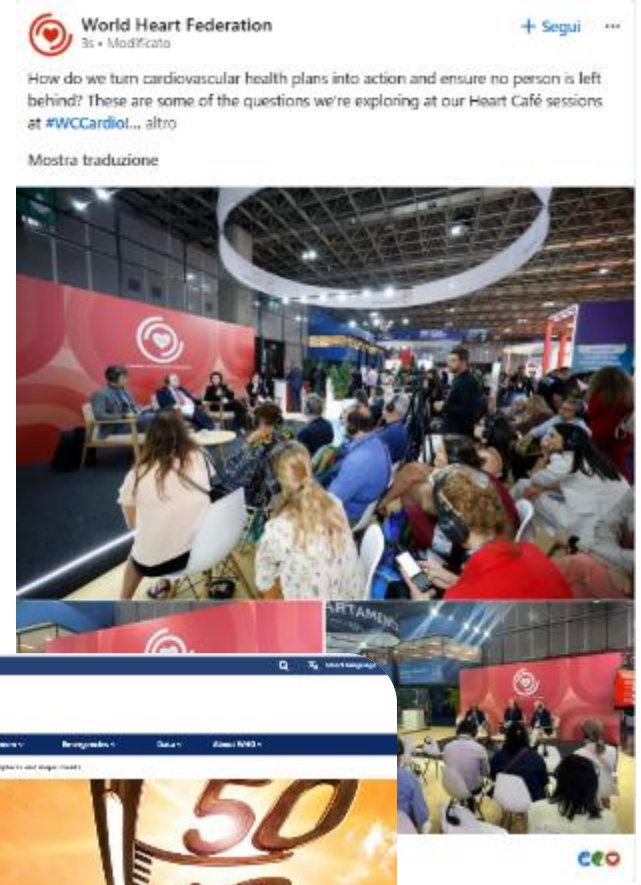
5,000 certificates of completion

- Open and freely accessible to everybody
- Course is in English (subtitles included)
- Self-paced (approx. 4 hours)
- Including training modules, videos with experts, focus and recap sections, reading materials, case studies, interactive exercises, key messages
- Knowledge checks and final assessment
- Certificate of achievement
- Evaluation survey

Translation, adaptation and new opportunities

- Italy
  (Planetary Health Challenge and ISDE)
- Dominican Republic
  (PAHO)
- Bulgaria
  (WHO Country Office)
- Brazil
  (Ministry of Health and University of Sao Paulo)













As a Health Organization: use your voice!

- raise awareness among all actors in the public health workforce, patients, and the general public;
- integrate air pollution into health curricula, training programmes, continuing education programmes, and professional practice and guidelines;
- champion health and care workers in leadership and decision-making roles to influence air quality policies and initiatives in ways that prioritize patient, public health, and health systems;
- reducing the environmental footprint of health systems while enhancing the quality and accessibility of care;
- and building collaborations across health and non-health organizations to support action for clean air.

World Health Organization



Let’s work together to make this a world with clean and healthy air for all!

Thank you!



Climate change, Air Quality, Energy and Health unit
World Health Organization
Email: *pegoraros@who.int*

EXTRA SLIDES

World Health Organization

WHO's activities on air pollution and health

Monitoring and reporting: with Sustainable Development Goals

- 3.9.1 : Mortality from air pollution
- 7.1.2 : Clean energy access
- 11.6.2: Air quality in cities

Normative work : WHO Air Quality Guidelines (ambient and indoor) & their implementations & Best Buys for air pollution

Knowledge, Evidence and measuring progress

Capacity building activities

- AirQ+: software tool for health impact assessment of air pollution
- Clean Household Energy Solution Toolkit tools (BAR-HAP, HOMES, etc)
- Health sector training on air pollution and health (APHT)

Technical support to countries through synthetizing scientific evidence and development of tools to engage with other sectors

Institutional capacity building and technical support

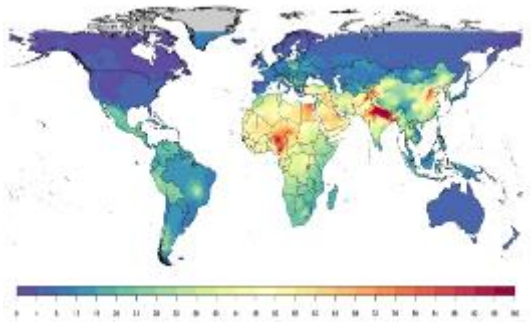
Leadership – raising awareness activities (e.g. BreatheLife Campaign), and leverage of political support (Global Conference, Health and Energy Platform of Action, NCD agenda), international collaborations

Leadership and coordination

SDG Indicators related to air pollution and health

SDG 3.9.1: Mortality from air pollution





SDG 7.1.2: Percentage of population with primary reliance on clean fuels and technologies at the household level





SDG 11.6.2: Annual urban mean concentration of particulate matter ($PM_{2.5}$), population-weighted

World Health Organization

SDG 7.1.2 Clean household energy access

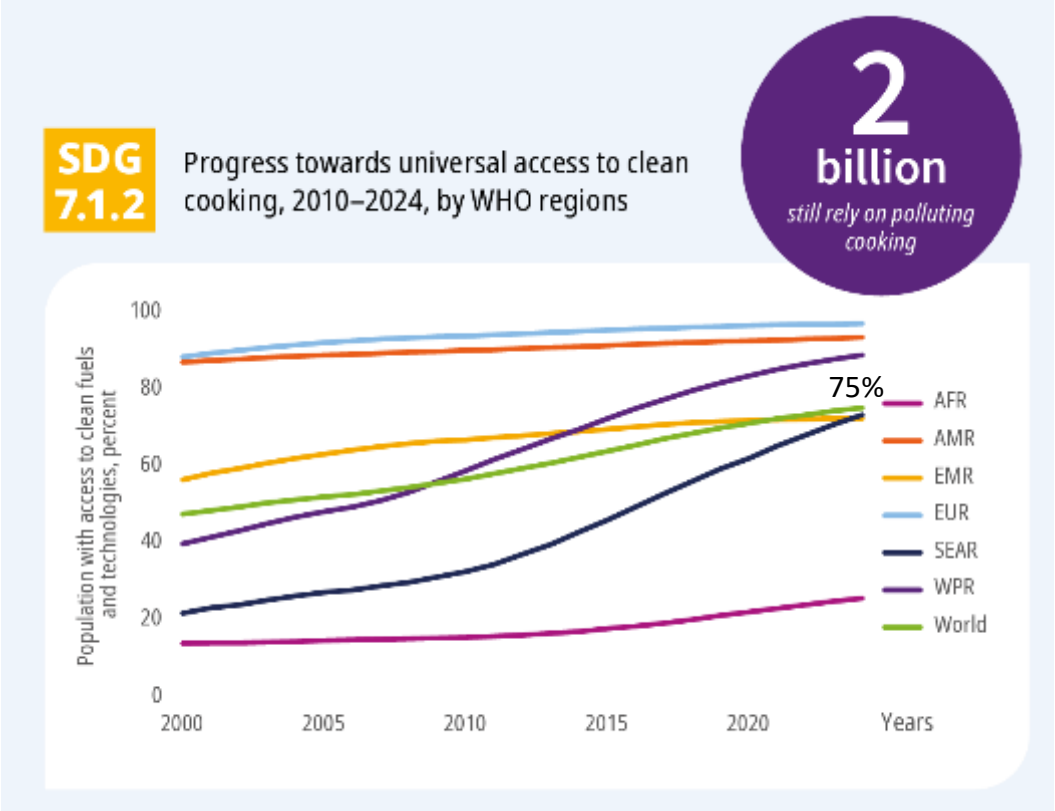
Definition: **Proportion of population with primary reliance on clean* fuels and technologies for cooking**

Computation method: Modelled

Input data: household surveys and censuses **(WHO Household Energy Database)**

Reporting period: annually

Proxy of household air pollution exposure



Output:

- Proportion of population with access to clean cooking by country, urban and rural

Years 2010 - 2024

Find more information here:

* 'clean' defined by WHO Guidelines for indoor air quality: household fuel combustion

SDG 11.6.2 Air quality in urban areas

Definition: **Annual mean concentration of particulate matter ($PM_{2.5}$), population weighted**

Computation method: Modelled

Input data: Ground level measurements from official monitoring network **(WHO Ambient Air Quality database)**; satellite ensemble reanalysis and populatior data.

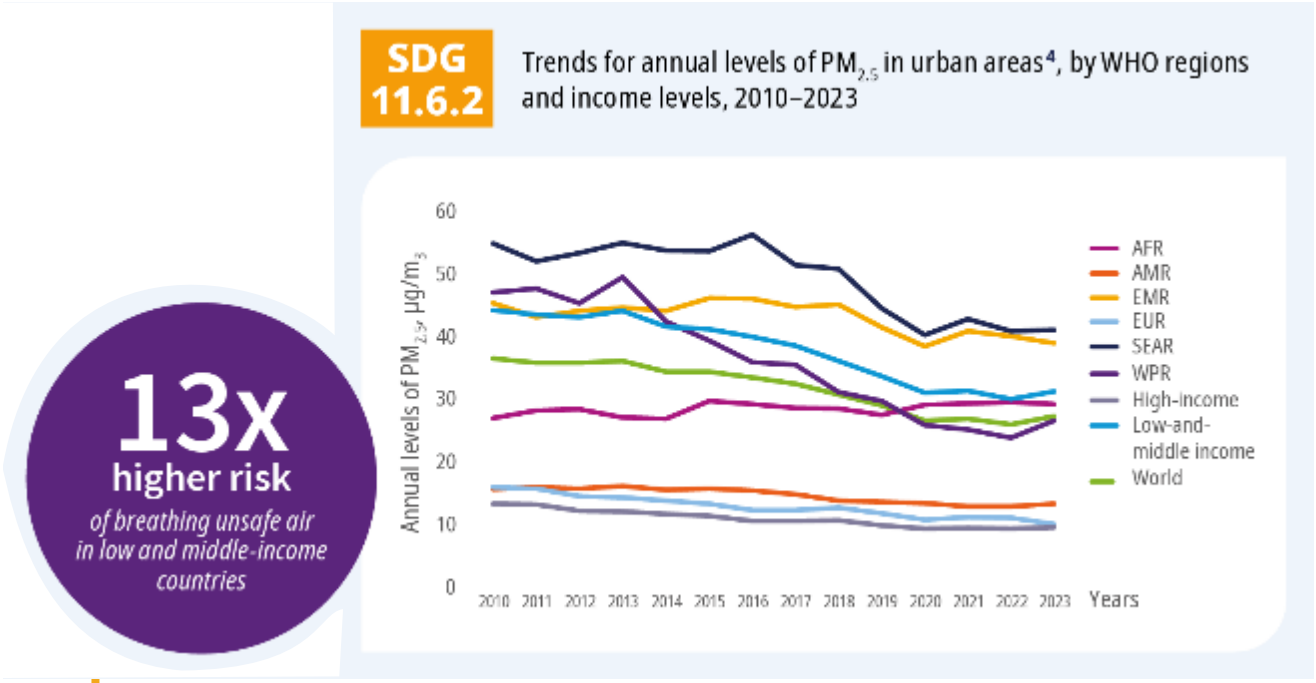
Reporting period: every 2-3 years

Proxy of ambient air pollution exposure

Output:

- Grid-level (11km x 11km) concentration for $PM_{2.5}$
- Population-weighted annual mean concentration, by country, with further disaggregation at city, town* and rural level

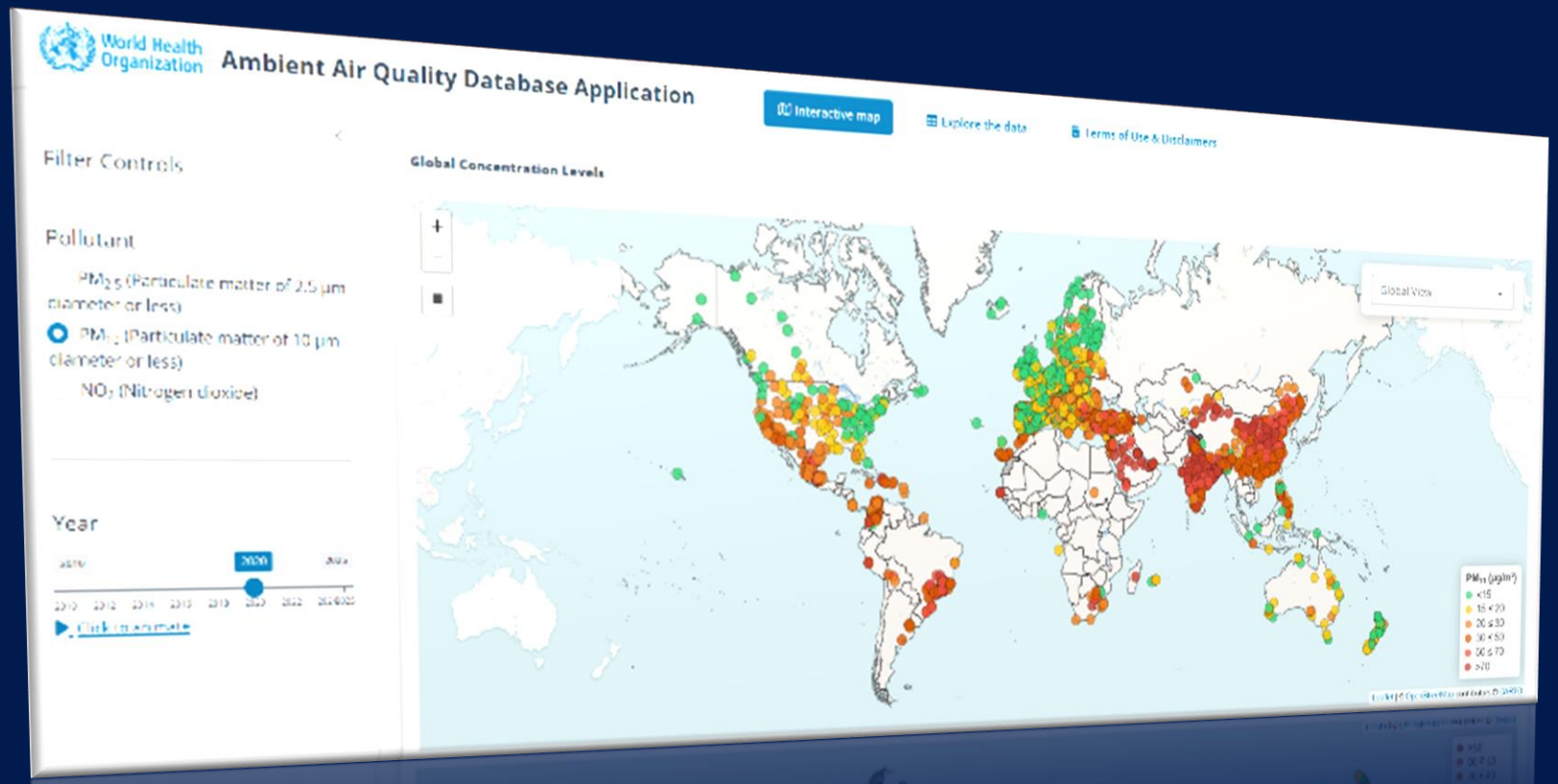
Years 2010 - 2023



Find more information here:

* Urban = cities + towns

WHO Ambient Air Quality database Version 8.0



Find more information here:

Compiles ground-level measurements of NO_2, PM_{10} and $PM_{2.5}$.

These measurements aim to represent an average for the city or town, rather than for individual monitoring stations.

The number of measurements has multiplied by over 7 -since 2011

Hosts data from 8 023 human settlements in 127 WHO Member States, for the period 2010-2024

Available resources: Excel and interactive web application

SDG 3.9.1 Mortality attributed to air pollution

Definition: **Age-standardized mortality rate attributed to household and ambient air pollution**

Computation method: Estimated

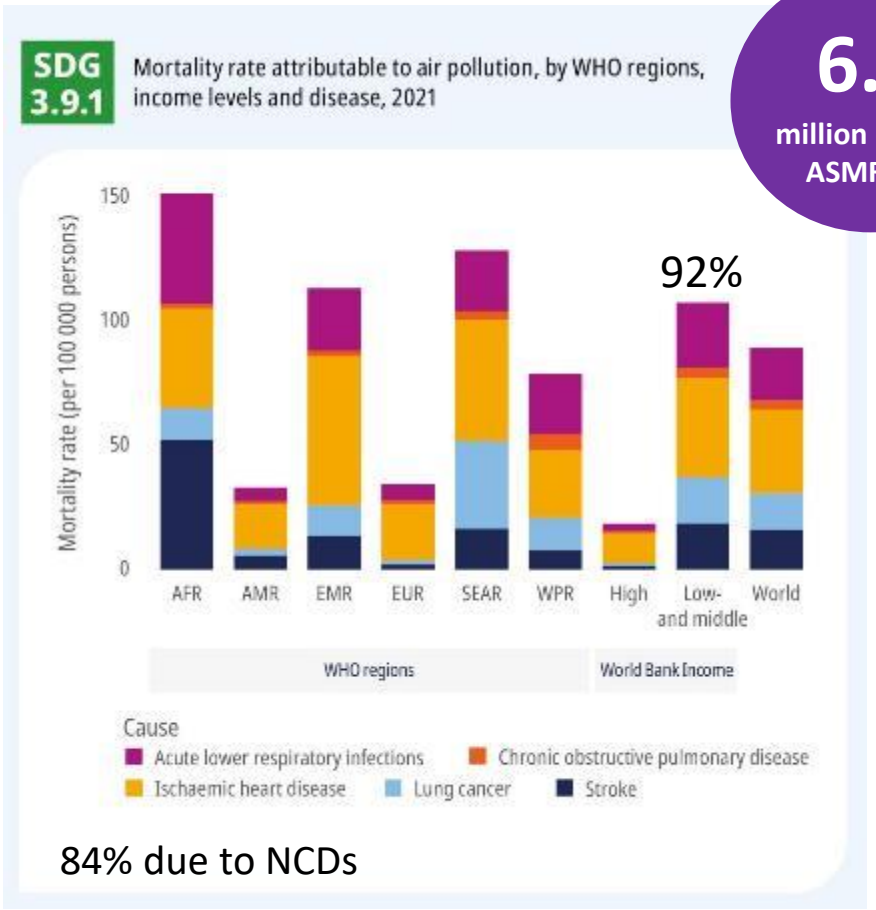
Input data: **WHO Global Health Estimates**, SDG 7.1.2, 11.6.2 as exposure and epidemiological evidence for Exposure-Response functions

Reporting period: every 2-3 years

Output:

- Deaths, DALYs, YLLs and YLDs attributed to air pollution annually , by country, cause-specific, age and sex

Years 2010 - 2021



Find more information here: