Protecting public health through addressing air pollution and climate action

Dr Dorota Jarosinska

WHO European Centre for Environment and Health

Serving a Future Society, ECMWF Annual Seminar 2025

Bonn, 09 April 2025

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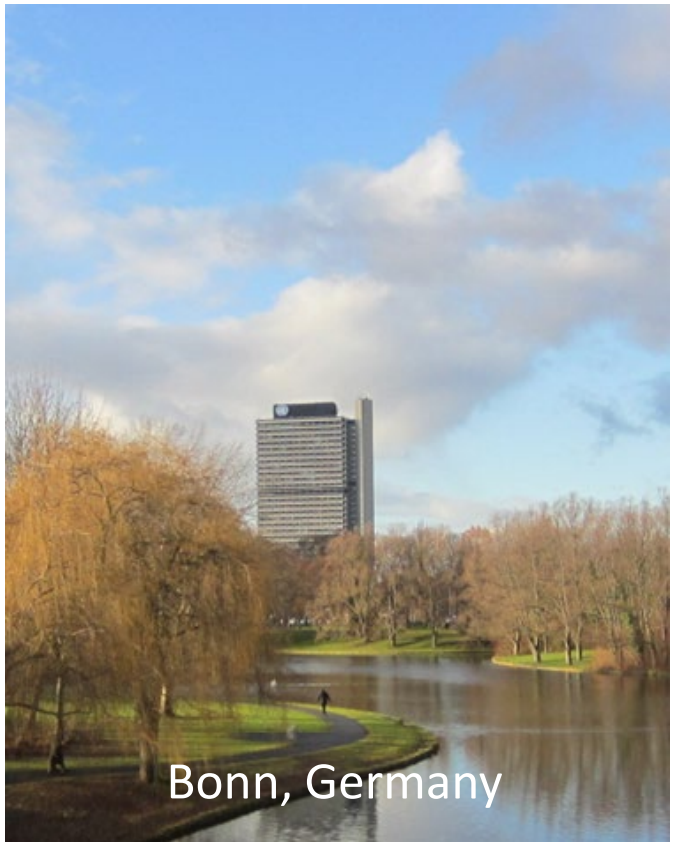
- Regional dimension:
  - support to 53 Member States of the WHO European Region
- Intersectoral dimension:
  - European Environment and Health Process
- Transboundary dimension:
  - Chair of the Task Force on Health
- Global dimension:
  - WHO global air quality guidelines and tools



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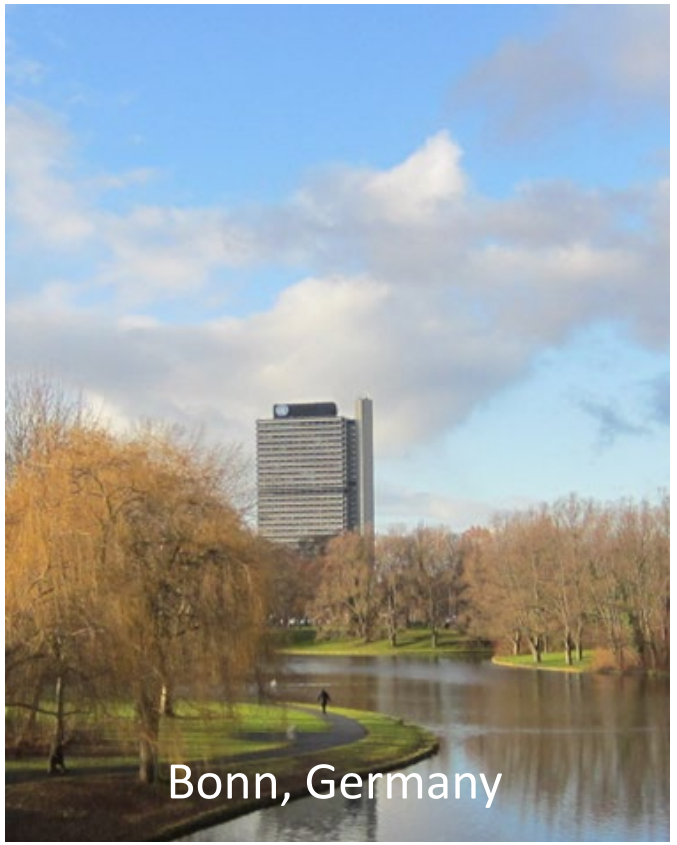
WHO work on air quality and health

- Normative work
- Methods and tools to assess the health impacts of AP
- Capacity building in Member States
- Strengthening the role of health sector
- Risk communication and health messaging of air pollution
- Advocacy
- Custodian of air quality and health related SDGs



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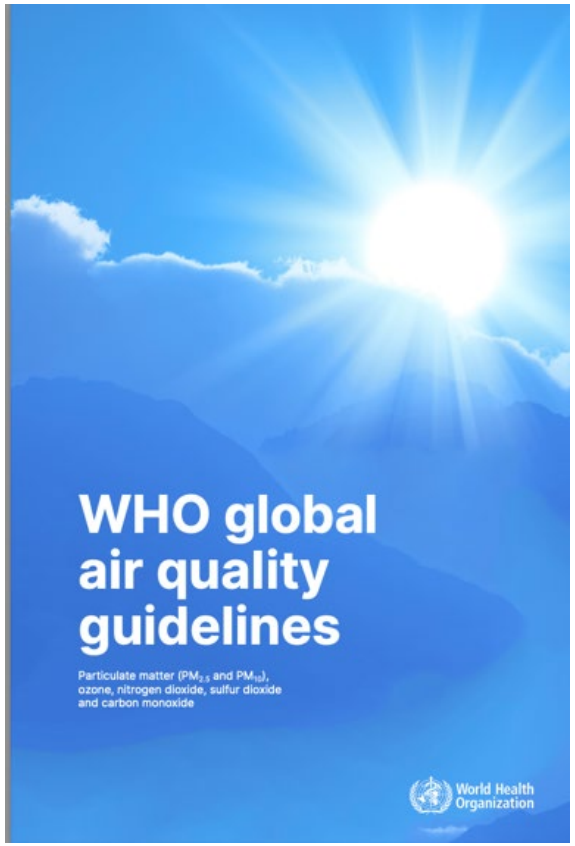
Why the new WHO global AQG?



- Marked increase in the quality and quantity of **evidence** on the health effects of air pollution
- Insights into sources of emissions and the contribution of air pollution to the **global burden of disease**
- Importance of addressing health **inequities** related to air pollution
- Better insight into global **concentrations** of some pollutants
- Significant advances in the worldwide **adoption** of the 2005 air quality guidelines
- Mitigating air pollution has become more central in **WHO and UN activities**

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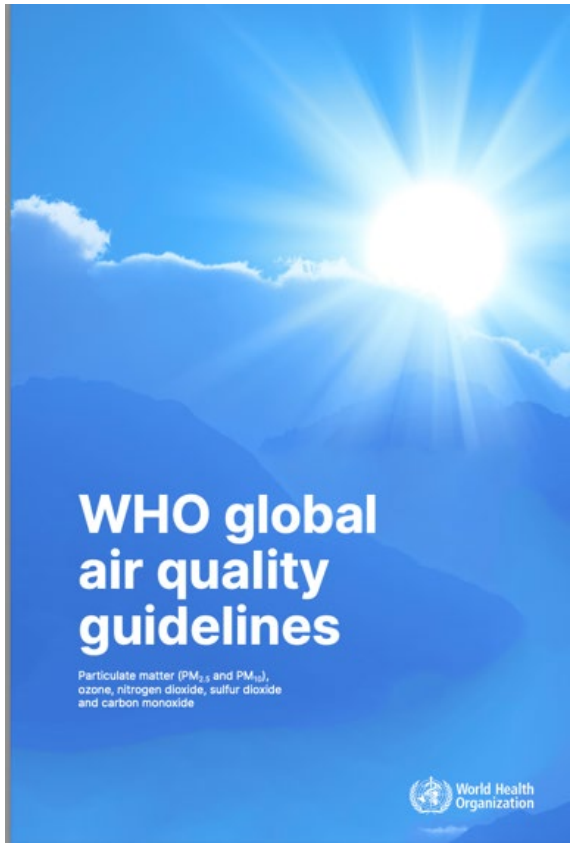
WHO global Air Quality Guidelines



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

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New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution
WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide

What are the new WHO global AQG

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 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

Good Practice Statements

SAND AND DUST STORMS

- Maintain suitable AQ management and dust forecasting programmes.
- Maintain AQ monitoring programmes and reporting procedures.
- Conduct epidemiological and toxicological studies.
- Implement wind erosion control through 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 in terms of particle number concentration (PNC) for a size range with a lower limit of ≤ 10 nm and no restriction on the upper limit.
- Expand common AQ monitoring by integration UFP monitoring.
- Distinguish between low and high PNC to guide decisions on the priorities of source emission control.
- Utilize emerging science and technology for the assessment of exposure.

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Main uses of the WHO AQG

As an evidence-informed tool

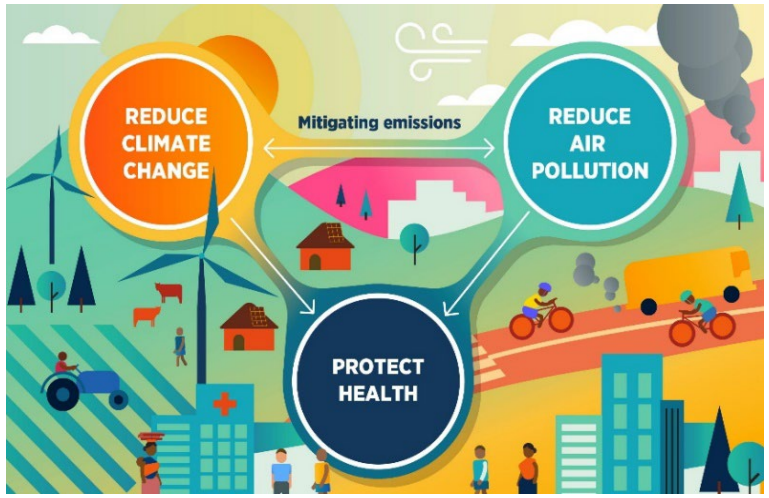
To guide legislation and **policies, to reduce levels of air pollutants** and decrease the disease burden due to air pollution exposure worldwide

To stimulate research

To identify critical data gaps for future research to better protect people from the harmful effects of air pollution

For climate action

Reducing air pollution and **mitigating climate change** together act to protect health



Synergies and health co-benefits of air quality and climate action

The economic benefits on human health from air quality improvement arising from mitigation action can be of the same order of magnitude as mitigation costs, and potentially even larger.

Source: Working Group III — IPCC

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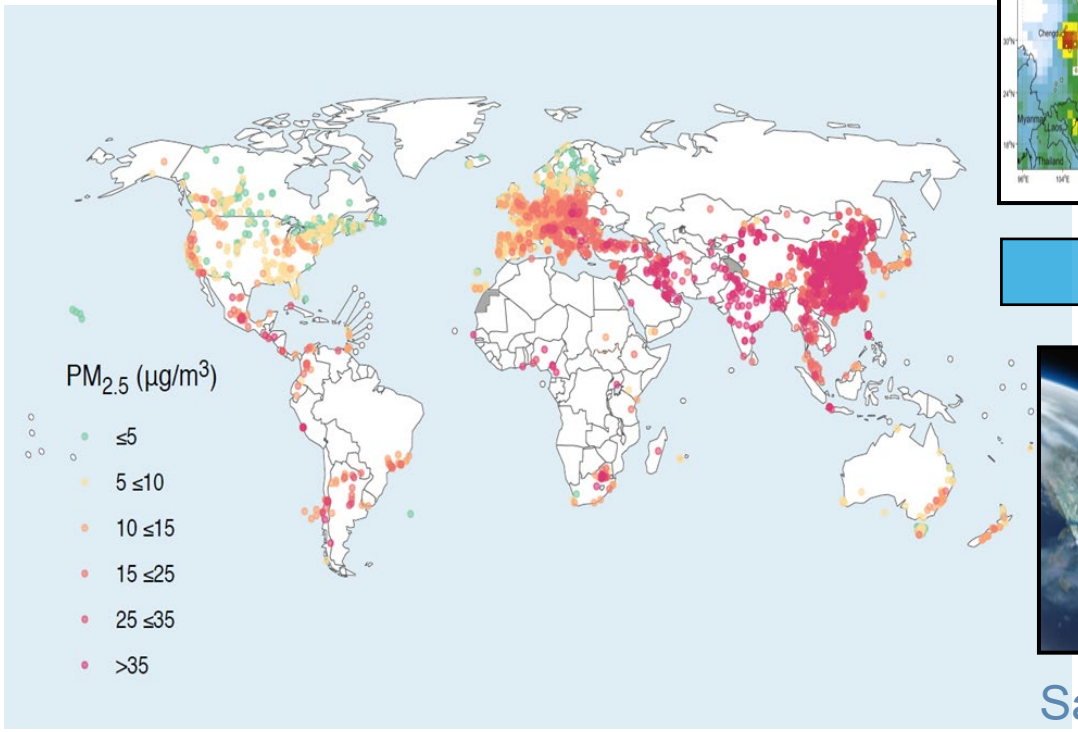
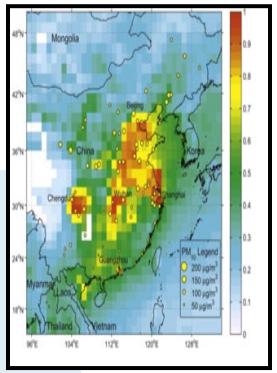
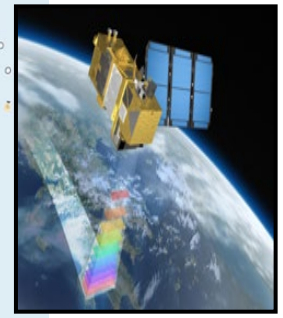
SDG 11.6.2 Concentrations of fine particulate matter (PM2.5)

Ground-level PM from WHO ambient air quality database



Chemical transport model





Satellite data

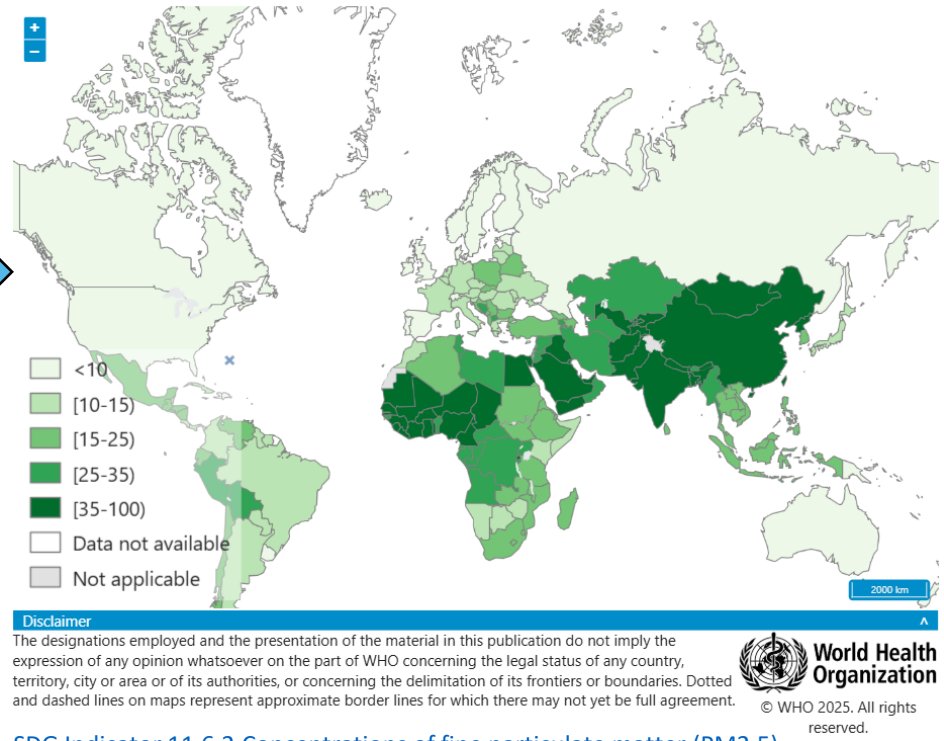
DIMAQ

ROYAL STATISTICAL SOCIETY
DATA | EVIDENCE | DECISIONS
Journal of the Royal Statistical Society
Applied Statistics
Series C

Appl. Statist. (2018)
67, *Part* 1, *pp.* 231–253

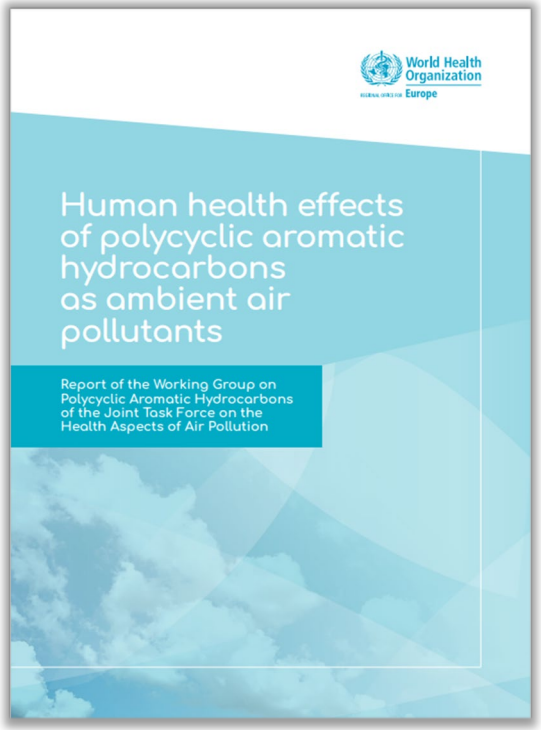
Data Integration Model for Air Quality: A Hierarchical Approach to the Global Estimation of Exposures to Ambient Air Pollution

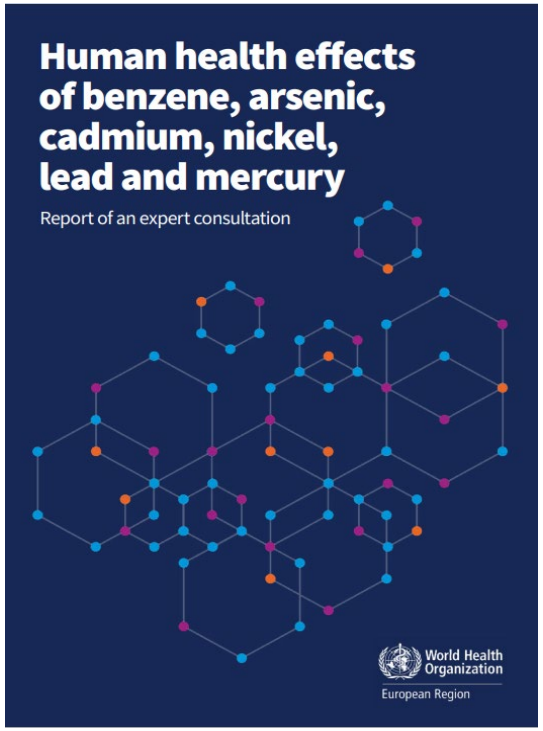
Gavin Shaddick, Matthew L. Thomas, Amelia Jobling, Michael Brauer, Aaron van Donkelaar, Rick Burnett, Howard Chang, Aaron Cohen, Rita Van Dingenen, Carlos Dora, Sophie Gumy, Yang Liu, Randall Martin, Lance A. Waller, Jason West, James V. Zidek, Annette Prüss-Ustün

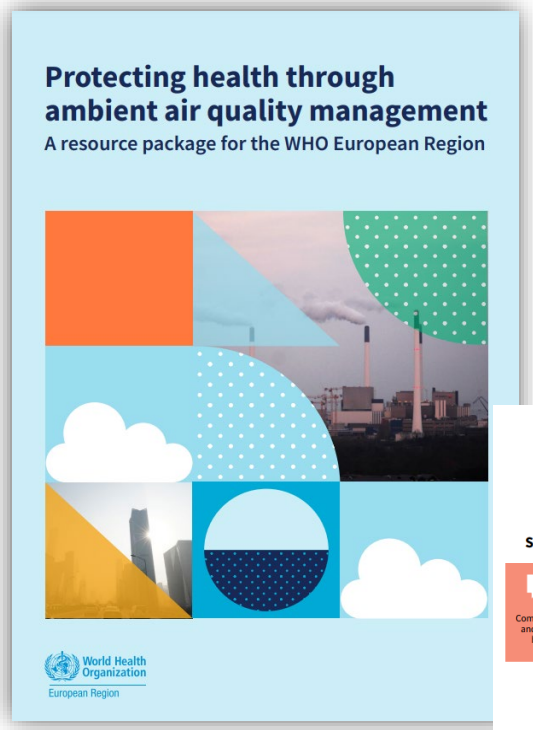


SDG Indicator 11.6.2 Concentrations of fine particulate matter (PM2.5)

Consolidation of the evidence and technical guidance







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Updating methods to assess health risks of air pollution

	HRAPIE-2	EMAPEC
Full name	Update of Health Risks of Air Pollution in Europe	Estimating the Morbidity from Air Pollution and its Economic Costs
Pollutants	PM2.5, PM10, NO_2, O_3	PM2.5, NO2
Coverage	Focus on WHO European Region	Global
Health outcomes	Mortality (mainly long-term effects)	Morbidity (mainly long-term effects), economic approaches
Features	• Systematic reviews and meta-analysis to inform concentration-response functions • Associated information for health risk assessment	• Review of systematic reviews • Association information for health risk assessment with emphasis on economics

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Project updates

HRAPIE-2

- Systematic reviews published:

  - Orellano et al. Long-Term Exposure to Particulate Matter and Mortality: An Update of the WHO Global Air Quality Guidelines Systematic Review and Meta-Analysis. Int J Public Health (September 2024)

  - Kasdagli et al. Long-Term Exposure to Nitrogen Dioxide and Ozone and Mortality: Update of the WHO Air Quality Guidelines Systematic Review and Meta-Analysis. Int J Public Health (October 2024)

- Selection of CRFs and associated information (Bonn, Dec 2024)

- Drafting of final WHO report, external review and publication (ongoing)

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EMAPEC

- Review of reviews:

  - Forastiere et al. Choices of morbidity outcomes and concentration-response functions for health risk assessment of long-term exposure to air pollution. Environ Epidemiol (June 2024)

- Case studies:

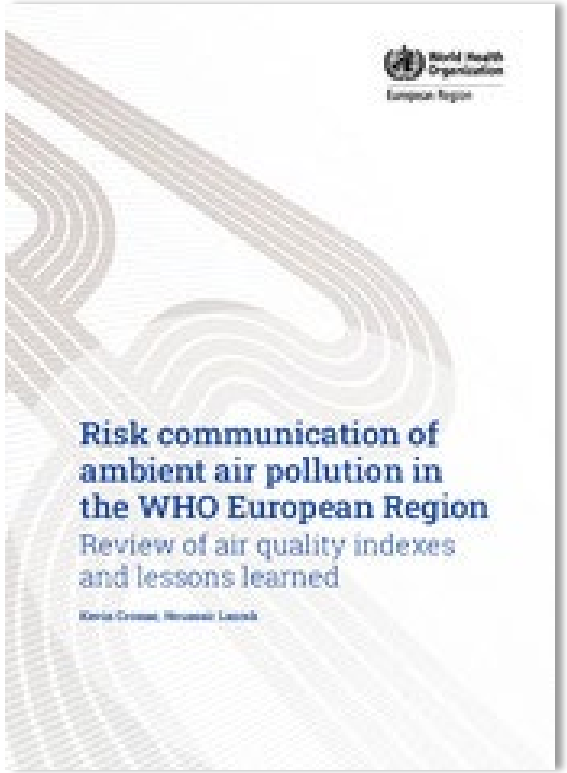
  - France: Public Health France: Estimation of morbidity attributable to long-term exposure to ambient air pollution and its economic impacts in mainland France, 2016-2019 (January 2025)

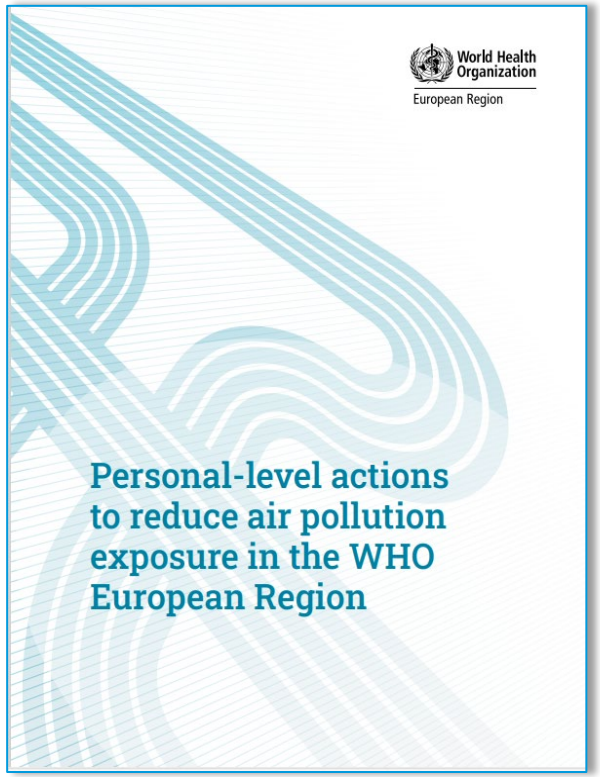
  - United Kingdom: Walton et al. Health and associated economic benefits of reduced air pollution and increased physical activity from climate change policies in the UK. Environ Int (February 2025)

  - Lazio, Italy: Regional Health Service – draft under review

- Drafting of final WHO report, external review, publication

Communication and health advice





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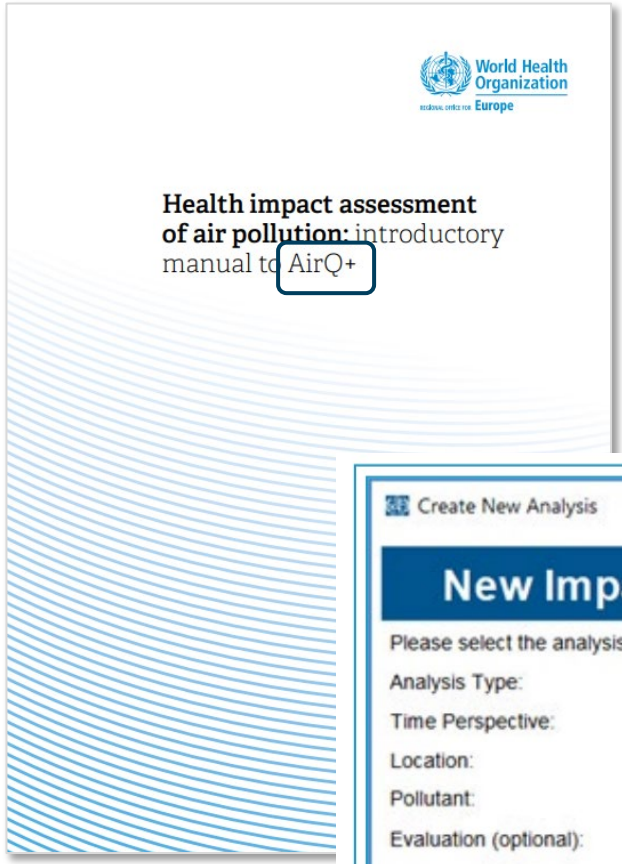
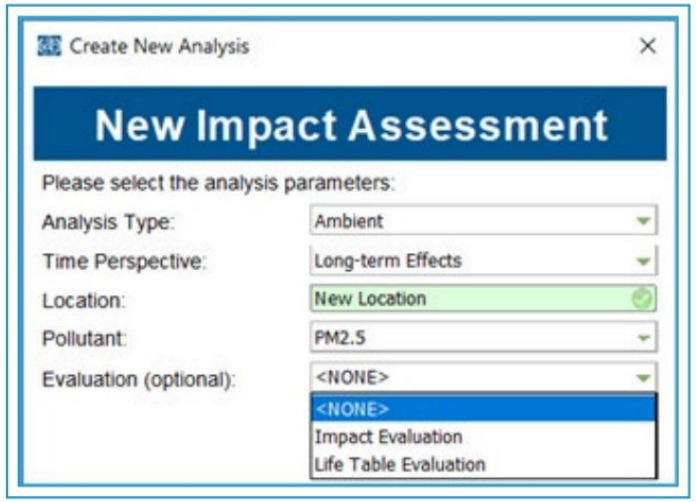
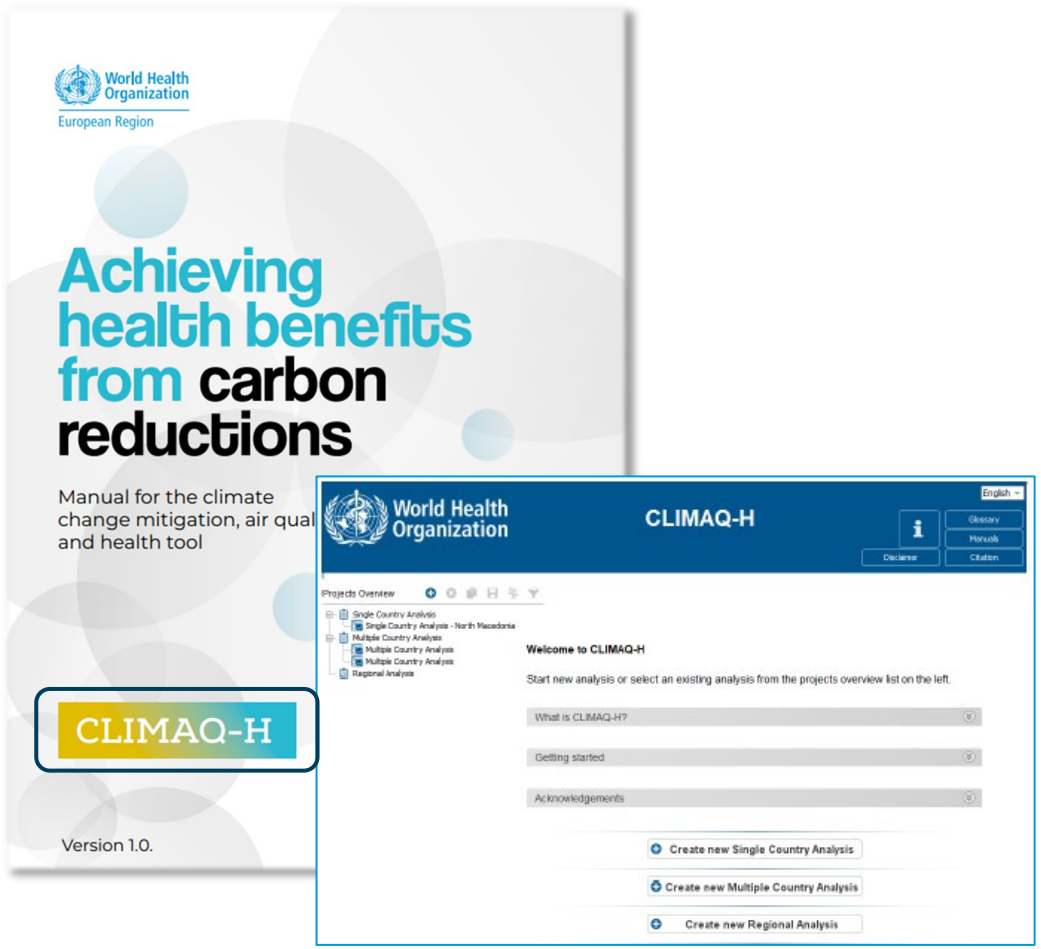
Tools and capacity building activities







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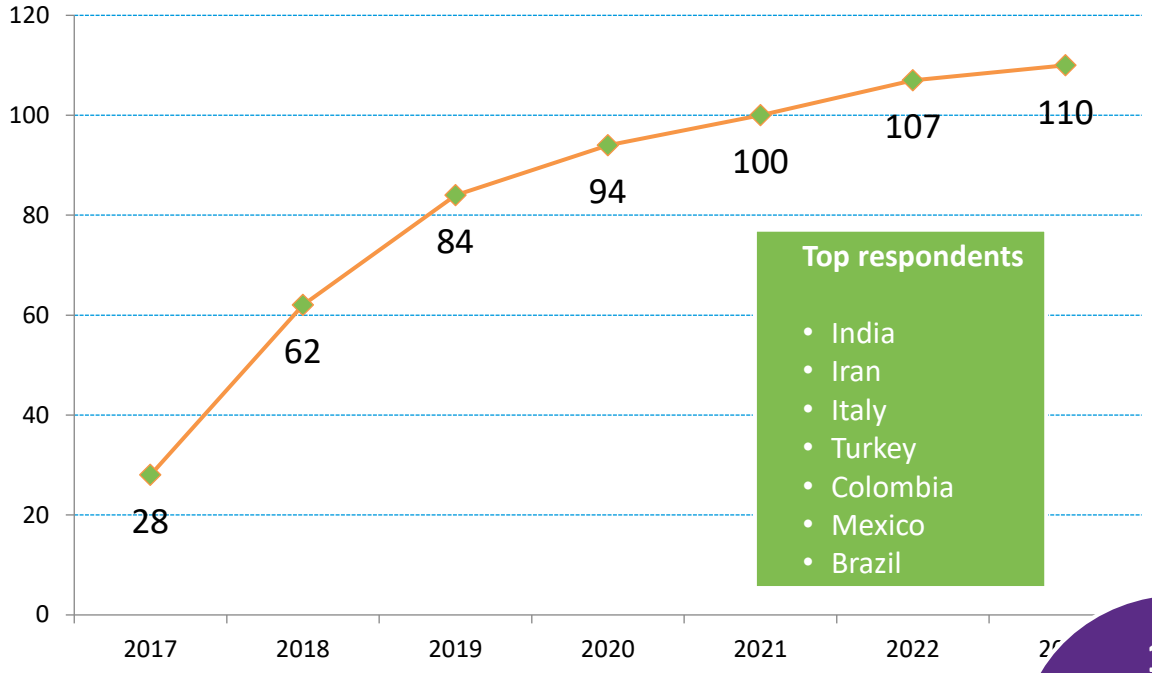
AirQ+ - tool to quantify health impacts of air pollution

Survey respondents by location (country)



117 countries and territories

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PHR | SSPH+ SWISS SCHOOL OF PUBLIC HEALTH

Public Health Reviews
REVIEW
published: 18 June 2024
doi: 10.3389/phrs.2024.1606969

Check for updates

Two Decades of Air Pollution Health Risk Assessment: Insights From the Use of WHO's AirQ and AirQ+ Tools

Heresh Amini[1,2†], Fatemeh Yousefian[3†], Sasan Faridi[4†], Zorana J. Andersen[5], Ellénore Calas[6], Alberto Castro[7,8], Karla Cervantes-Martínez[9], Thomas Cole-Hunter[5], Magali Corso[10], Natasa Dragic[11], Dimitris Evangelopoulos[12], Christian Gapp[13], Mohammad Sadegh Hassanvand[4], Ingu Kim[14], Alain Le Tertre[15], Sylvia Medina[10], Brian Miller[16], Stephanie Montero[17], Weeberb J. Requia[18], Horacio Riojas-Rodriguez[19], David Rojas-Rueda[20,21], Evangelia Samoli[22], Jose Luis Texcalac-Sangrador[19], Maayan Yitshak-Sade[1,2], Joel Schwartz[23], Nino Kuenzli[7,8], Joseph V. Spadaro[24], Michal Krzyzanowski[25] and Pierpaolo Mudu[14]*

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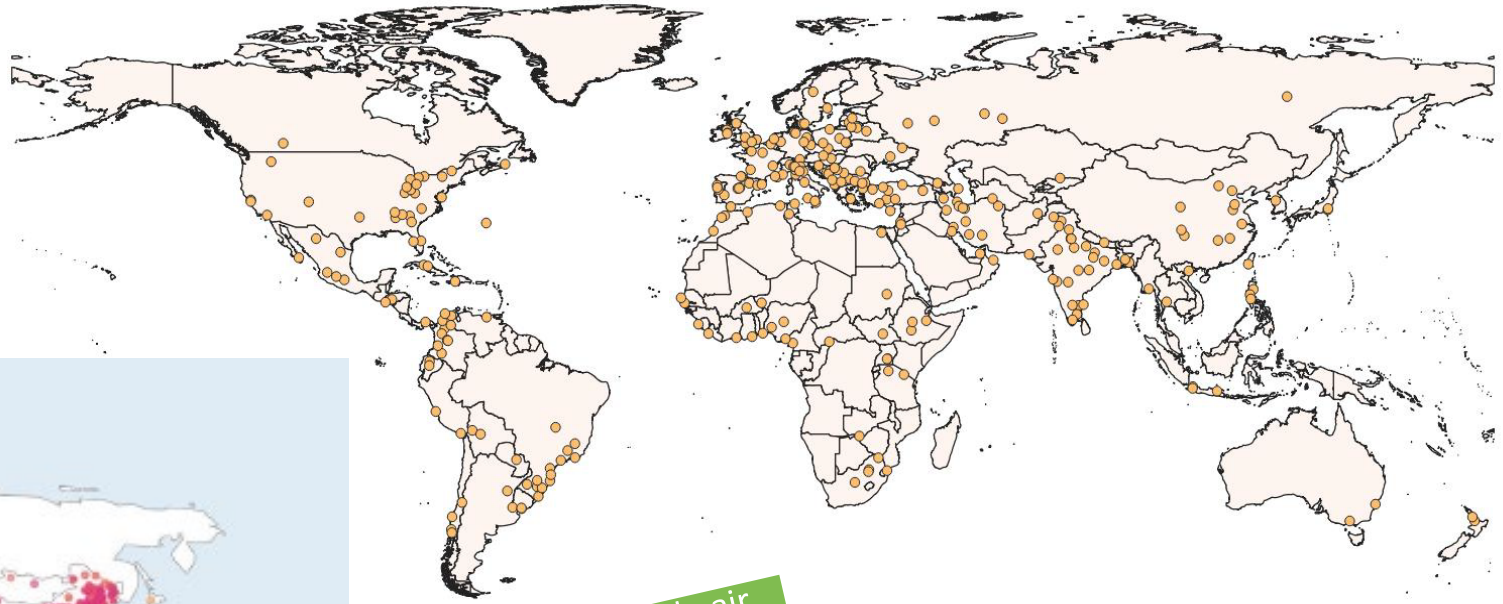
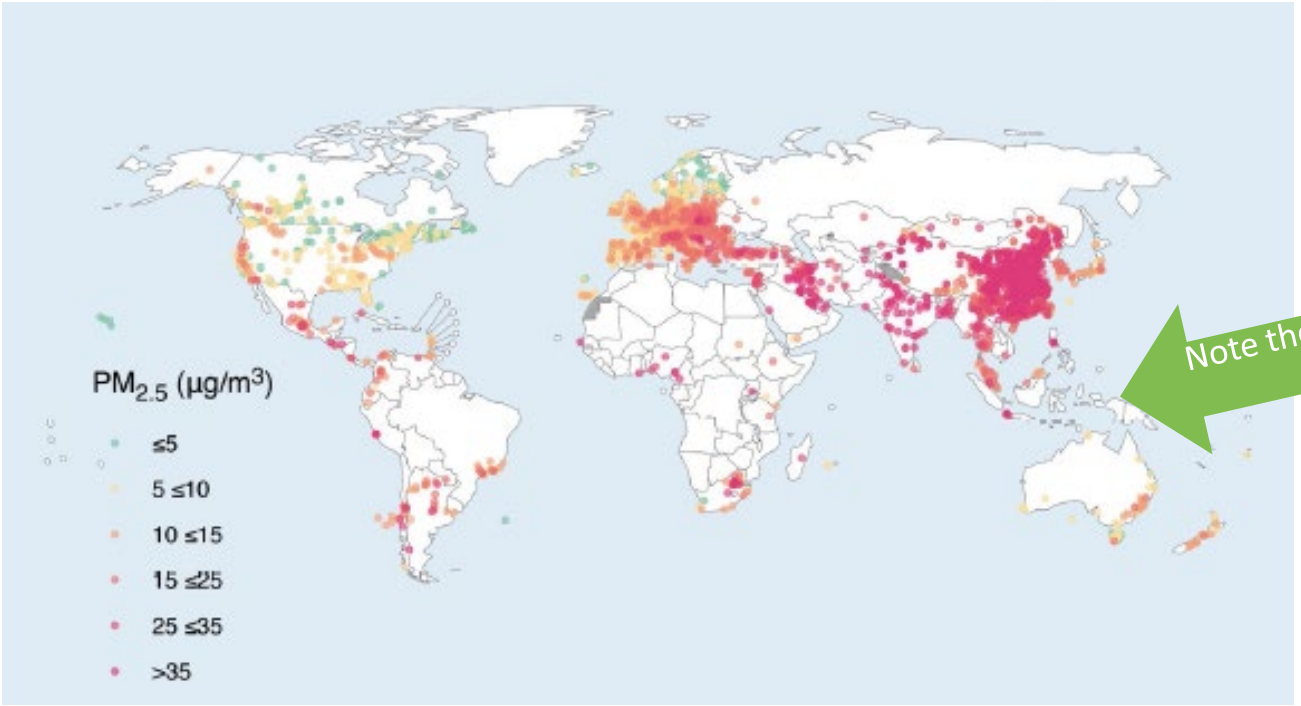
Edited by:
Ana Ribeiro,
University Porto, Portugal

Review of nearly 300 published studies from 69 countries

AirQ+ users 2016-2024 - survey respondents by location (cities and areas)

369
cities & areas



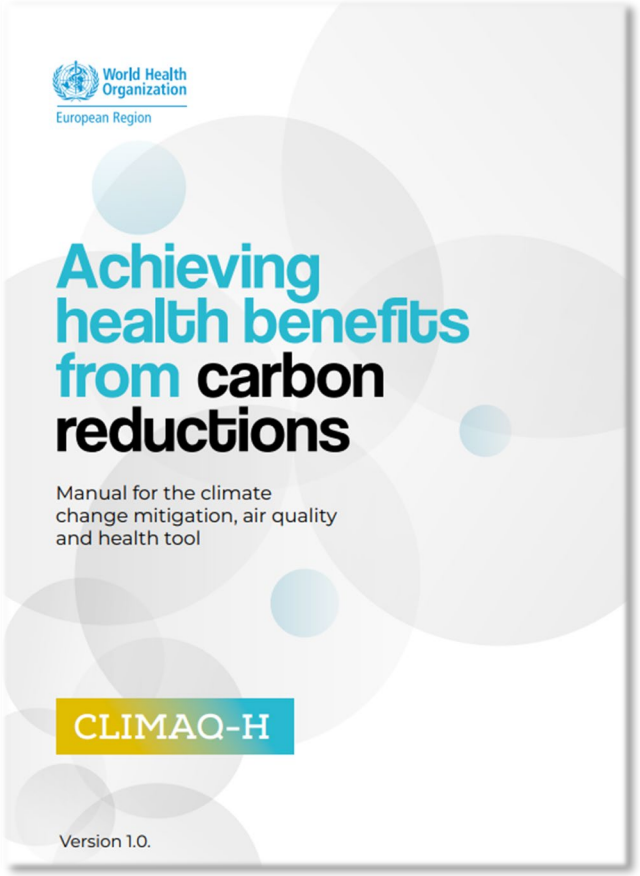


Note the overlap with available air pollution data

The designations employed and the presentation of the material in this presentation do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city of area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

See https://www.who.int/data/gho/data/themes/air-pollution/who-air-quality-database

CLIMAQ-H tool - Climate Change Mitigation, Air Quality and Health



Climate change mitigation policies that reduce GHG emissions also improve air quality, bringing health co-benefits

Estimates of the health and related economic gains achieved by Member States by implementing actions and measures aimed at mitigating climate change by reducing domestic carbon emissions.

Actions and measures to decrease GHG emissions as defined by the Paris Agreement and reported by governments in their nationally determined contributions (NDCs).

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Update of WHO guidance on heat health action planning

Second edition to strengthen …

Timeline: 2022-2026

- links to general preparedness frameworks
- communication on climate change and heat responses
- public health advice
- specific interventions at local level

UPDATED CORE ELEMENTS

GOVERNANCE
ESTABLISH A GOVERNANCE STRUCTURE FOR HEAT-HEALTH ACTION

HEAT-HEALTH WARNING SYSTEM
IMPLEMENT AN ACCURATE AND TIMELY WARNING SYSTEM FOR ACTION

VULNERABLE POPULATIONS
ENSURE CARE FOR THOSE AT RISK

COMMUNICATIONS
DEVELOP A HEAT-HEALTH COMMUNICATIONS PLAN

HEALTH SYSTEM RESILIENCE
STRENGTHEN HEALTH SYSTEM PREPAREDNESS AND RESPONSE

REDUCTION IN HEAT EXPOSURE
PROTECT PEOPLE FROM HEAT.

SURVEILLANCE
ESTABLISH TIMELY SURVEILLANCE AND DETECTION FOR HEAT-HEALTH ACTION

MONITORING, EVALUATION AND LEARNING
ESTABLISH A PROCESS FOR REVIEW AND IMPROVEMENT

Experts' meetings 2024-2025

Capacity building on air quality and health

Training on air quality and health

Bishkek, Kyrgyzstan, December 2023:

- for 50 experts from Kazakhstan and Kyrgyzstan
- lectures, discussions and hand-on exercises of AirQ+

Tbilisi, Georgia, February 2025:

- attended by 25 specialists
- Use of AirQ+ and CLIMAQ-H tools

Ongoing updates to training curriculum

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Strengthening capacities in assessing health risks of air pollution in Kyrgyzstan and Kazakhstan: WHO training workshop

Joint Task Force on the Health Aspects of Air Pollution (TFH)

- Established under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP)
- Regional inter-sectoral platform since 1998
- Chaired by WHO ECEH
- Members are representatives of the Parties to the Convention
- Facilitation of intersectoral action and networking
-

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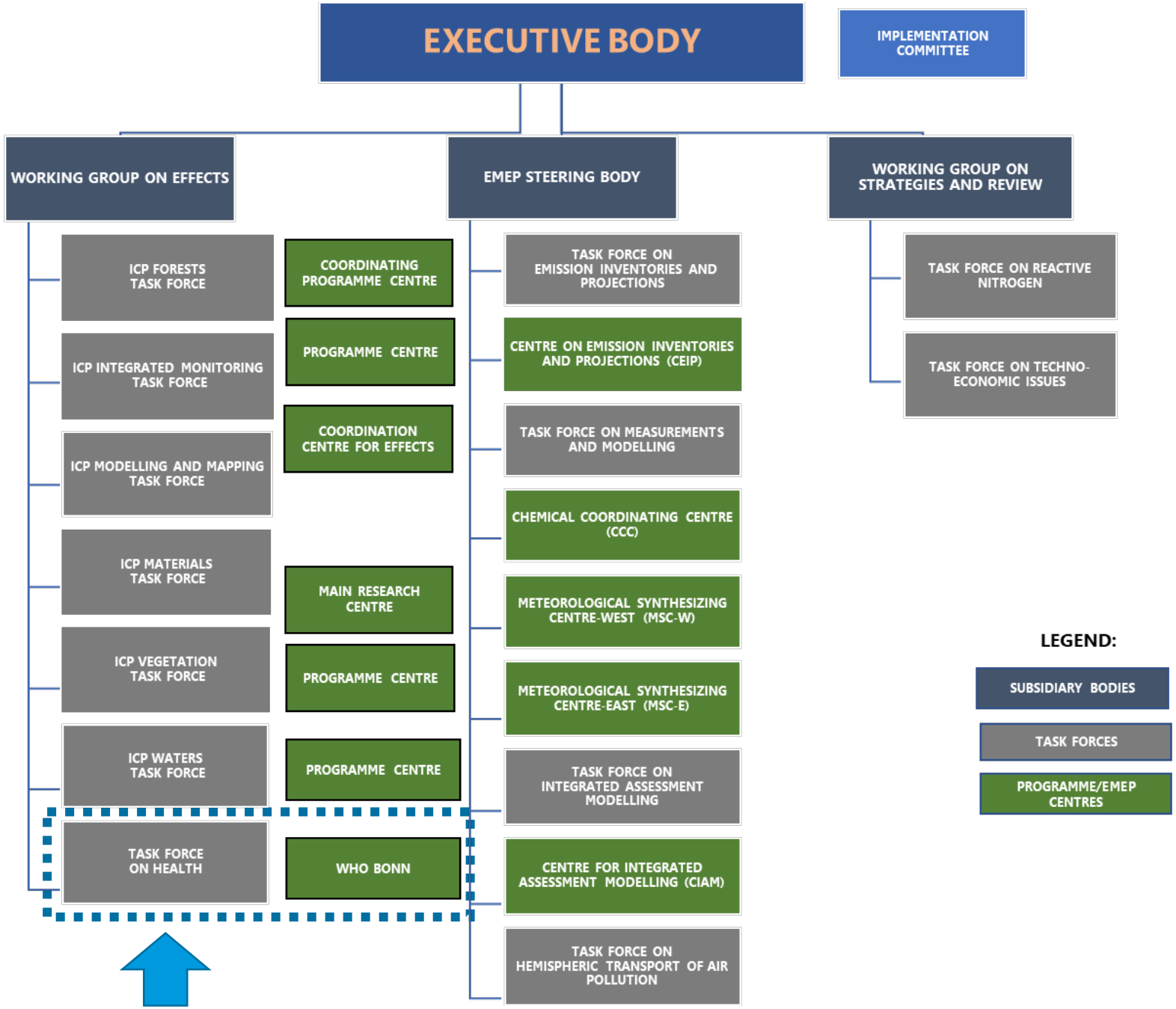

TFH work

- Implementation of the TFH workplan
  - consolidation of existing evidence on health outcomes of exposure to air pollution
  - development of methodologies for assessment of direct and indirect impacts of long-range transboundary air pollution on human health
  - tools and capacity-building for the health impact assessment of air pollution
- Annual THF meetings
  - representatives of the Parties, experts, stakeholders
  - updates on policies, research, country experiences, tools and capacity building
- Reports and publications

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Thank you

Acknowledgments:
Pierpaolo Mudu, Román Perez Velasco, Sophie Gumy
Vladimir Kendrovski, Oliver Schmoll

More information at:
Air quality EURO
AirQ+ software tool for health risk assessment of air pollution
Climate Change Mitigation, Air Quality and Health (CLIMAQ-H)
Climate change EURO

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