

# UNECE Air Convention (LRTAP)

## Air Pollution and Urban Health: WHO Work on AirQ+ (and other tools)

Pier Mudu

2<sup>nd</sup> Expert Panel on Clean Air in Cities (EPCAC) – 29 September 2020



# Presentation outline

1. Introduce to AirQ+ the tool produce by WHO-EURO for the **health risk assessment** of air pollution;
2. Learn the other tools available or under development by WHO-EURO.

# 1.

## AirQ+

# What is AirQ+? 1

A user-friendly software  
to estimate the magnitude  
of the most important and best recognized  
effects of air pollution in a given population

## What is AirQ+? 2

- Developed by WHO/Europe with support from German government
- Updated and improved version of the WHO AirQ software (used for more than fifteen years)
- Can also be used for supporting educational and training activities related to environment and health

# Downloading AirQ+ software

## (Current version: AirQ+2.0, December 2020)

<http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/airq-software-tool-for-health-risk-assessment-of-air-pollution>

The screenshot shows a web browser displaying the WHO Europe website. The page title is "AirQ+: software tool for health risk assessment of air pollution". The navigation menu includes Home, Health topics, Countries, Publications, Data and evidence, Media centre, and About us. The breadcrumb trail is: Health topics > Environment and health > Air quality > Activities > AirQ+: software tool for health risk assessment of air pollution. The main content area features a sidebar with links for News, Events, Policy, Activities (highlighted), Data and statistics, Publications, Partners, and Contact us. The main text describes the software's purpose in quantifying the effects of air pollution exposure on public health. It includes a list of two types of estimates: short-term changes and long-term exposures. A sidebar on the right contains a "Take our AirQ+ survey" button and a "Start the survey" button. Below the survey information, there is a note about WHO/Europe's interest in gathering information about the software's use.

www.euro.who.int/en/health-topics/environment-and-health/air-quality

Meistbesucht Erste Schritte Vorgeschlagene Sites Web Slice-Katalog Environmental Epide...

English Français Deutsch Русский

World Health Organization  
REGIONAL OFFICE FOR Europe

Home Health topics Countries Publications Data and evidence Media centre About us

Health topics > Environment and health > Air quality > Activities > AirQ+: software tool for health risk assessment of air pollution

### Air quality

- News
- Events
- Policy
- Activities**
- Data and statistics
- Publications
- Partners
- Contact us

### AirQ+: software tool for health risk assessment of air pollution

Quantifying the effects of exposure to air pollution in terms of public health has become a critical component in policy discussion. WHO/Europe's software tool AirQ+ performs calculations that allow quantification of the health effects of exposure to air pollution, including estimates of the reduction in life expectancy.

AirQ+ estimates:

- the effects of short-term changes in air pollution (based on risk estimates from time-series studies);
- the effects of long-term exposures (using life-tables approach and based on risk estimates from cohort studies).

For each type of estimate, separate HELP files explain details of calculation.

Methodology and scientific basis for the risk estimates are summarized in the documents listed below.

Take our AirQ+ survey

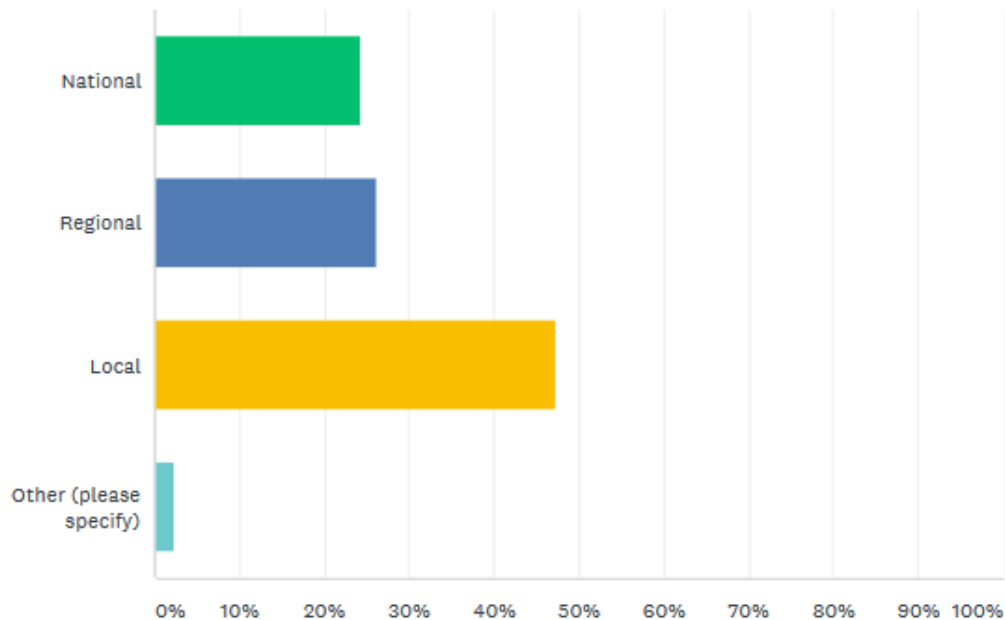
Start the survey

WHO/Europe is interested in gathering information about where and how AirQ+ is used, to improve its assistance. Please share information on your use of AirQ+. We will use the survey data in aggregated form for a general overview and statistical analysis of AirQ+ users.

# AirQ+ Survey monkey 6

## What is the geographical level of your analysis?

Answered: 351 Skipped: 13



### 2016-2020

National	24.22%	85
Regional	26.21%	92
Local	47.29%	166
Other (please specify)	Responses 2.28%	8
<b>TOTAL</b>		<b>351</b>

### 2016-2019

National	23.58%	58
Regional	24.80%	61
Local	49.19%	121
Other (please specify)	Responses 2.44%	6
<b>TOTAL</b>		<b>246</b>

### 2016-2018

National	19.50%	31
Regional	25.16%	40
Local	52.83%	84
Other (please specify)	Responses 2.52%	4
<b>TOTAL</b>		<b>159</b>

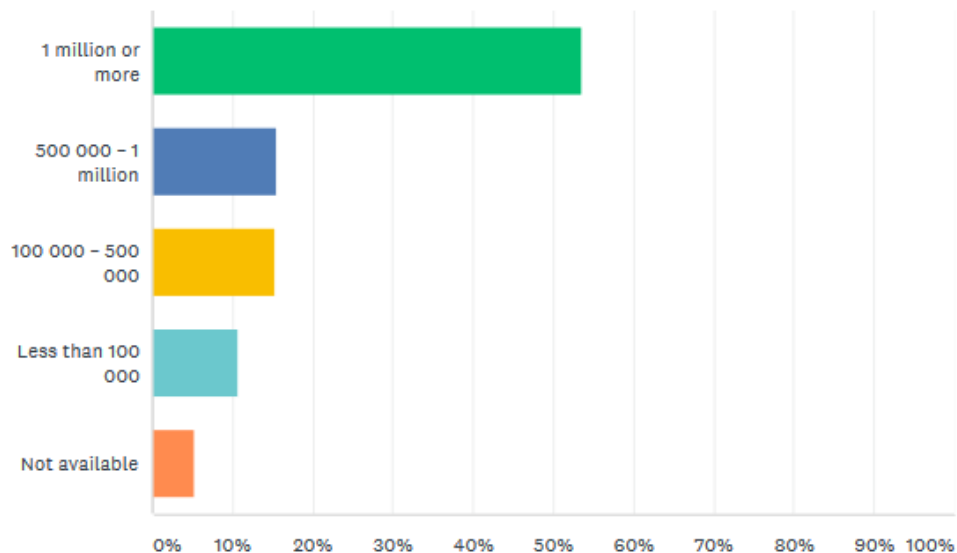
### 2016-2017

National	18.67%	14
Regional	21.33%	16
Local	57.33%	43
Other (please specify)	Responses 2.67%	2
<b>Total</b>		<b>75</b>

# AirQ+ Survey monkey 7

How many people live in the area you intend to analyse?

Answered: 349 Skipped: 15



## 2016-2020

1 million or more	53.58%	187
500 000 - 1 million	15.47%	54
100 000 - 500 000	15.19%	53
Less than 100 000	10.60%	37
Not available	5.16%	18
<b>TOTAL</b>		<b>349</b>

## 2016-2019

1 million or more	55.51%	136
500 000 - 1 million	17.55%	43
100 000 - 500 000	12.24%	30
Less than 100 000	10.20%	25
Not available	4.49%	11
<b>TOTAL</b>		<b>245</b>

## 2016-2018

1 million or more	57.59%	91
500 000 - 1 million	16.46%	26
100 000 - 500 000	12.66%	20
Less than 100 000	10.13%	16
Not available	3.16%	5
<b>TOTAL</b>		<b>158</b>

## 2016-2017

1 million or more	52.70%	39
500 000 - 1 million	18.92%	14
100 000 - 500 000	13.51%	10
Less than 100 000	9.46%	7
Not available	5.41%	4
<b>Total</b>		<b>74</b>



# AirQ+: welcome screen

The screenshot shows the AirQ+ welcome screen with several key elements highlighted by colored circles and callouts:

- Menu:** A yellow circle highlights the 'Projects Overview' sidebar on the left, which lists 'Impact Assessment', 'Burden of Disease', and 'Risk Analysis'.
- Documentation:** A red circle highlights the 'Documentation' section, which includes a 'Welcome to AirQ+' heading and a list of links: 'What is AirQ+?', 'Getting started', and 'Acknowledgments'.
- Start analysis:** A green circle highlights the 'Start analysis' section, which contains three buttons: 'Create new Impact Assessment', 'Create new Burden of Disease', and 'Create new Risk Analysis'.
- Language and Navigation:** A red circle highlights the top right corner, featuring a language dropdown set to 'English' and a menu with links for 'Glossary', 'Disclaimer', 'Manuals', and 'Citation'.

The interface also features the World Health Organization logo and the 'AirQ+' title in the top left, and a footer with 'AirQ+' and 'v. 2.0'.

# Current work



Health impact assessment  
of air pollution: introductory  
manual to AirQ+



November 2



Health impact assessment  
of air pollution: AirQ+  
multiple-area data input



November



Health impact assessment of  
air pollution: AirQ+ life table  
manual



November 2019  
AirQ



AirQ+: burden of disease due  
to air pollution manual



November 2019  
AirQ



AirQ+: carcinogenic  
pollutants and risk analysis



Please note that the  
published cover of the  
manuals may be  
different from the ones  
shown here

- Review of methods used for estimating burden of disease attributable to air pollution
- Technical discussion is on-going on the new features
- New economic module
- Online training activities

## Next steps

- Spanish translation also on-going
- Implementation of additional modules (Economic module and manual)
- AirQ+ 2.2 (English, Russian, French, Russian and Spanish)
- AirQ+ 2.3 (Economic module, only in English)
- Identification of priority updates and improvements with a variety of experts
  - Update based on the new AQG
- Production of additional supporting documentation
- Dissemination activities (testing and getting comments is a fundamental activity)
- Harmonization and “dialogue” with other WHO tools

2.

## Other WHO tools

# AirQ+/BenMAP

Analysis parameters	Analysis Parameters	BenMAP—CE		AirQ+		
		Preloaded Data	User Provided Data	Preloaded Data	User Provided Data	
Pollutants	Pollutants <sup>1</sup>	<ul style="list-style-type: none"> <li>PM<sub>2.5</sub></li> <li>Ozone</li> </ul>	<ul style="list-style-type: none"> <li>User can conduct analyses for                             <ul style="list-style-type: none"> <li>PM<sub>2.5</sub></li> <li>PM<sub>10</sub></li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>User can conduct analyses</li> </ul>	
Air Quality						
Population	Air Quality	<ul style="list-style-type: none"> <li>Year 2000–2 monitoring U.S.</li> </ul>	<b>Health Impact Function (HIF) Functional Form</b> <ul style="list-style-type: none"> <li>Log-linear</li> <li>Logistic</li> <li>Global Burden of Disease (GBD) Integrated Exposure-Response (IER) Function</li> </ul>	<ul style="list-style-type: none"> <li>User can select various operators, variables, and population variables to define unique functions, including specifying different functions for different parts of an air quality distribution</li> </ul>	<ul style="list-style-type: none"> <li>Log-linear</li> <li>Linear-log</li> <li>Global Burden of Disease (GBD) Integrated Exposure-Response (IER) Function</li> </ul>	n.a.
Baseline Rate of Deaths and Illnesses	Population	<ul style="list-style-type: none"> <li>U.S. popula 2000 to 2050 stratified by at 12 km gri</li> </ul>				
β Coefficient	Baseline Rate of Deaths and Illnesses	<ul style="list-style-type: none"> <li>Cause-speci rates projec five-year in</li> <li>Hospital an department county- and</li> </ul>	<b>Distributions that can be Specified for Uncertainty Calculations</b> <ul style="list-style-type: none"> <li>Normal</li> <li>Triangular</li> <li>Poisson</li> <li>Binomial</li> <li>Log Normal</li> <li>Uniform</li> <li>Exponential</li> <li>Geometric</li> <li>Weibull</li> <li>Gamma</li> <li>Logistic</li> <li>Beta</li> <li>Pareto</li> <li>Cauchy</li> </ul>	<ul style="list-style-type: none"> <li>Users can select a non-parametric custom distribution</li> </ul>	n.a.	n.a.
Health Impact Function (HIF) Functional Form	β Coefficient	<ul style="list-style-type: none"> <li>Over 100 P! impact func and Canadi include mo: admissions, visits, exac respiratory loss days</li> </ul>				
Distributions that can be Specified for Uncertainty Calculations						
Economic Values			<b>Economic Values</b> <ul style="list-style-type: none"> <li>Multiple cost-of-illness (COI) and willingness-to-pay (WTP) studies for each health endpoint quantified by health impact function</li> </ul>	<ul style="list-style-type: none"> <li>Import .csv or .xlsx file specifying COI or WTP function(s), including health endpoint and unit value</li> </ul>	n.a.	n.a.
Additional Features			<b>Additional Features</b> <ul style="list-style-type: none"> <li>Global Burden of Disease (GBD) Rollback tool allows estimation of PM<sub>2.5</sub> health impacts worldwide based on data from GBD study.</li> </ul>	n.a.	<ul style="list-style-type: none"> <li>Cancer Unit Risk Values for arsenic, benzene, benzo[a]pyrene, chromium (VI), nickel, and vinyl chloride</li> </ul>	<ul style="list-style-type: none"> <li>User can modify coefficients</li> </ul>

# HEAT (available online)

## Tools to evaluate the impact of air pollution due to specific activities

HEAT 4.1

HEAT Health economic assessment tool

→ HOME

→ NEWS AND ANNOUNCEMENTS

→ HOW HEAT WORKS

→ START USING THE TOOL

→ EXAMPLE APPLICATIONS

→ HEAT USER GUIDE

→ HEAT TRAININGS

→ ACKNOWLEDGEMENTS

→ ARCHIVE

### Welcome to the Health Economic Assessment Tool (HEAT) for walking and cycling by WHO/Europe

>> The next HEAT Webinar takes place on Monday 12 November 12:00-13:00 (CET time) (see [News for details](#)) <<

The HEAT tool is designed to enable users without expertise in impact assessment to conduct economic assessments of the health impacts of walking or cycling. The tool is based on the best available evidence and transparent assumptions. It is intended to be simple to use by a wide variety of professionals at both national and local levels. These include primarily transport planners, traffic engineers and special interest groups working on transport, walking, cycling or the environment.

The HEAT estimates the value of reduced mortality that results from specified amounts of walking or cycling, answering the following question:

**If x people regularly walk or cycle an amount of y, what is the economic value of the health benefits that occur as a result of the reduction in mortality due to their physical activity?**

In addition, HEAT can now also take into account the health effects from road crashes and air pollution, and effects on carbon emissions.

The tool can be used for a number of different assessments, for example:

- **assessment of current (or past) levels of cycling or walking**, e.g. showing what cycling or walking are worth in your city or country.
- **assessment of changes over time**, e.g. comparisons of “before and after” situations, or “scenarios A vs. scenario B” (e.g. with or without measures taken).
- **evaluation of new or existing projects, including benefit-cost ratio calculations.**

HEAT can be used as a stand-alone tool or to provide input into more comprehensive economic appraisal exercises, or prospective health impact assessments.

**What kind of results can you produce with your local data or scenario?** See examples [here](#).

More information on how HEAT works can be found [here](#). A detailed description of the development process, evidence used and main project steps as well as a step-by-step-guide can be found in the [Methodology and user guide](#).

More information and materials are also available at <http://www.euro.who.int/HEAT>

For questions or comments on HEAT please email to [heatwalkingcycling@who.int](mailto:heatwalkingcycling@who.int).

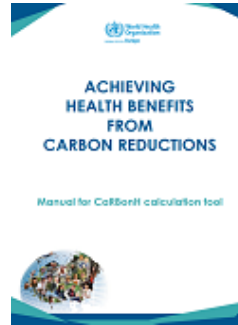
[Start using the tool](#)

What kind of results can you produce with your data?  
[Examples...](#)

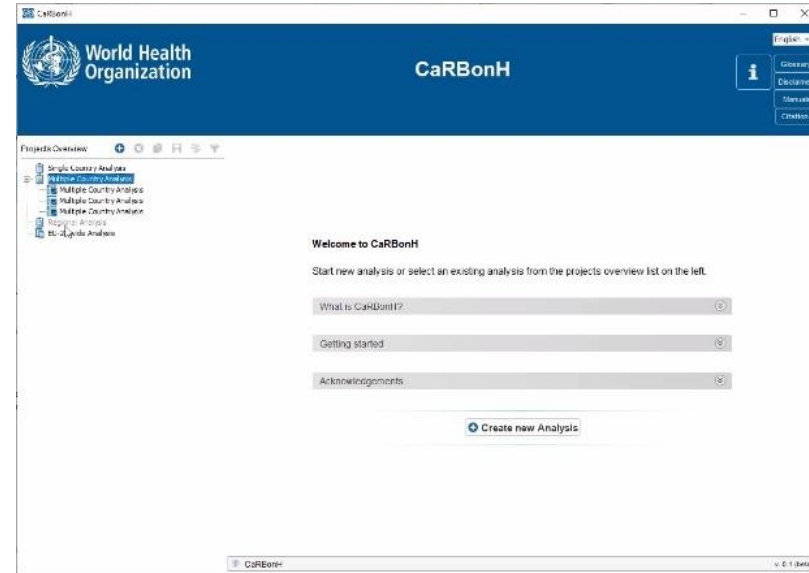
<https://www.heatwalkingcycling.org/#homepage>

# CaRBonH (available online for download)

**CaRBonH** - quantify the effects on health and economy of the improvement of air quality due to CO<sub>2</sub> reduction related to National Determined Contributions (NDC) at the country level.



New interface under development



<https://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/publications/2018/achieving-health-benefits-from-carbon-reductions-manual-for-carbonh-calculation-tool-2018>

# GreenUR (under testing)

## Tools to evaluate the impact of air pollution due to land-use

**GreenUr** – quantify the impact on health of Green spaces. The results from several research projects converge towards a quantifiable association of the effects of green spaces on health, in different populations and for a variety of spatial and temporal scales.

New interface under development



<https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/activities/greenur-the-green-urban-spaces-and-health-tool>

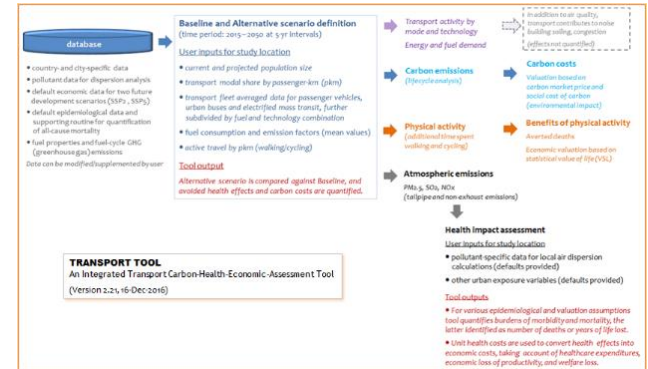


# iSTHAT (under development)

## Tools to evaluate the impact of air pollution due to specific activities

**iSTHAT - (Integrated Sustainable Transport & Health Assessment Tool)** has been designed and developed to provide a simplified methodological framework and corresponding tool for the assessment of health and economic benefits of carbon-related measures in the context of urban transport. It is a user-friendly, interactive Excel-based tool that assesses carbon mitigation alternatives in surface transport for information and education purposes.

<https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/activities/isthat-the-integrated-sustainable-transport-and-health-assessment-tool>



# Main challenges

- Data availability
- Sources of uncertainty affecting quantification of environment-related health impacts
- Communicating Air Pollution and Health Risks

# Conclusions

- HRA provides an important process to understand the impacts of air pollution
- Estimating health impacts of policies are important to orient decision-making
- The health sector is empowered with tools that allow collaboration with other sectors
- WHO provides AirQ+ that is a tool that is simple to use to estimates adverse health risks and impacts of air pollution
- WHO is also providing (or developing) other tools that quantify the adverse health risks and impacts of air pollution but related to particular activities and land-use

# Thank you for your attention

## AUTHOR

Pierpaolo Mudu, WHO (mudup@who.int)

## ACKNOWLEDGEMENTS

Michal Krzyzanowski

Dorota Jarosisnska

## WHO web sites

Air pollution [http://www.who.int/topics/air\\_pollution/en/](http://www.who.int/topics/air_pollution/en/)

Air quality and health: [euro.who.int/air](http://euro.who.int/air)

*AirQ+ is co-funded by the German Ministry of Environment (BMUB)*

