4th International Conference on Children's Health and the Environment
Vienna, 10-12 June 2007

Development of WHO Guidelines on Indoor Air Quality

Dr. Michal Krzyzanowski
Regional Adviser, Air Quality and Health
WHO Regional Office for Europe

WHO European Centre for Environment and Health, Bonn Office

http://www.euro.who.int/air

WORLD HEALTH ORGANIZATION
EUROPE

This presentation:

- Existing WHO Guidelines related to IAQ
- Special issues related to IAQ Guidelines
- Plan for development of WHO Guidelines for IAQ
- WHO Guidelines on Dampness, Mould and Ventilation
- Review of actions related to dampness and mould

WORLD HEALTH ORGANIZATION
EUROPE

WHO Guidelines for indoor air pollutants

Air quality Guidelines for Europe, 2nd edition, WHO 2000

Indoor air pollutants:

- Environmental Tobacco Smoke
- Man-made vitreous fibers
- Radon

Organic pollutants

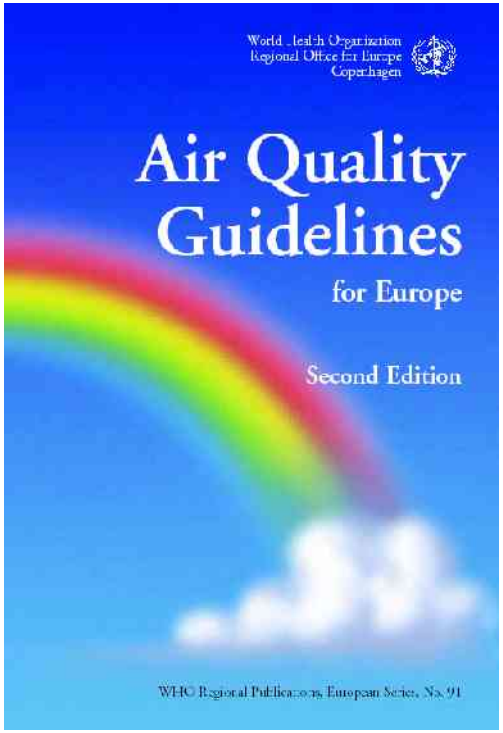
- CO
- Formaldehyde
- Styrene
- Tetrachloroetylene

Inorganic pollutants

- Asbestos

Classical air pollutants

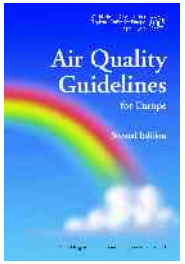
- NO2
- Particulate matter



http://www.euro.who.int/air/activities/20050223_4

WORLD HEALTH ORGANIZATION
EUROPE

WHO Guidelines for ETS (WHO2000)



Environmental Tobacco Smoke:

- Carcinogenic in humans (unit risk per 1 person smoking at home 1/1000)

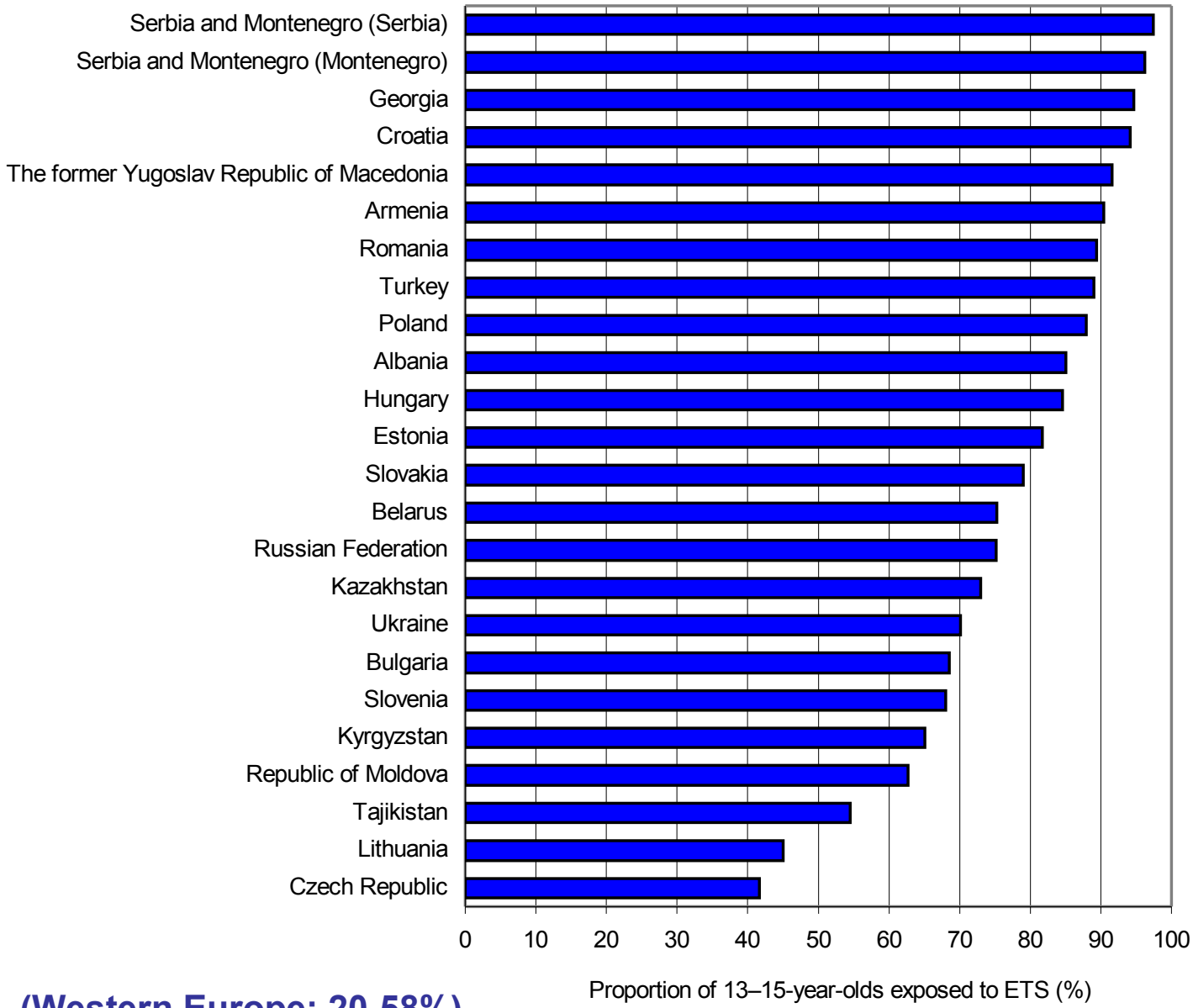
- Produce mortality and morbidity at levels 1-10 µg/m3 nicotine

- Acute and chronic respiratory effects on children in homes with smokers or even in homes with occasional smoking.

There is no evidence for safe exposure level.

WORLD HEALTH ORGANIZATION
EUROPE

Children's exposure to ETS in their homes in selected countries of Europe, 2002 - 2005



ENHIS

WORLD HEALTH ORGANIZATION EUROPE

(Western Europe: 20-58%)

Source: GYTS

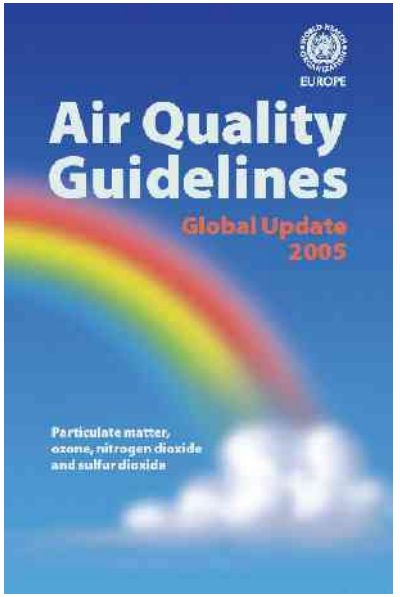
WHO Air Quality Guidelines – Global Update 2005

Chapter 9:

Indoor Air Quality

- … current knowledge … and heterogeneous nature of exposure may not permit a numerical guideline for indoor exposures … (but) permit several risk management strategies to be identified

- Recommendations for phased approach for development of guidelines for IAQ management in developing countries.



Chapter 10:

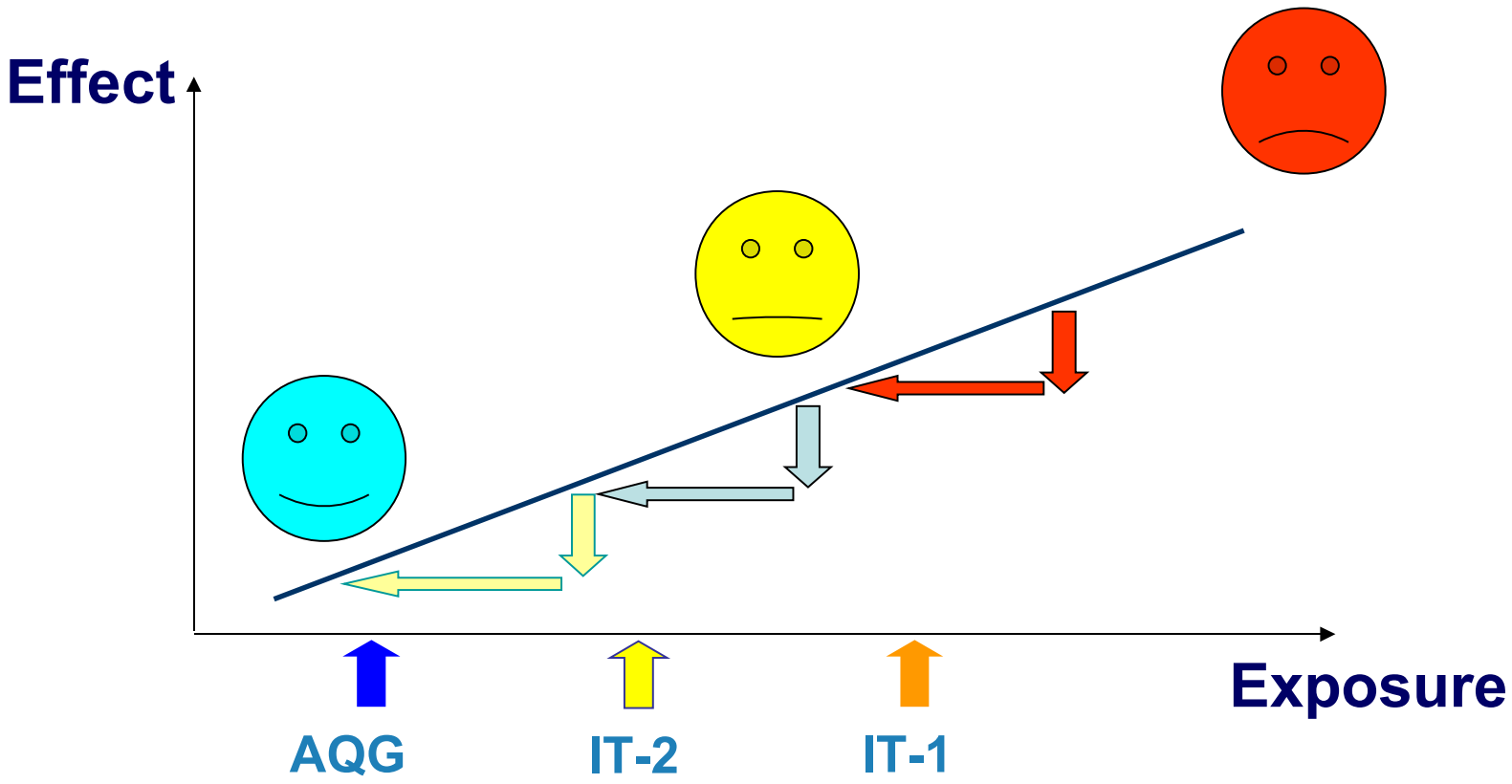
Particulate matter

- Guideline values (& Interim Targets) for PM2.5 and PM20
- Specific characteristics critical for toxicity of PM not identified (but confirming that PM from biomass combustion associated with a wide range of adverse health impacts

http://www.euro.who.int/InformationSources/Publications/Catalogue/20070323_1

WORLD HEALTH ORGANIZATION
EUROPE

Passing interim targets on the way towards AQG



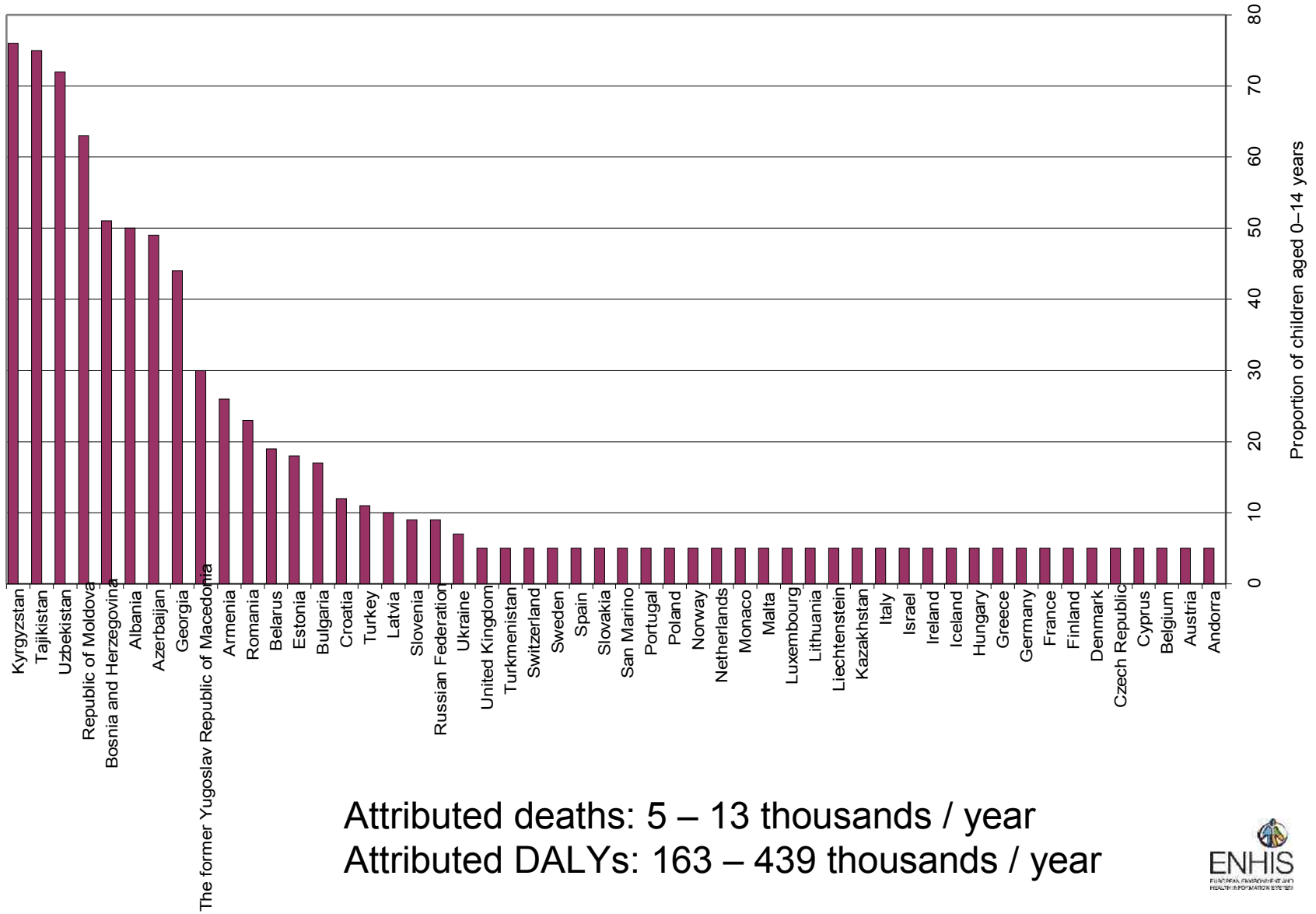
WORLD HEALTH ORGANIZATION
EUROPE

WHO AQG: Global update: Particulate matter - annual mean

Annual mean level	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	Basis for the selected level
Interim target-1 (IT-1)	70	35	Levels associated with about 15% higher long-term mortality than at AQG
Interim target-2 (IT-2)	50	25	Risk of premature mortality decreased by approximately 6% compared to IT1
Interim target-3 (IT-3)	30	15	Mortality risk reduced by approximately 6% compared to IT2 levels.
Air quality guideline (AQG)	**20**	**10**	Lowest levels at which total, CP and LCA mortality have been shown to increase (Pope et al., 2002). The use of $PM_{2.5}$ guideli is preferred.

AQG 2000: no guideline value

Proportion of children 0-14 years of age living in homes using solid fuel. WHO/Euro 2004



Attributed deaths: 5 – 13 thousands / year
Attributed DALYs: 163 – 439 thousands / year

WORLD HEALTH ORGANIZATION EUROPE

ENHIS

IAQ Guidelines: Special issues to be considered

- Concentration-based guidelines on specific pollutants have had little impact on IAQ management

- Health impacts of various sources of IAQ problems can not be characterized in terms of the concentration-based approach (e.g. indoor combustion; dampness in building structure)

- Need to consider qualitative indicators of health hazards

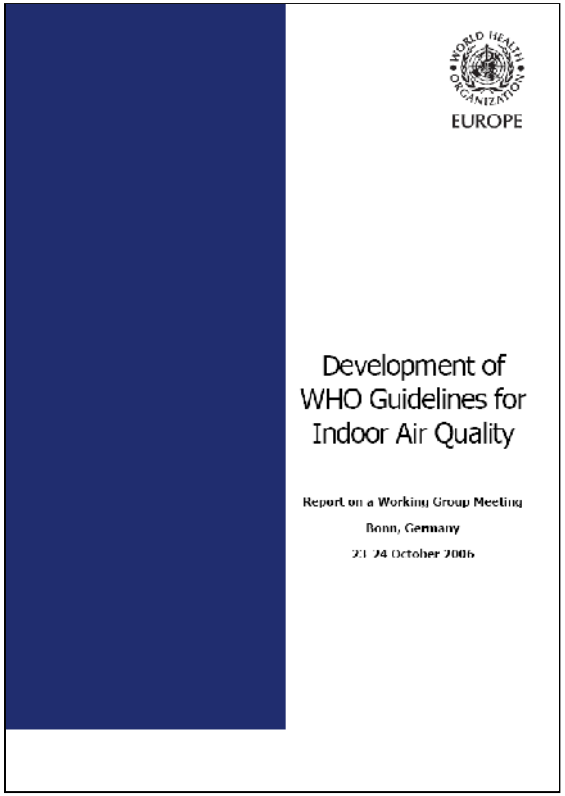
- Interim targets may provide a promising tool supporting policy development in various regions of the world

WORLD HEALTH ORGANIZATION
EUROPE

Development of WHO Guidelines on IAQ: WHO planning meeting

Bonn, 23-24 October 2006

- 29 invited experts
- WHO/Euro, WHO HQ, IARC
- Observers (EC, USEPA, Shell Foundation)



Funding

- German Ministry of the Environment (BMU)

http://www.euro.who.int/Document/AIQ/IAQ_mtgrep_Bonn_Oct06.pdf

WORLD HEALTH ORGANIZATION EUROPE

Development of WHO Guidelines on IAQ: WHO planning meeting: CONCLUSIONS (1 of 3)

Development of IAQ Guidelines recommended due to:

- **Wide range of sources** of air pollution specific to indoor spaces;

- **Specificity of some exposures** in indoor spaces in terms of pollution composition and exposure levels;

- Large fraction of **time spent indoors** affects population exposures;

- **Separation of indoor and outdoor spaces** which modify the exposures to a number of pollutants.

Guidelines may **use qualitative indicators** (e.g. existence of dampness in the building structures; use of solid fuels in indoor spaces).

WORLD HEALTH ORGANIZATION
EUROPE

Development of WHO Guidelines on IAQ: WHO planning meeting: CONCLUSIONS (2 of 3)

Definition of indoor spaces to be included:

Indoor **settings in which the general population or especially susceptible population groups** like children, elderly, asthmatics etc. **are potentially exposed** to indoor air pollution.

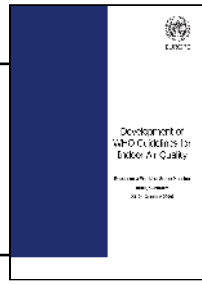
- homes,
- schools,
- day care centres,
- public places as libraries
- institutionalized settings like nursing homes.

The **existing air quality guidelines** and recommendations **are potentially applicable for indoor air** and should be applied and accounted for as such in the development of the WHO guidance specific to the indoor air settings.

WORLD HEALTH ORGANIZATION
EUROPE

Development of WHO Guidelines on IAQ: WHO planning meeting: CONCLUSIONS (3 of 3)

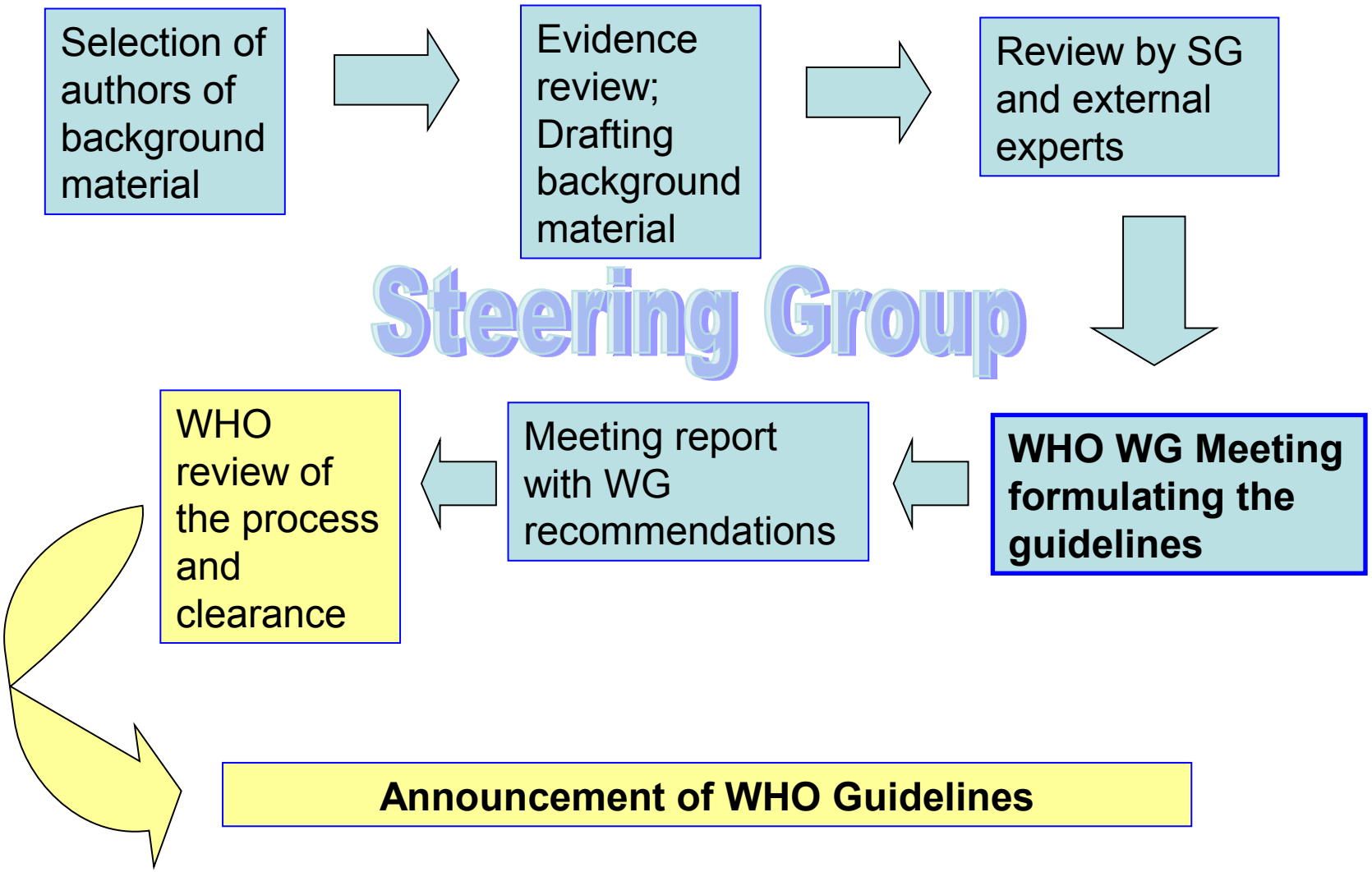
Factors to be included in the IAQ Guidelines



Group A	Group B	Group C
Pollutants	**Biological agents**	**Indoor combustion**
Formaldehyde	**Dampness and mould**	**Stove venting**
Benzene		- flues
Naphthalene		- hoods
Nitrogen dioxide (NO_2)	**Ventilation**	**Ventilation**
Carbon monoxide (CO)	- natural	- natural
Radon (Rn)	- forced / mechanical	- forced
Particulate matter[1]		**Combustion quality**
Halogenated compounds	**Allergens**	**Fuels**
PAH[2], especially BaP[3]	- from house dust mites	- solid
	- from pets	- processed solid
		- liquid
		- gas
		- electricity

WORLD HEALTH ORGANIZATION EUROPE

Development of WHO Guidelines on IAQ: The process



WORLD HEALTH ORGANIZATION
EUROPE

Development of WHO Guidelines on IAQ: WHO Steering Group members

Ross Anderson	University of London, London, United Kingdom
Aaron Cohen	Health Effects Institute, Boston, USA
Severine Kirchner	Scientific and Technical Centre for Buildings (CSTB), Marne la Vallée, France
Lars Mølhave	University of Aarhus, Aarhus, Denmark
Aino Nevalainen	National Public Health Institute, Kuopio, Finland
Bernd Seifert	Berlin, Germany
Kirk Smith	University of California, Berleley, USA
John Spengler	Harvard School of Public Health, Boston, USA

WORLD HEALTH ORGANIZATION
EUROPE

Development of WHO Guidelines on IAQ: Guidelines on Dampness, Mould and Ventilation

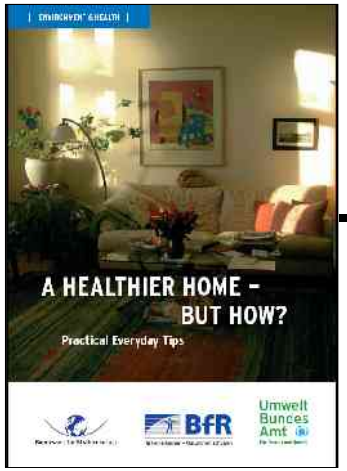
Section	Title	Author(s)
1	General description	WHO + Authors
2	Effects of dampness on sources of indoor air pollutants and resulting exposure	J. Douwes (NZ)
3	Ventilation in relation to mould and dampness	O. Seppänen (FIN) J. Kurnitski (FIN)
4	Health effects associated with mould and dampness	M. Mendell (USA) T. Sigsgaard (DK) MR. Hirvonen (FIN)
5	Evaluation of human health risks	WHO + SG + Authors
6	Recommended guidelines	WHO WG October 2007
7	References	Authors

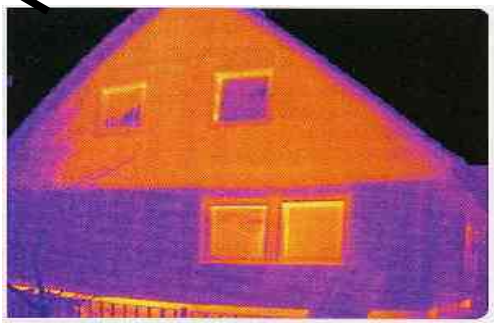
WORLD HEALTH ORGANIZATION
EUROPE

The problem of damp, mould and ventilation

WORLD HEALTH ORGANIZATION
EUROPE

Review of actions related to dampness, mould and ventilation: what works?





Source: WarmFront project, UK

WORLD HEALTH ORGANIZATION
EUROPE

WHO review of actions related to dampness and mould

Objectives:

(1) **accumulate evidence** on the actions implemented in various countries to reduce damp and mould

(2) **assess the effectiveness** of these actions to improve IAQ

(3) **formulate recommendations** for public policy and policy action

Main deliverables:

- List of case studies as “European practice collection”
- Policy briefs recommending the most effective and practical actions

Benefits for countries / EU:

- Increased capacity to develop and apply policies
- Increased capacity to advocate for action on the indoor air quality across sectoral policies

Supported by EC DG SANCO (2005156)

WORLD HEALTH ORGANIZATION EUROPE

WHO review of actions related to dampness and mould: the process

Collection of European case studies on projects aiming at:

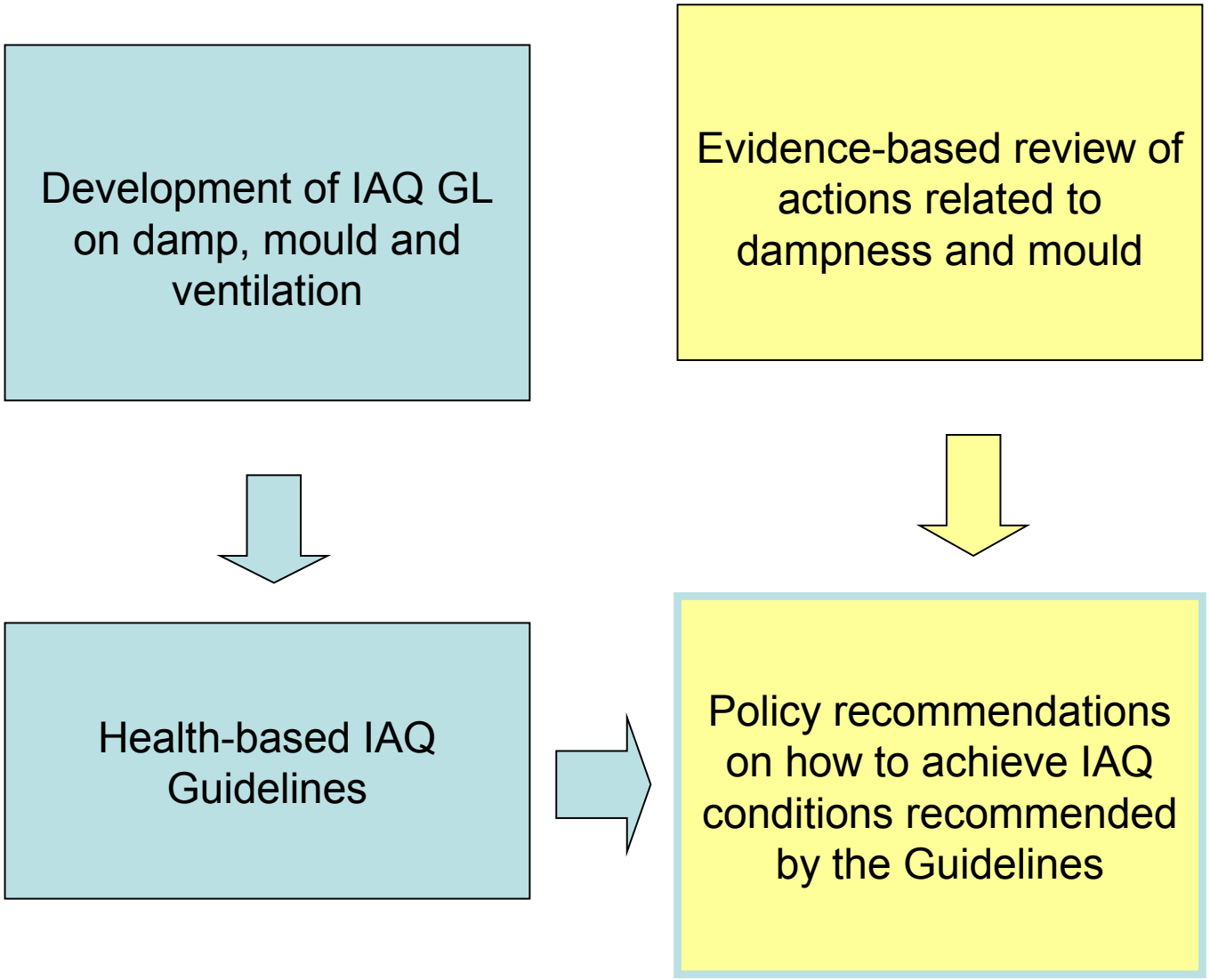
- Reduction of relative humidity in indoor air
- Reduction of damp in building structures
- Removal / prevention of mould growth
- Improvement of ventilation / air exchange rates

Indoor spaces covered:

- Residential buildings / dwellings
- Schools
- Child and elderly centres with focus on non-care elements
- (typical care settings are excluded)

WORLD HEALTH ORGANIZATION
EUROPE

Conclusions: developing policy on IAQ



WORLD HEALTH ORGANIZATION
EUROPE


Thank you
http://www.euro.who.int/air

Development of WHO Guidelines on IAQ: WHO planning meeting

Background material

- National guidelines
- International and national recommendations
- Research reports and reviews

Plenary

- Health effects
- Exposures
- Developing countries
- Existing guidelines and recommendations

Small groups

- Air pollutant specific guidelines
- Biological agents
- Combustion and other developing world issues

WORLD HEALTH ORGANIZATION
EUROPE