

# Indoor air quality and health - the WHO perspective

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International Conference on Integrated  
Problem-Solving Approaches to Ensure Schoolchildren's Health  
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# Sources of indoor air pollution



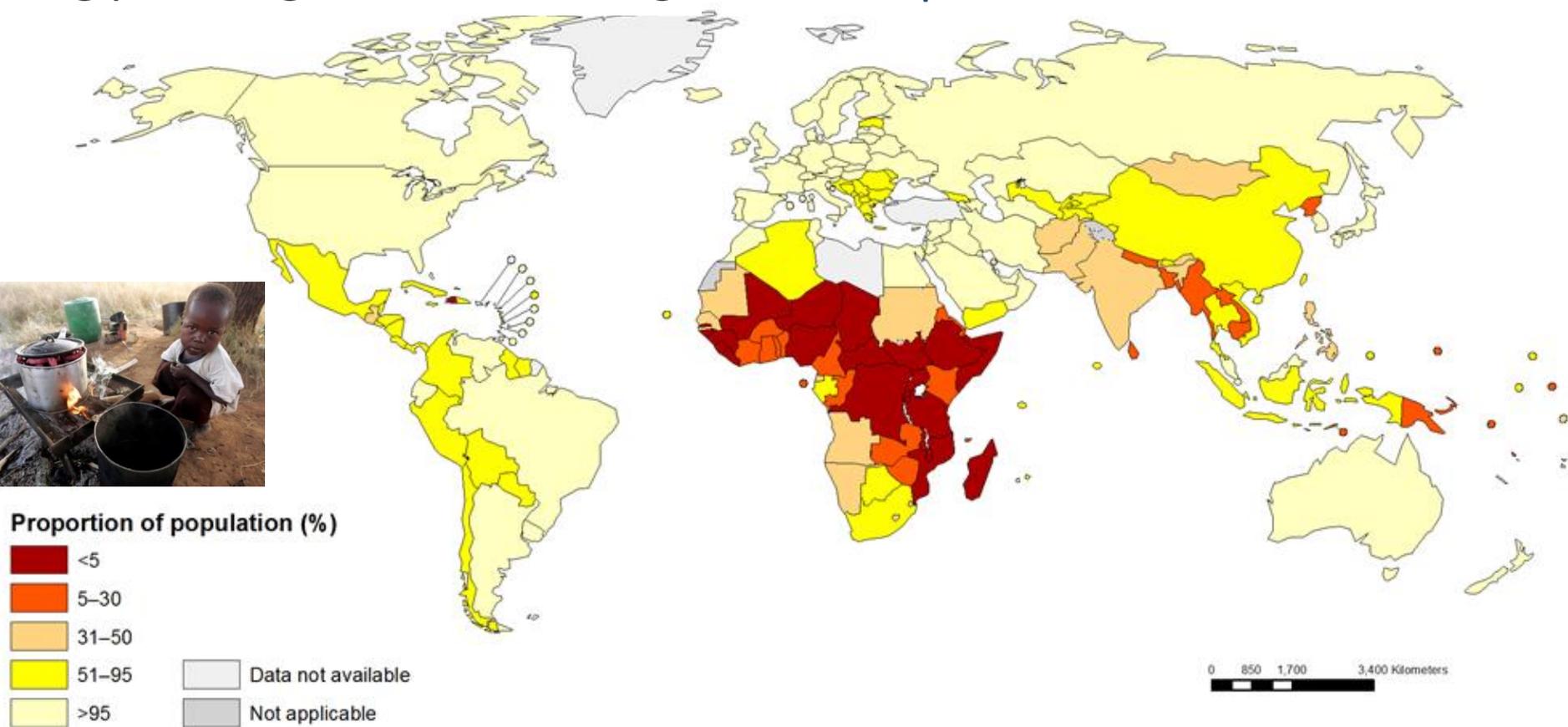
EEA, 2013

# Household air pollution and the related disease burden (2016)

About 3 billion people primarily using polluting fuels for cooking



Disease burden from household air pollution: *~3.8 million deaths*



# WHO European Region (2016)



550 000 premature deaths per year

509 000 due to ambient air pollution

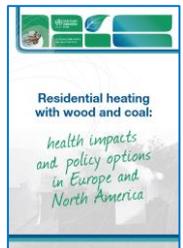
56 000 due to household air pollution

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# Contribution of residential heating to outdoor PM2.5 and burden of disease

- Burning solid fuels in the home creates air pollution indoors and outdoors

Region	PM <sub>2.5</sub> from residential heating (%)		PM <sub>2.5</sub> from residential heating (µg/m <sup>3</sup> )		Premature deaths/year		Disability-adjusted life-years (DALYs)/year	
	1990	2010	1990	2010	1990	2010	1990	2010
Central Europe	11.1	21.1	3.5	3.4	18 000	20 000	370 000	340 000
Eastern Europe	9.6	13.1	2.0	1.4	24 000	21 000	480 000	410 000
Western Europe	5.4	11.8	1.3	1.7	17 000	20 000	280 000	290 000
High-income North America	4.6	8.3	0.9	1.1	7 500	9 200	140 000	160 000
Central Asia	9.9	8.3	2.4	1.6	5 500	4 200	180 000	110 000
Global	3.0	3.1	0.9	0.7	120 000	110 000	2 800 000	2 200 000



- Regulatory and/or voluntary measures exist to reduce emissions

# Public health impact of second-hand smoke

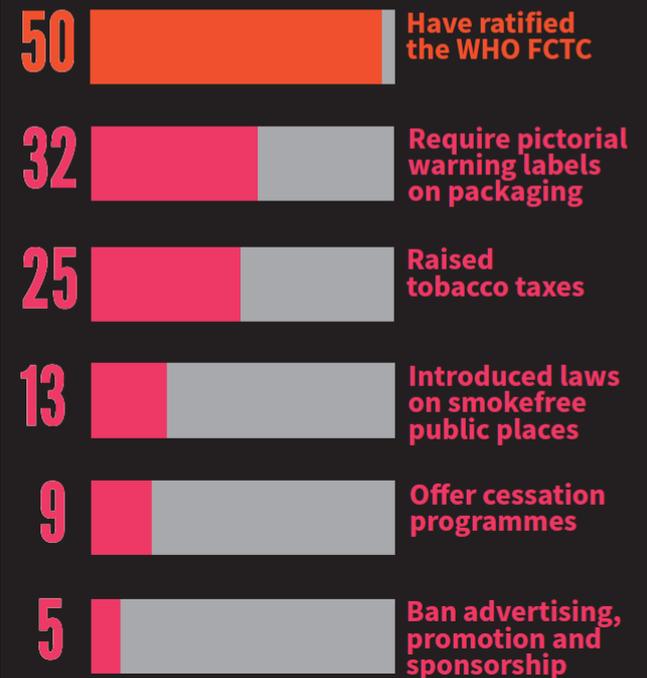
- In the European Region, 54% children under the age of 15 years are exposed to second-hand smoke (SHS) inside the home, and 74% to second-hand smoke outside the home
- Several Member States in the European Region move towards becoming tobacco-free (smoking prevalence of 5% or less)
- The European Region has the highest level of protection from tobacco smoke in indoor workplaces

**WHO  
FCTC**

High level of ratification  
Low level of full implementation

The WHO Framework Convention on Tobacco Control is a legally binding treaty for cost-effective tobacco control

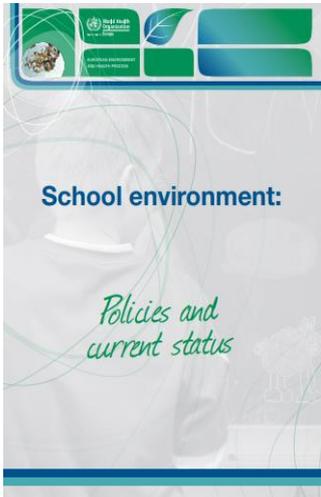
## What have the 53 countries in the WHO European Region done?



© WHO 2018

Source: WHO Report on the global tobacco epidemic, 2017. Geneva: World Health Organization; 2017

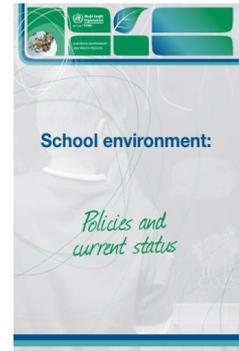
# School environment – policies and current status in the WHO European Region



- An important gap in data on exposures to indoor air pollutants and mould/dampness in the eastern part of the Region
- Policies aiming at improving IAQ in schools and kindergartens exist in most Member States
- Member States have a variety of guidelines or standards on ventilation applicable to classrooms
- Poor ventilation and stuffy air in classrooms is a common problem in some countries during the cold season
- Exposures to mould and dampness are rather common in some countries
- Information on selected chemicals in indoors air

# Summary of IAQ policies: analysis by GNI per capita based groupings

Policy	GNI per capita based grouping of Member States			
	High	Upper-middle	Low and lower-middle	All
1. Authority responsible for IAQ in kindergartens and schools	15/21 (71%)	3/7 (43%)	3/3 (100%)	21/31 (68%)
2. Health-based IAQ standards for non-occupational settings	12/21 (57%)	1/7 (14%)	1/3 (33%)	14/31 (45%)
3. Regular IAQ surveillance	5/20 (25%)	0/7 (0%)	1/3 (33%)	6/30 (2%)
4. Research projects focusing on IAQ since 2009	16/21 (76%)	4/7 (57%)	0/3 (0%)	20/31 (65%)
5. Policy to control indoor levels of formaldehyde and VOCs	12/20 (60%)	1/7 (14%)	0/3 (0%)	13/30 (43%)
6. Policy to prevent exposure to mould	15/21 (71%)	3/7 (43%)	0/3 (0%)	18/31 (58%)
7. Requirements for indoor air temperature	19/21 (90%)	6/7 (86%)	3/3 (100%)	28/31 (90%)
8. Ventilation requirements	18/20 (90%)	5/7 (71%)	2/3 (67%)	25/30 (83%)
9. Policy to prevent exposure from indoor combustion sources	5/19 (26%)	3/7 (43%)	0/3 (0%)	8/29 (28%)
10. Policy to prevent chemical contamination	8/20 (40%)	4/7 (57%)	3/3 (100%)	15/30 (50%)
11. New policies introduced after Parma	8/19 (42%)	3/7 (43%)	0/3 (0%)	11/29 (38%)



Note: Data are presented as number of positive responses / total number of responses (percent of positive responses).

# WHO European Region Environment and Health Process



Frankfurt, 1989



Helsinki, 1994



London, 1999



Budapest, 2004



Parma, 2010

## 5<sup>th</sup> Ministerial Conference, Parma, 2010

Regional Priority Goal 3: Preventing disease through improved outdoor and indoor air quality

- ii. We will develop appropriate cross-sectoral policies and regulations capable of making a strategic difference in order to reduce indoor pollution ...
- iii. We aim to provide each child with a healthy indoor environment in child care facilities, kindergartens, schools and public recreational settings, implementing WHO's indoor air quality guidelines ...

# Sixth Ministerial Conference, Ostrava, Czechia, 2017

## Ministerial Declaration

Compendium of possible actions

Institutional arrangements



Seven priority EH topics, including:

## Improve indoor and outdoor air quality

Possible actions:

- Reduce indoor air pollution
- Pay special attention to vulnerable populations
- Take into account the WHO air quality guidelines and indoor air quality guidelines
- Cross-sectoral and multistakeholder cooperation
- Public health and environment authorities lead in raising public awareness
- Provide training opportunities and facilitate research and develop tools and guidance
- ...

# First WHA Resolution on Air Pollution and Health (May 2015)

- Indoor and outdoor air pollution among the leading avoidable causes of disease and death globally
- The role of health authorities in raising awareness about the potential to save lives and reduce health costs, if air pollution is addressed
- The role of WHO AQG, both for ambient and indoor air quality, in providing guidance for clean air that protect human health
- Encourage and promote measures reduce levels of indoor air pollution such as clean cooking, heating and lighting and efficient energy use
- Cooperation between sectors and integration of health concerns into air pollution-related policies
- Strengthen international transfer of expertise, technologies and data



# WHO Framework Convention on Tobacco Control (WHO FCTC, 2003)

- First international health-related treaty adopted globally
- The global implementation of the WHO FCTC increasing over the years
- Article 8 requires the adoption of effective measures to protect people from exposure to tobacco smoke:
  - in indoor workplaces;
  - in indoor public places;
  - on public transport;
  - and “as appropriate” in “other public places”



**World Health  
Organization**

**SEVENTY-SECOND WORLD HEALTH ASSEMBLY**  
Provisional agenda item 11.6

**A72/15**  
**18 April 2019**

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## **Health, environment and climate change**

**Draft WHO global strategy on health, environment and climate  
change: the transformation needed to improve lives and  
well-being sustainably through healthy environments**

**Report by the Director-General**

# Draft WHO global strategy on health, environment and climate change

A vision on how to respond to environmental health risks and challenges until 2030 and ensure safe, enabling and equitable environments for health by transforming way of living, working, producing, consuming and governing.

## Key settings as sites for interventions

... to address environmental health risks and reduce health

- **Households.** To ensure that shelter: is structurally sound; has adequate indoor temperatures; provides adequate water, sanitation and illumination and has sufficient space; is equipped with clean, affordable and reliable energy for cooking, heating and lighting, and ventilation; and protects from injurious hazards, noise, mould, pests and indoor contaminants, including harmful exposure from household and consumer products.
- **Schools.** To ensure a safe and health-promoting environment for education; to use schools as centres to generate awareness about the linkages between health and environment, including chemical risks, and provide education on healthier and more sustainable approaches; and to facilitate the inclusion of best practices in the wider community.

# WHA Resolution on the role of the health sector in SAICM

Road map to enhance health sector engagement in the strategic approach to international chemicals management towards the 2020 goal and beyond

## ACTION AREAS

### RISK REDUCTION



- Health protection strategies
- Healthy health care settings
- Raising awareness

### KNOWLEDGE AND EVIDENCE



- Risk assessment, biomonitoring and surveillance
- Measuring progress
- Sharing and collaborating

### INSTITUTIONAL CAPACITY



- National policy and regulatory frameworks
- International Health Regulations (2005)
- Training and education

### LEADERSHIP AND COORDINATION



- Health in all chemicals policies
- Health sector engagement and coordination
- Engagement with other sectors and stakeholders

## Chemicals road map

### Goal 3 Target 3.9

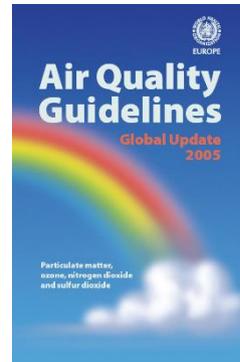
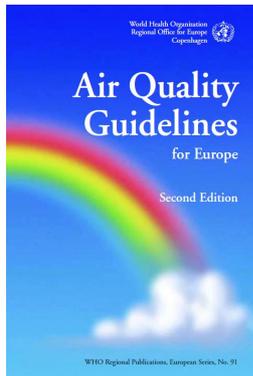
By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

### Goal 6 Target 6.3

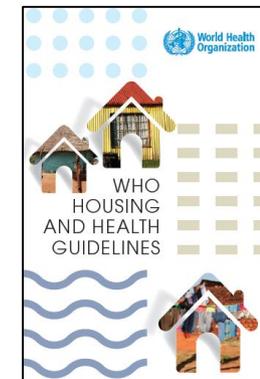
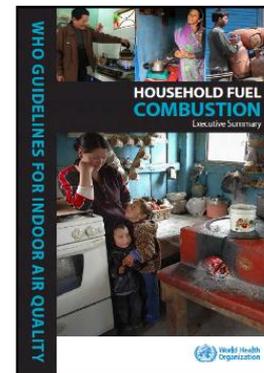
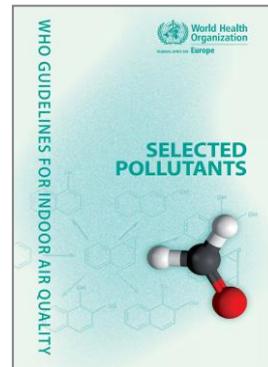
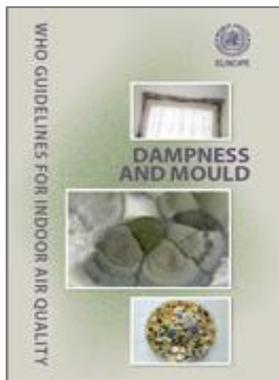
By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

### Goal 12 Target 12.4

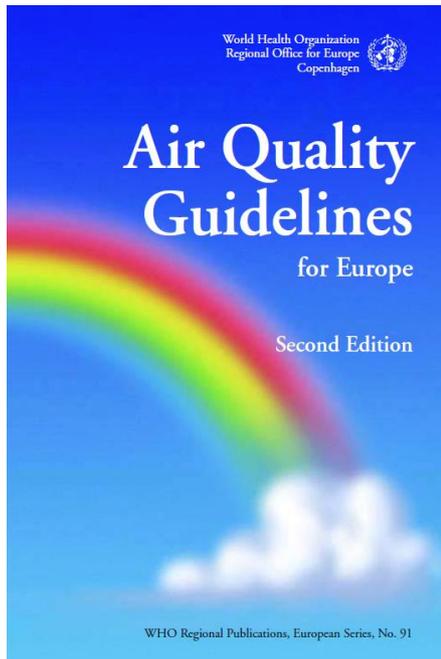
By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment



# Indoor air quality in WHO guidelines



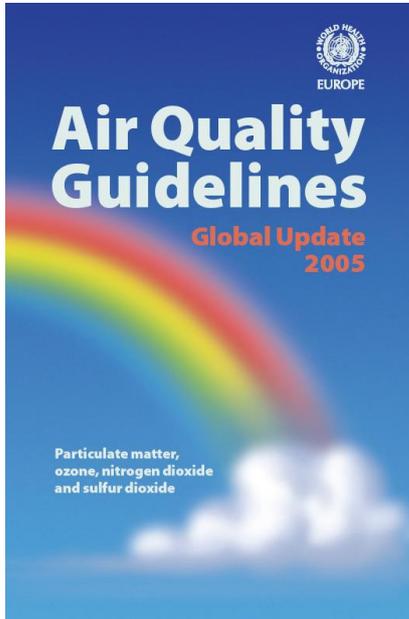
# WHO Air Quality Guidelines for Europe, 2000



## Section on indoor air pollutants

- second-hand smoke
- man-made vitreous fibres
- radon

# WHO Air Quality Guidelines, global update 2005



Guideline values on PM, NO<sub>2</sub>, ozone and SO<sub>2</sub> applicable in all non-occupational environments, including indoors in households, schools, vehicles etc.

Given the recent evidence from systematic reviews and meta-analyses used for the WHO comparative risk assessment exercise (9) and that from studies of health risks of ETS (and the fact that exposure occurs both indoors and outdoors for all the pollutants involved) it is reasonable now to propose using the same air quality guidelines for both indoor and outdoor exposures.

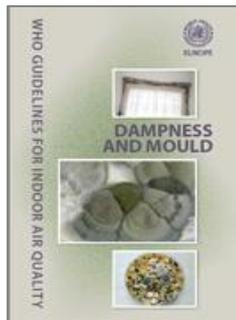
However,

- management of AQ indoors requires different approaches than outdoor AQ management
- a chapter on indoor air quality proposed a framework for **the future development of WHO indoor AQGs**

# Update WHO Global Air Quality Guidelines

- Process initiated in 2016
- Systematic reviews on long-term exposure to PM, NO<sub>2</sub> and O<sub>3</sub>, and short-term exposure to PM, NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub>, CO and selected health outcomes
- Systematic review on long-term exposure to PM, NO<sub>2</sub> and O<sub>3</sub> in indoor settings and all-cause and cause-specific mortality

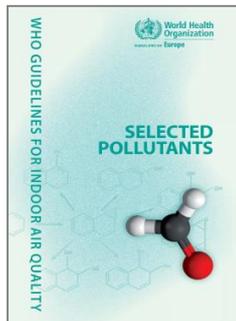
# WHO Indoor Air Quality Guidelines



## Biological agents

- dampness and mould
- allergens (house dust mites, pets)

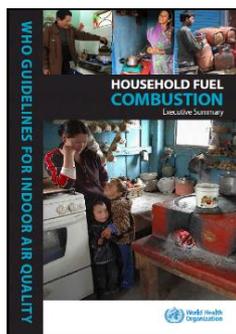
WHO, 2009



## Selected chemicals

- formaldehyde, naphthalene, benzene
- NO<sub>2</sub>, CO, PAH, radon
- halogenated compounds (PCE, TCE)
- particulate matter (*follow WHO AQG*)

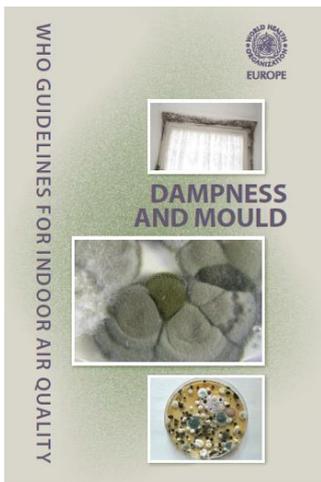
WHO, 2010



## Household fuel combustion

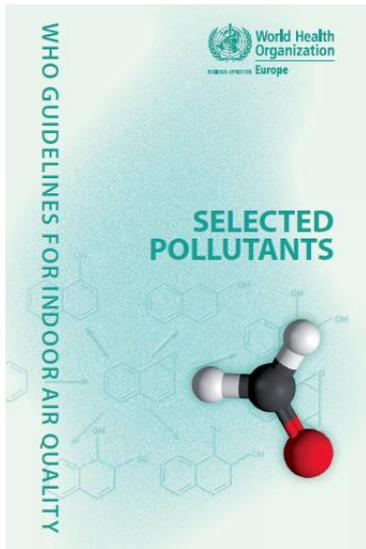
WHO, 2014

# WHO Guidelines for Indoor Air Quality Dampness and Mould



- No quantitative health based guideline values or thresholds for specific micro-organism contamination - no quantitative exposure-effect relationships available
- Recommendations for indoor air quality management
- Focus on prevention of persistent dampness and microbial growth on interior surfaces and building structures to minimize adverse health effects

# WHO Guidelines for Indoor Air Quality Selected Pollutants

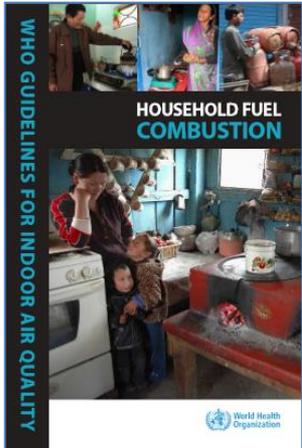


- Measures to eliminate/reduce exposure to pollutants known or likely to be hazardous
- Measures to reduce the concentrations of air pollutants both outdoors and indoors - controlling the source(s) of emission, secondary factors (dispersion and dilution)

Guideline values for nine pollutants: benzene, CO, formaldehyde, naphthalene, NO<sub>2</sub>, PAHs, radon, trichloroethylene and tetrachloroethylene

NOT included: second-hand smoke (WHO AQG 2000), particulate matter (WHO AQG, 2005)

# WHO Guidelines for Indoor Air Quality Household Fuel Combustion

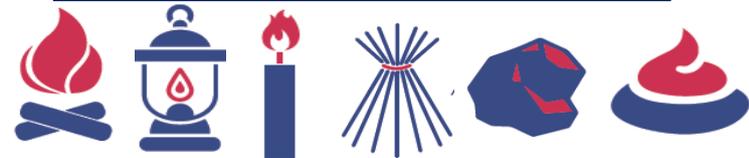


- Provide emission rate targets for PM<sub>2.5</sub>, and CO to determine fuel and technology combinations as “clean” for health
- Policy guidance in transition towards the sustained adoption of clean fuels (e.g. LPG) and technologies
- Recommendations against the use of kerosene and unprocessed coal
- Importance of addressing all main household energy end uses for health benefits

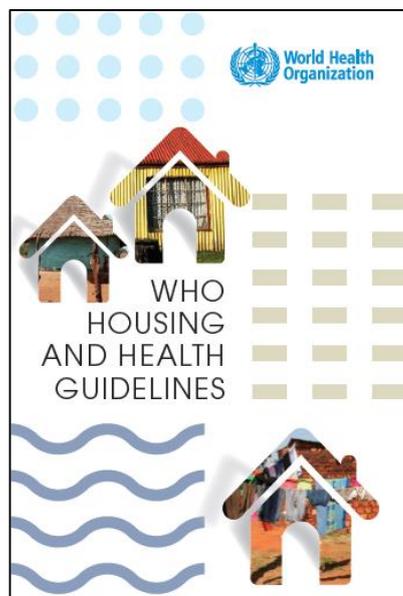
## Clean - unexposed



## Polluting- exposed



# WHO Housing and Health Guidelines



- When implementing the HHGL it will be helpful to take a **multifactorial approach**, addressing **multiple risk factors** at the same time in order to achieve a **range of health benefits** in the most **efficient manner** possible

# The 2030 Agenda for Sustainable Development



# Tool to assess the risks of exposure to chemical mixtures in indoor air

- On-going project coordinated by WHO ECEH
- Aims to better protect children's health from the negative impacts of chemicals indoors
- Focus on schools, kindergartens and other settings for children
- Health outcomes: respiratory, cardiovascular, nervous systems
- Development of an online tool to support assessment of risks of combined exposure to (selected) chemicals indoors
- An overview of analytical methods
- An overview of approaches to monitoring and control

# Thank you for your attention



<http://www.euro.who.int/en/health-topics/environment-and-health>