

Role of Gas for Clean Household Energy and Health



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World Health
Organization

Presentation Outline

- Household energy use and health impacts
- WHO Guidelines for indoor air quality: household fuel combustion
- Role of gas in improving air quality
- Urban context & case studies



Overview: Household Air Pollution

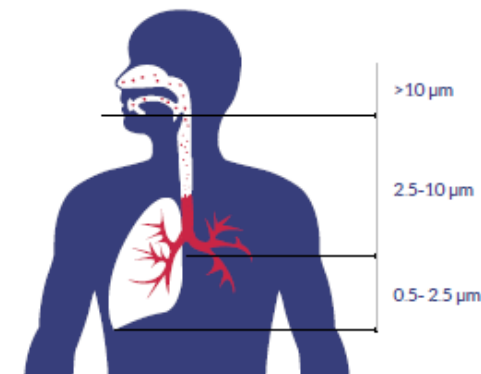
- **Household air pollution (HAP)** is a mixture of pollutants released during incomplete combustion of carbon-based fuels (wood, coal, dung) in and around the home (not just indoors!)

cooking, heating, lighting

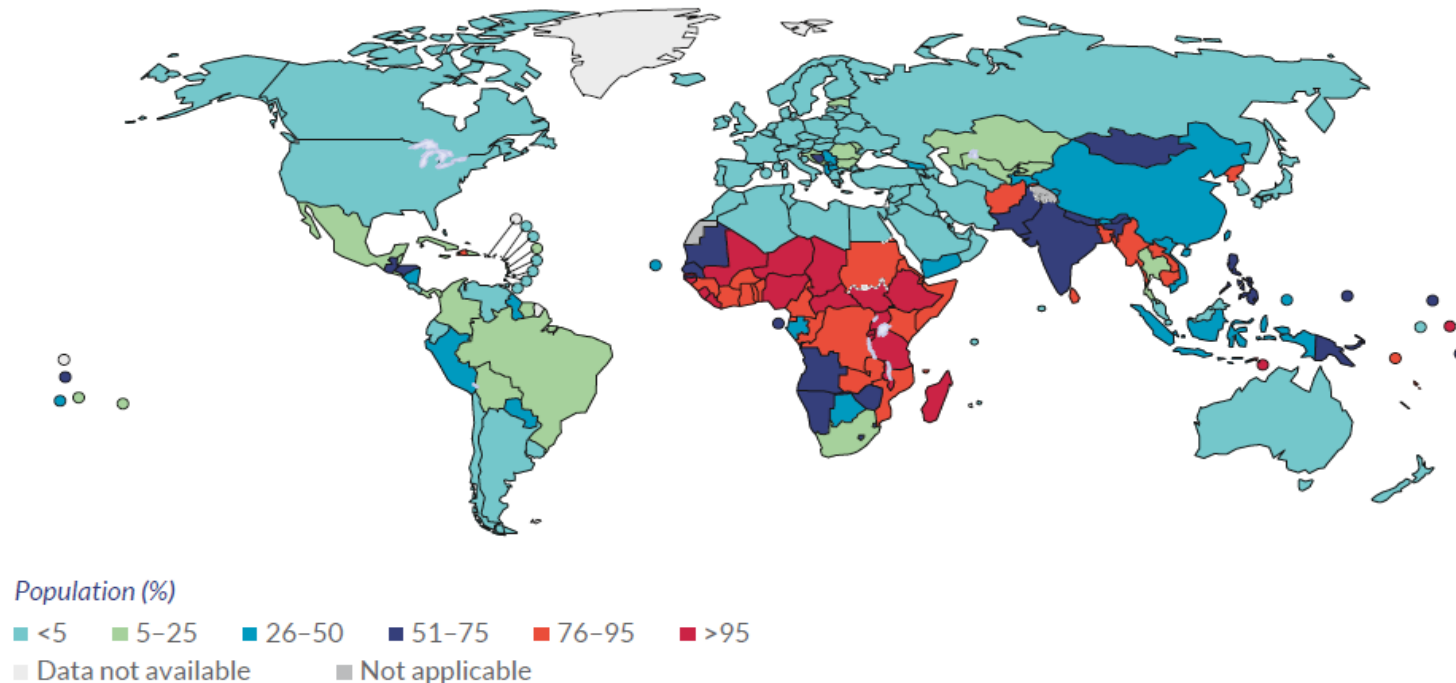
- Particles $<2.5\mu\text{m}$ in diameter penetrate deep into the lungs and effect the body leading to diseases

- Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Childhood pneumonia
- Lung cancer
- Cataract

- Adverse pregnancy outcomes
- Cognitive development
- Tuberculosis
- Diabetes



Global Toll from COOKING with Polluting Fuels and Technologies



3 billion people
primarily use polluting
fuels and technologies
for **cooking**

**~4 million
deaths
per year**

(WHO 2014)

Other Health Impacts

Burns, scalds, poisonings & injury



Traditional stoves can pose major **safety** risks in the home.



Kerosene is a leading cause of childhood **poisonings** in low and middle income countries

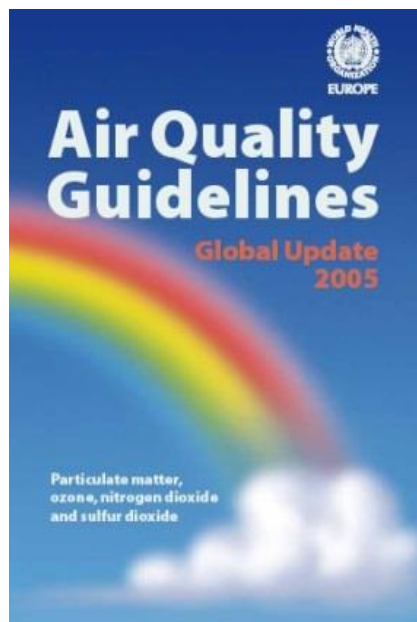


Fuel collection can lead to **musculo-skeletal injuries** and is major source of time loss

Importance of Clean Household Energy Use



Previous WHO Air Quality Guidelines

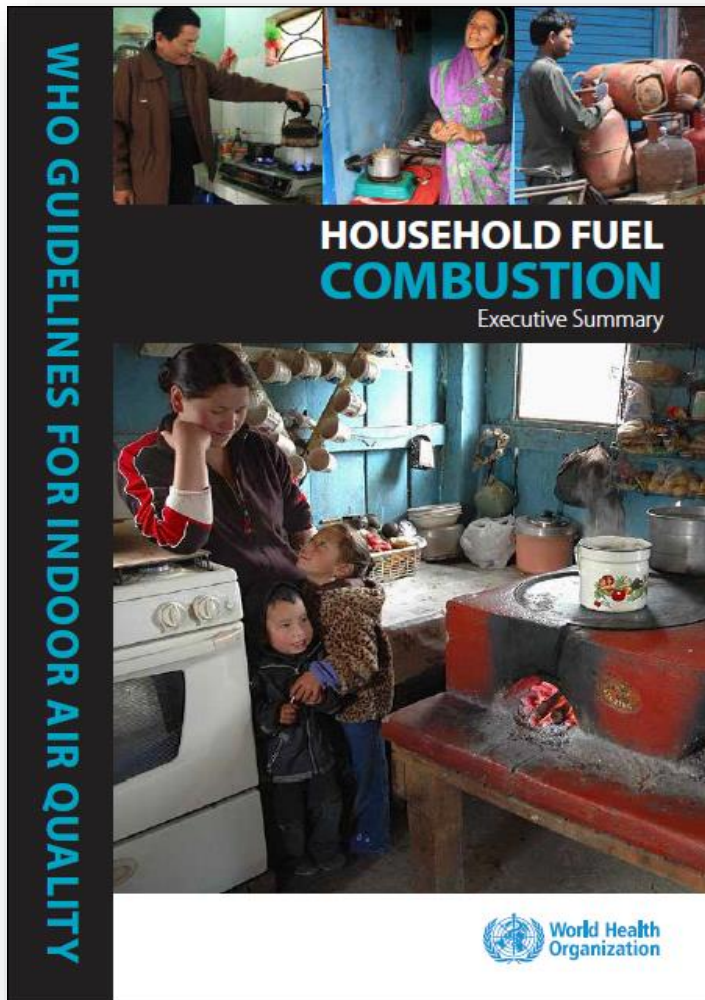


Annual mean level	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	Basis for the selected level
WHO interim target 1 (IT-1)	70	35	These levels are estimated to be associated with about 15% higher long-term mortality than at AQG levels.
WHO interim target 2 (IT-2)	50	25	In addition to other health benefits, these levels lower risk of premature mortality by approximately 6% (2–11%) compared to IT-1.
WHO interim target 3 (IT-3)	30	15	In addition to other health benefits, these levels reduce mortality risk by approximately another 6% (2–11%) compared to IT-2 levels.
WHO air quality guidelines (AQG)	20	10	These are the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to PM _{2.5} in the ACS study (323). The use of the PM _{2.5} guideline is preferred.

“The guidelines presented here are recommended to **apply to all environments where population exposure occurs and therefore protect all population groups”.**

(WHO Air quality guidelines, global update 2005, p 179)

WHO Guidelines for indoor air quality: household fuel combustion



Normative guidance:

- Provide **emission rate targets** for PM_{2.5}, and CO that determine whether fuel and technology combinations are “clean” for health
- Discourage **kerosene and unprocessed coal use**
- Emphasize importance of addressing **all** main household energy end uses for health benefits
- Call for strategies to accelerate access, prioritizing **transitional fuels and technologies** with substantial health benefits when needed

Current status: Clean vs. Polluting Fuels & Tech



**Clean -
unexposed**



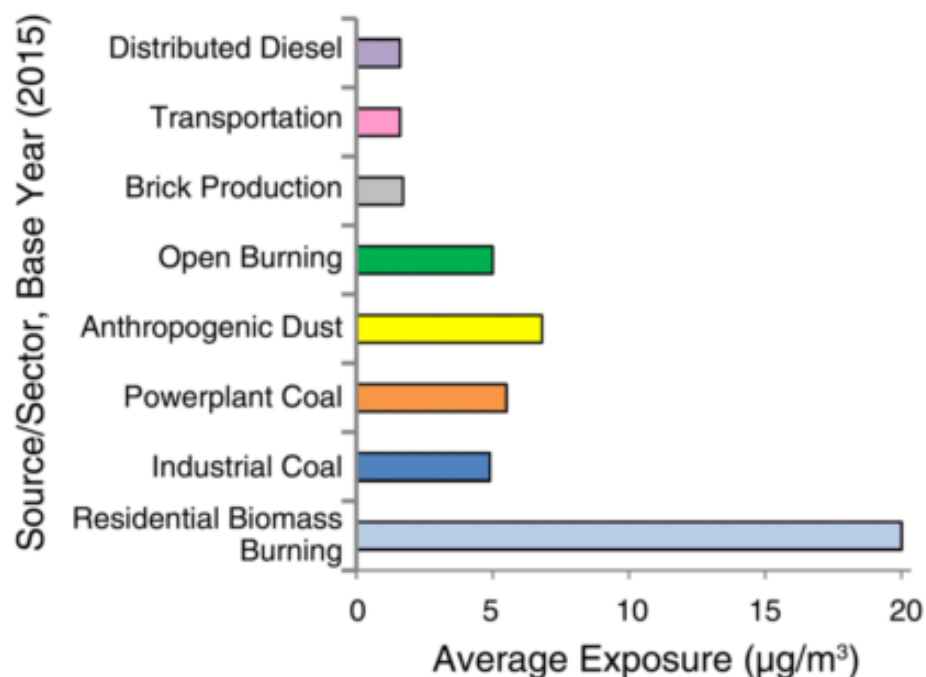
**Polluting-
exposed**



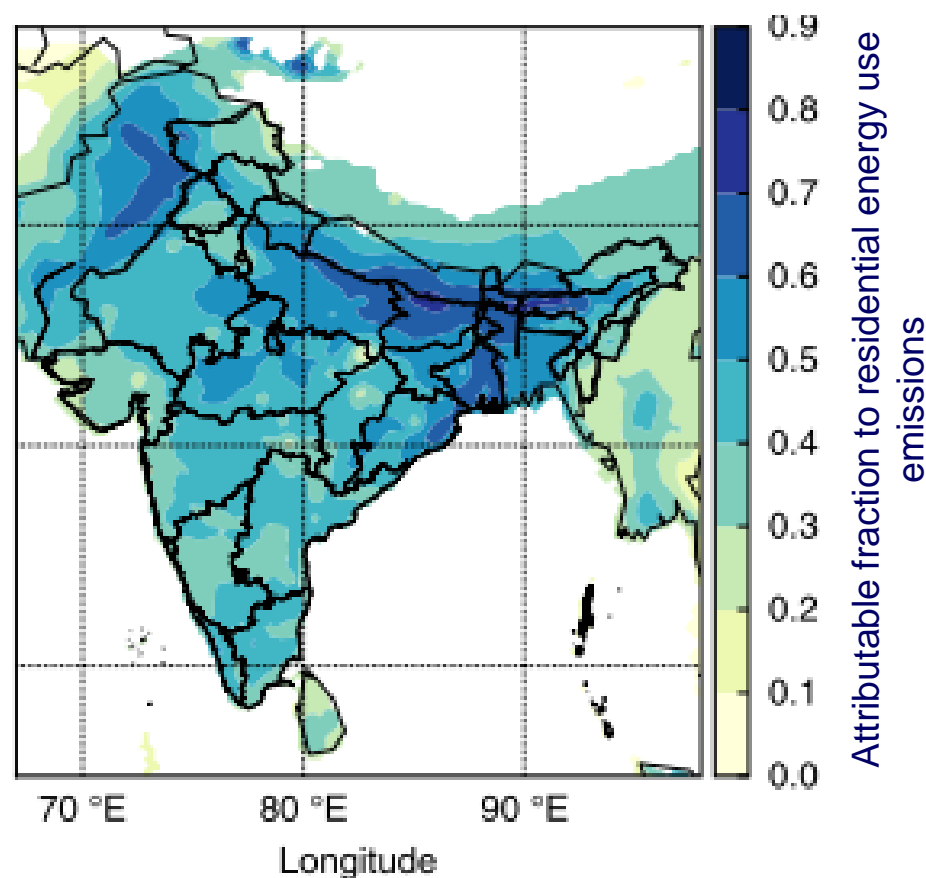
Household ↔ Ambient

- Household air pollution is a major contributor to ambient

Contribution by selected sources to average population exposure to ambient PM_{2.5} in India, 2015



GBD MAPS Working Group, 2018



Conibear et al. 2018, Nature Communications

Role of natural gas

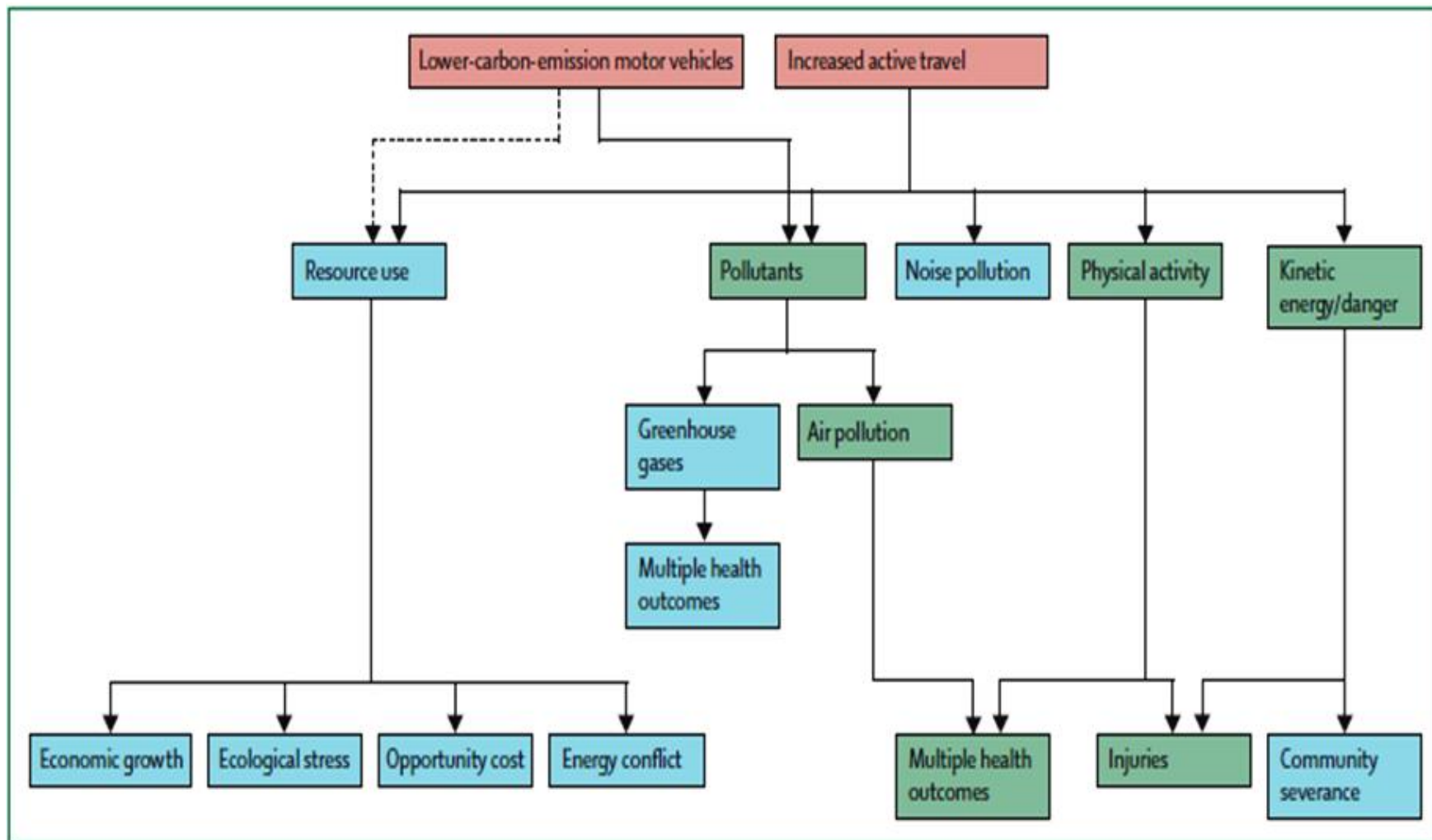
- Natural gas (PNG), LPG, ethanol, methanol are considered clean household energy at point of use
- Critical to adhere to safety standards and guidelines



Urban Health Initiative Catalyzing Change



Pathways linking transport and health



Woodcock et al., 2009 (Lancet)

Case Studies

- **Residential gas use + health**

Increase in natural gas infrastructure caused significant decrease in rate of infant mortality in Turkey



(Cesur et al. 2017, Economic Journal)

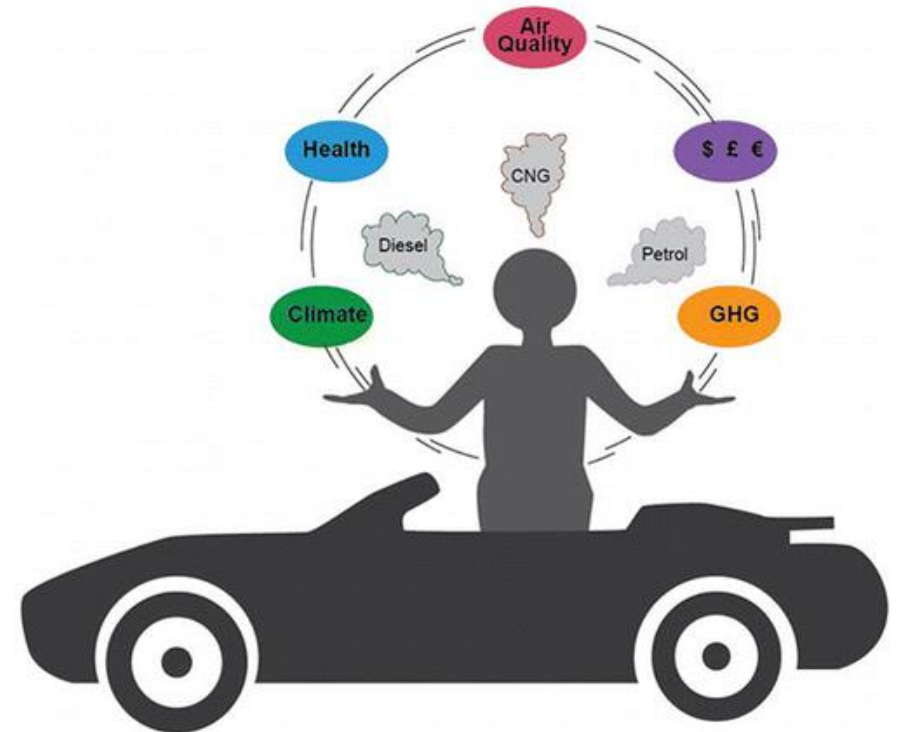
Case Studies

● Chile:

Natural gas + air quality

- Replacing **diesel buses** in Santiago with natural gas reduces annual $\text{PM}_{2.5}$ by 0.33 ug/m^3
- Replacing **wood burning stoves** in Santiago with clean fuel reduces annual $\text{PM}_{2.5}$ by 2.07 ug/m^3

(Mena-Carrasco et al. 2012)



Bangladesh:

CNG conversion for motor vehicle fleet has
Climate costs, net air quality benefits

(Wadud and Khan . 2013)

Final Considerations

- Sustained use of clean fuels and technologies is not equivalent to access
- Safety for households, filling station workers, public critical, necessitating extensive communication
- Interlinkages between household, ambient, urban, rural



THANK YOU

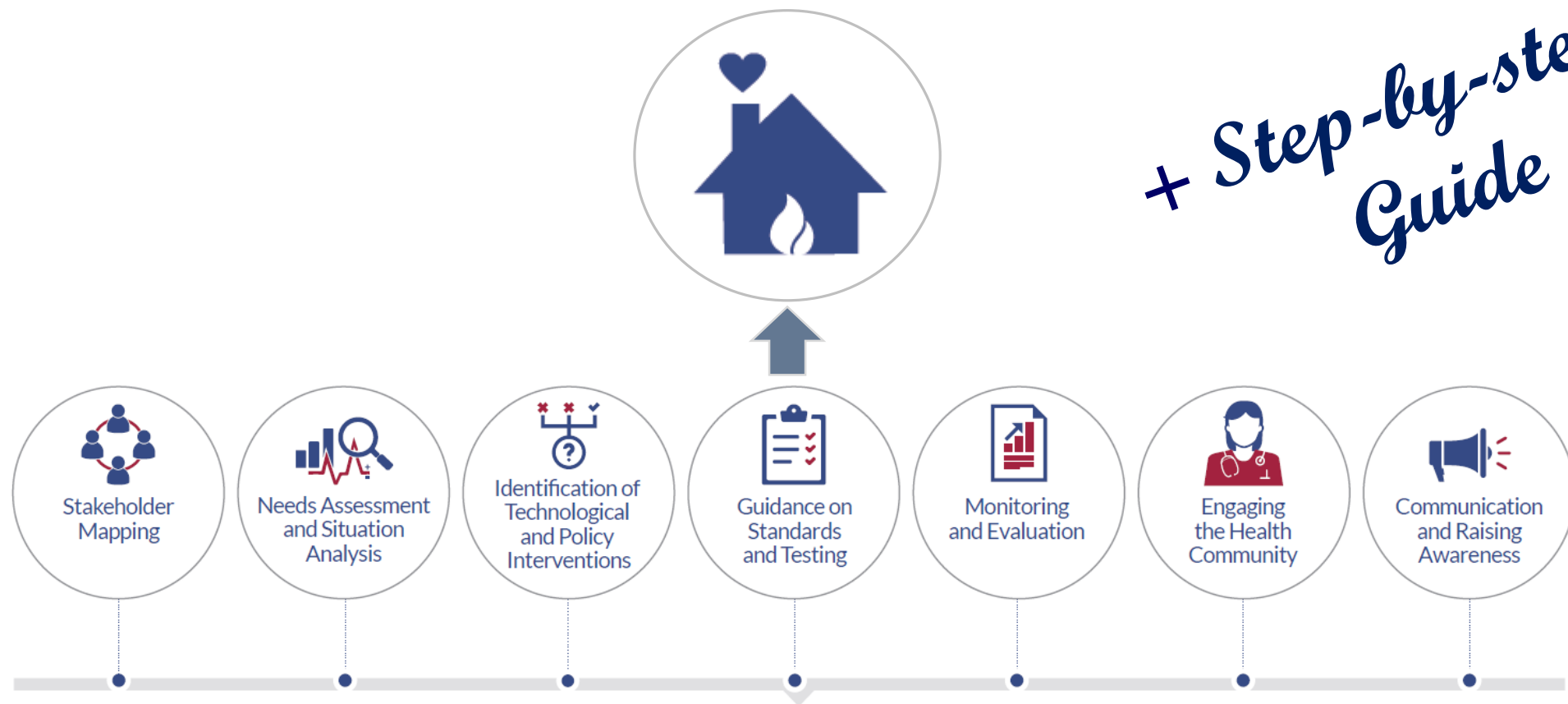


Questions or Comments?
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<http://www.who.int/indoorair/guidelines/hhfc/en/>

Clean Household Energy Solutions Toolkit (CHEST)

+ Step-by-step Guide



**Tools and Resources for Developing & Implementing
Clean Home Energy Policies & Programmes**

BREATHELIFE



A global campaign to protect our health and climate by improving air quality

- For **Cities** : 35 cities have joined the network (Oct 2017), solutions
London, Washington DC, Santiago, Manchester, Aburrà Valley, Jalisco State, Mongolia
- For the **General public** : information on risks, air quality levels
- For the **Health professionals**: information on risks for patients, actions

Launched Oct 2016 at UN HABITAT III Conference

breathelife2030.org

BreatheLife Campaign - breathelife2030.org

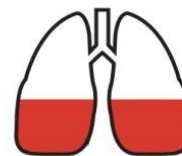
Aim

To mobilize cities and individuals to protect our health and our planet from the effects of air pollution

- Citywide commitments towards WHO Air Quality Guidelines, and solutions
- Actions for individuals
- Health sector leadership

THE **INVISIBLE KILLER**

Air pollution may not always be visible, but it can be deadly.



36%
OF DEATHS FROM
LUNG CANCER



34%
OF DEATHS FROM
STROKE



27%
OF DEATHS FROM
HEART DISEASE

BREATHELIFE.
Clean Air. Healthy Future.



World Health
Organization



CLIMATE &
CLEAN AIR
COALITION
FOR
HEALTHY
CLIMATE
POLICYMAKERS