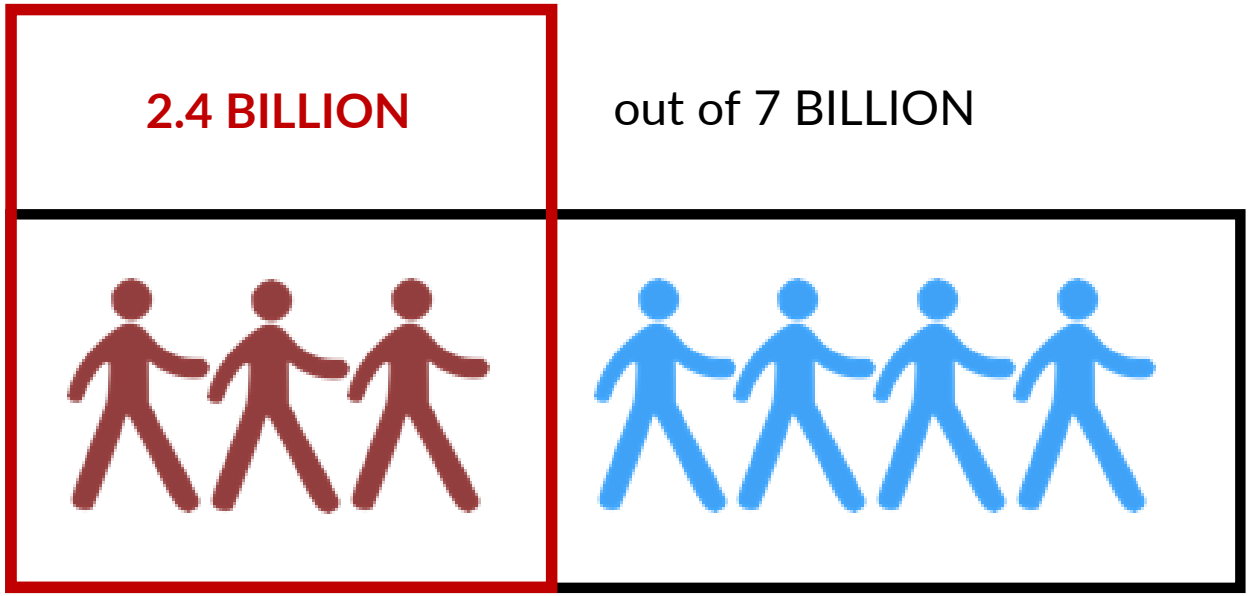
World Health Organization

Energy access: Accelerating the adoption of clean cooking, heating and lighting to protect public health

Heather Adair-Rohani, WHO Dept Environment, Climate Change & Health

How big is the problem?

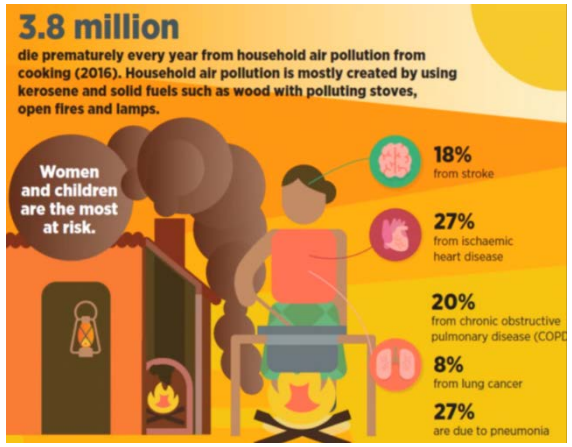
In 2020, around **1/3 of the world's population** still relies mainly on **polluting** fuels and stove combinations for cooking



Why is lack of access to clean household energy a health problem?

Billions are exposed to high levels of health-damaging pollutants

Millions of deaths annually & leading cause of burns/poisoning in LMIC



Adverse impacts are greatest in women, children and infants and a major source of climate changing pollutants

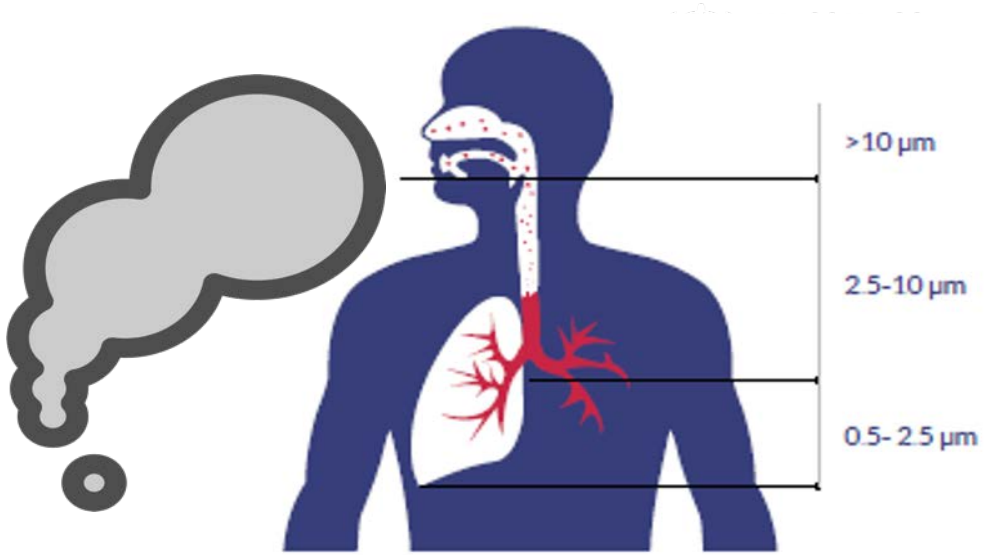
« **Household air pollution** is air pollution generated by household fuel combustion, leading to indoor air pollution, and contributing to ambient air pollution »

WHO Guidelines for Indoor Air Quality: Household fuel combustion, 2014

Credits: Heather Adair-Rohani, Nigel Bruce, Jessica Lewis.

Household Air Pollution: Composition

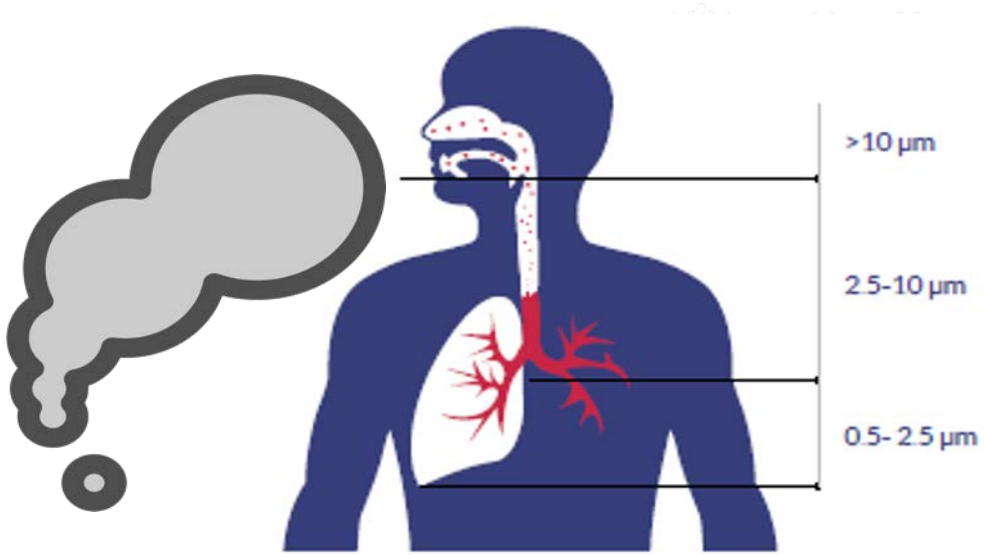
- **Household air pollution contains a mixture of pollutants, including:**
  - Particulate matter (PM)
  - Carbon monoxide (CO)
  - Nitrogen dioxide (NO_2)
  - Methane (CH_4)
  - Polyaromatic hydrocarbons (PAH)
  - Volatile organic compounds (VOC)
  - Black carbon
  - Carbon dioxide (CO_2)
  - Nitrous oxide (N_2O)



- **Particulate matter <2.5 µg/m³ in diameter can penetrate deep into the lungs, enter the bloodstream, and damage tissues and organs**

Household Air Pollution: Composition

- **Household air pollution contains a mixture of pollutants, including:**
  - Particulate matter (PM)
  - Carbon monoxide (CO)
  - Nitrogen dioxide (NO_2)
  - Methane (CH_4)
  - Polyaromatic hydrocarbons (PAH)
  - Volatile organic compounds (VOC)
  - Black carbon
  - Carbon dioxide (CO_2)
  - Nitrous oxide (N_2O)

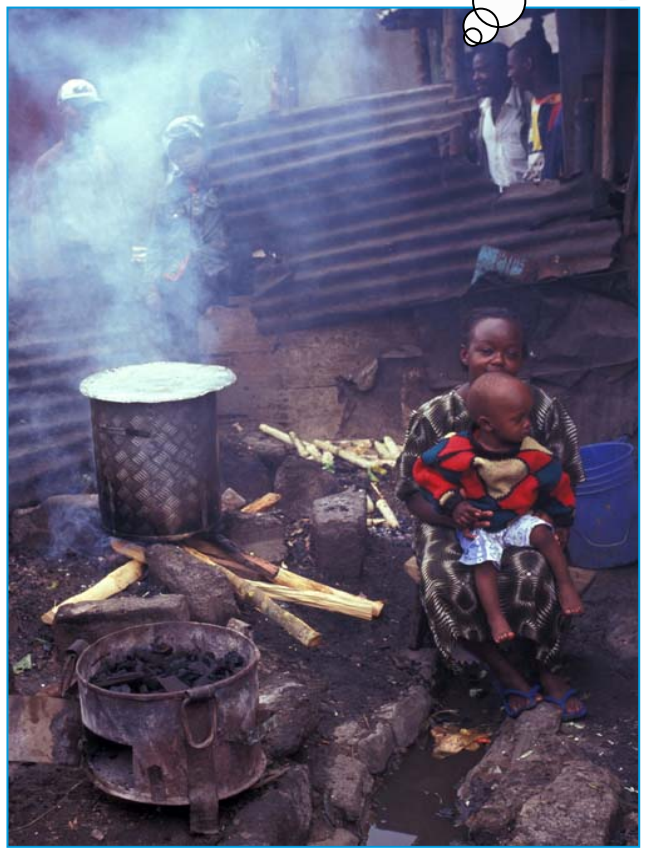


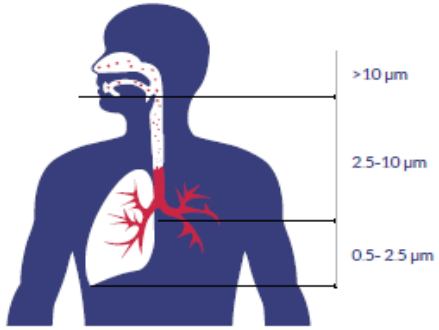
- **Particulate matter <2.5 µg/m³ in diameter can penetrate deep into the lungs, enter the bloodstream, and damage tissues and organs**

Household Air Pollution & Impacts on Health

World Health Organization

PM
CO
NMVOCS
PAH
NOx
SO_x





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

- Adverse Pregnancy Outcomes
- Cognitive development
- Tuberculosis
- Diabetes

How big is the health burden?

3.2 million deaths per year attributed to household air pollution from *cooking alone*, accounting for only those diseases with the strongest evidence.

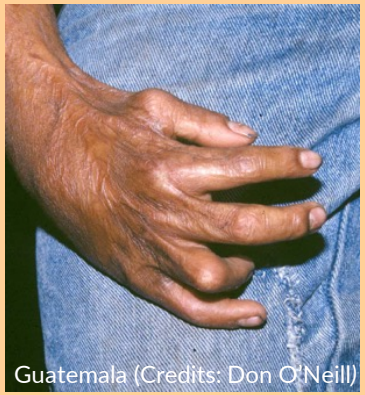
Household air pollution also accounted for the loss of an estimated **86 million healthy life years**, with the largest burden falling on women living in low- and middle-income countries.

Accounting for other end uses (e.g. space heating, lighting, supplementary cooking) and health outcomes would likely increase these numbers.

An overall perspective on the impacts of household energy use beyond disease

World Health Organization

Safety risks


Guatemala (Credits: Don O'Neill)

Burns, scalds, poisoning, musculo-skeletal injuries, animal bites, violence etc.

Energy supply and deforestation


Ghana (Credits: Dan Pope)

Charcoal production, a fuel widely used in urban areas, is an important cause of deforestation

Climate impacts


Nepal (Credits: Jon Mingle

Polluting fuels and technologies contribute to global warming as they emit both CO_2 and SLCPs.

Time burden


Nepal (Credits: Nigel Bruce)

Fuel collection and cooking with inefficient stoves take time that could be spent on other activities.

World Health Organization

SLCPs- Short Lived Climate Pollutants

Beyond cooking: health risks from other household energy

World Health Organization

Residential heating and lighting with polluting fuels like kerosene, wood and coal devices is a source of household air pollution in some parts of the world.

The same inefficient devices for cooking are used for space heating.

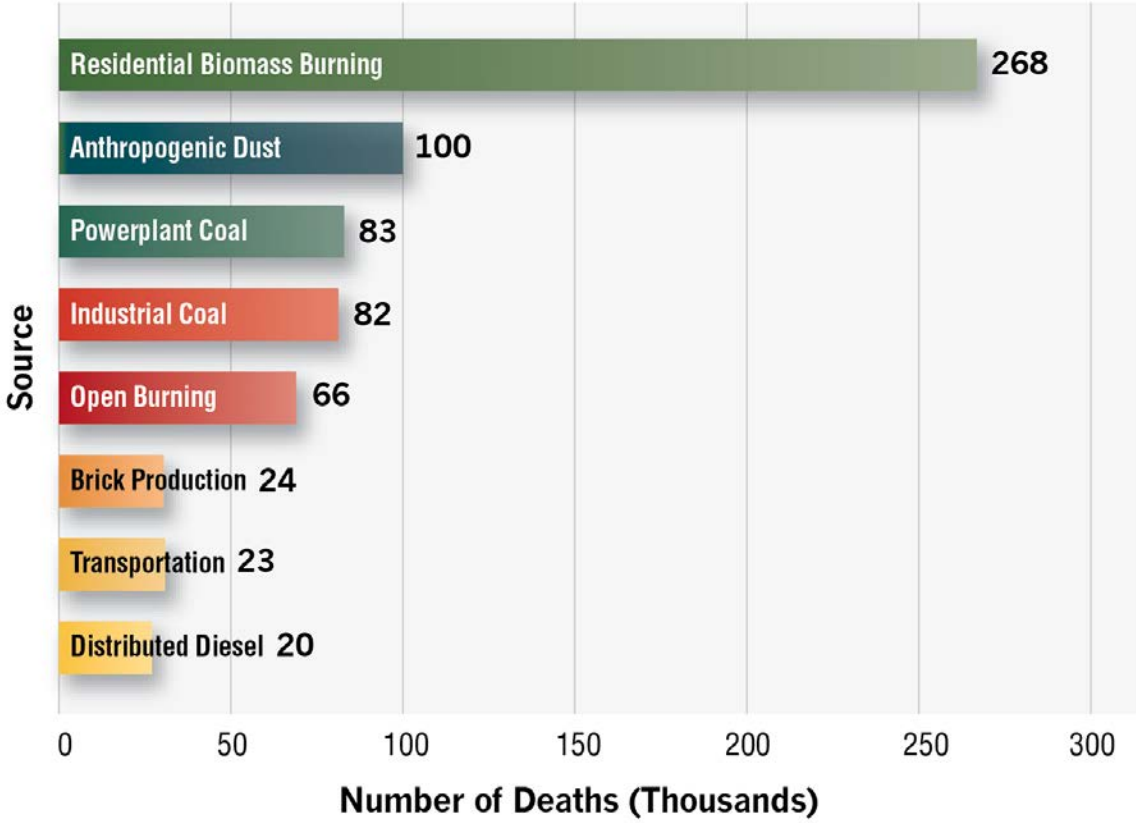
Kerosene or paraffin, a polluting liquid fuel for health and climate is frequently used for lighting and space heating in some regions.

Household air pollution leaking outdoors via chimneys and hoods is an important source of ambient (outdoor) air pollution across the world, particularly in North America, Europe, and some parts of Asia.

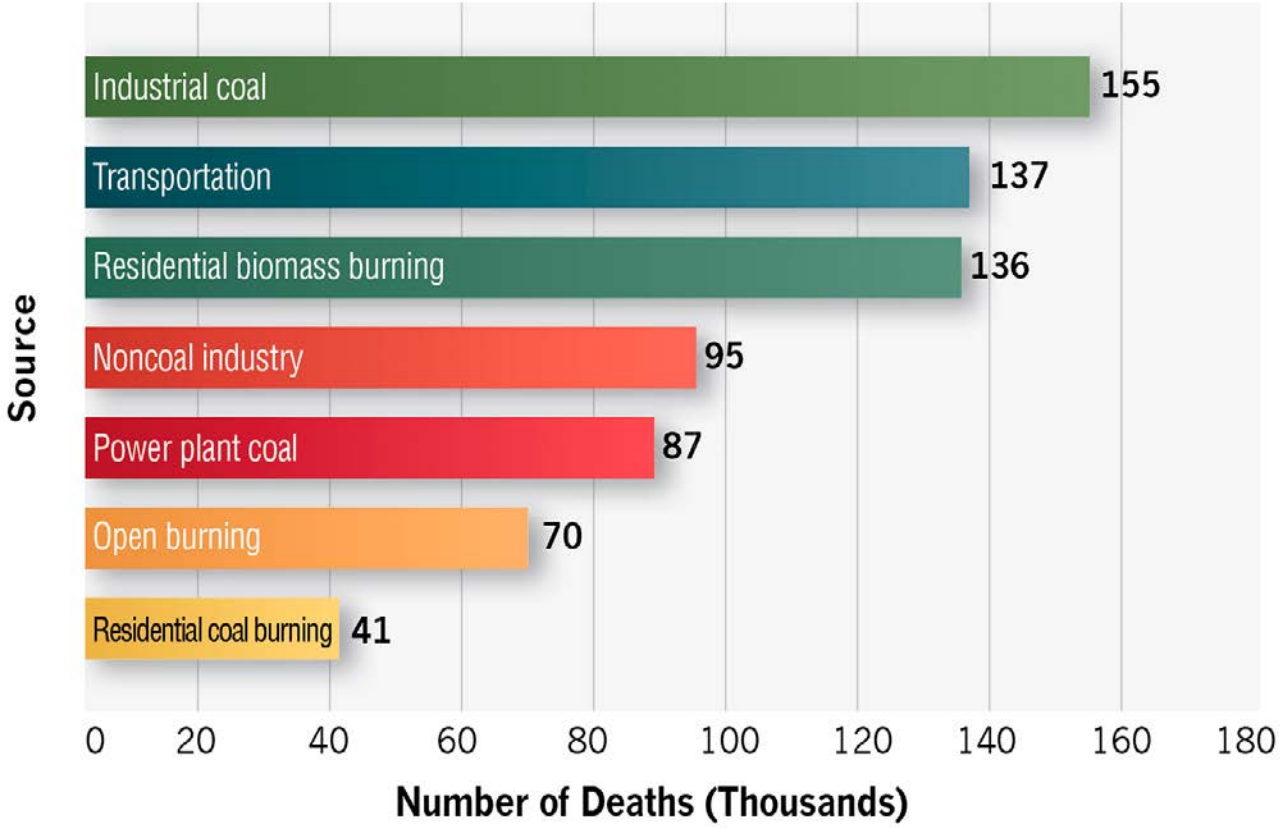
HAP – Source of Outdoor Air Pollution

Results from HEI's State of Global Air

India - 2015



China - 2013



HEI

HAP & Climate linkages

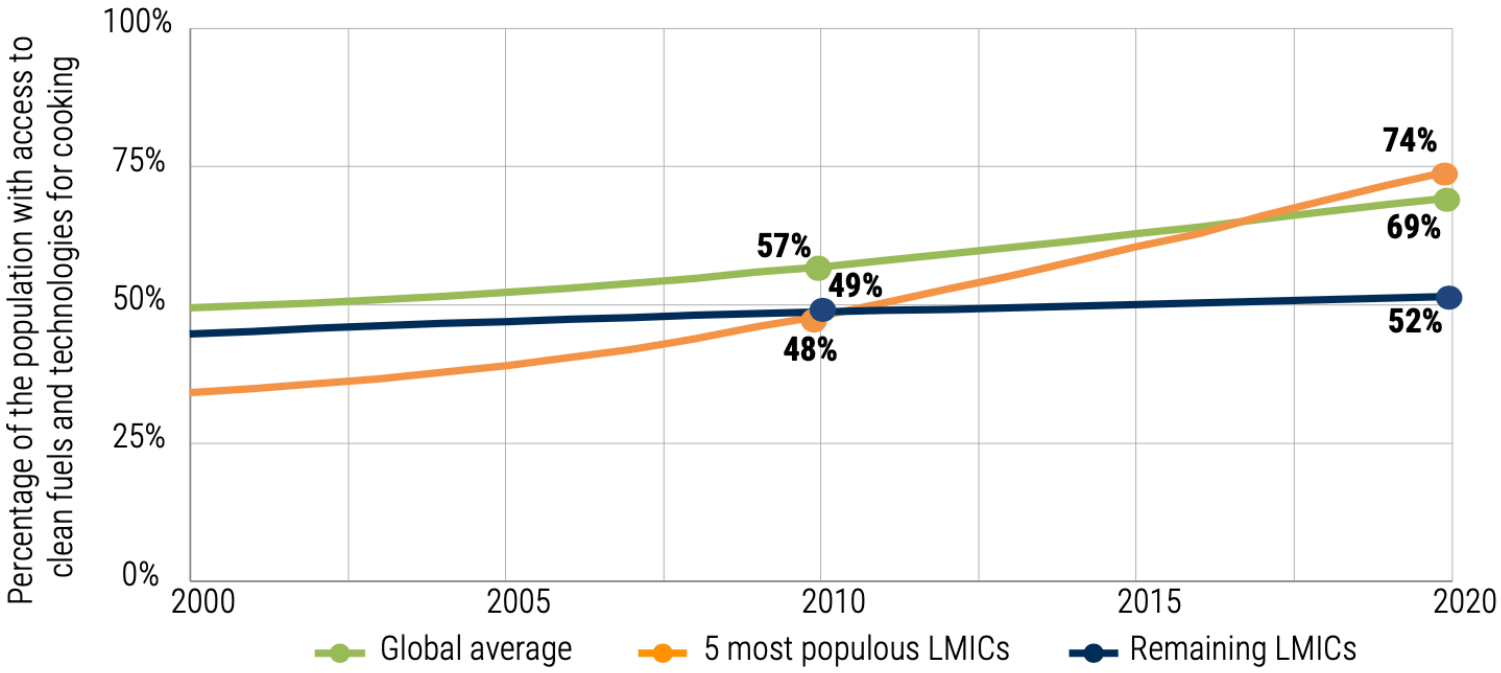
World Health Organization

- Household emissions of climate-related pollutants escape from the home, contributing to ambient air pollution and climate change
- Cooking with polluting fuels is responsible for **~2% of human-created greenhouse gas** emissions
- Household-level burning of polluting fuels is responsible for **more than half of all global black carbon emissions**
- Black carbon has a warming capacity up to 1,500 times greater than carbon dioxide
- Deforestation from unsustainable harvesting of trees for fuelwood and charcoal production contributes to carbon dioxide in the atmosphere

Inequities in clean energy transition – not universal

World Health Organization

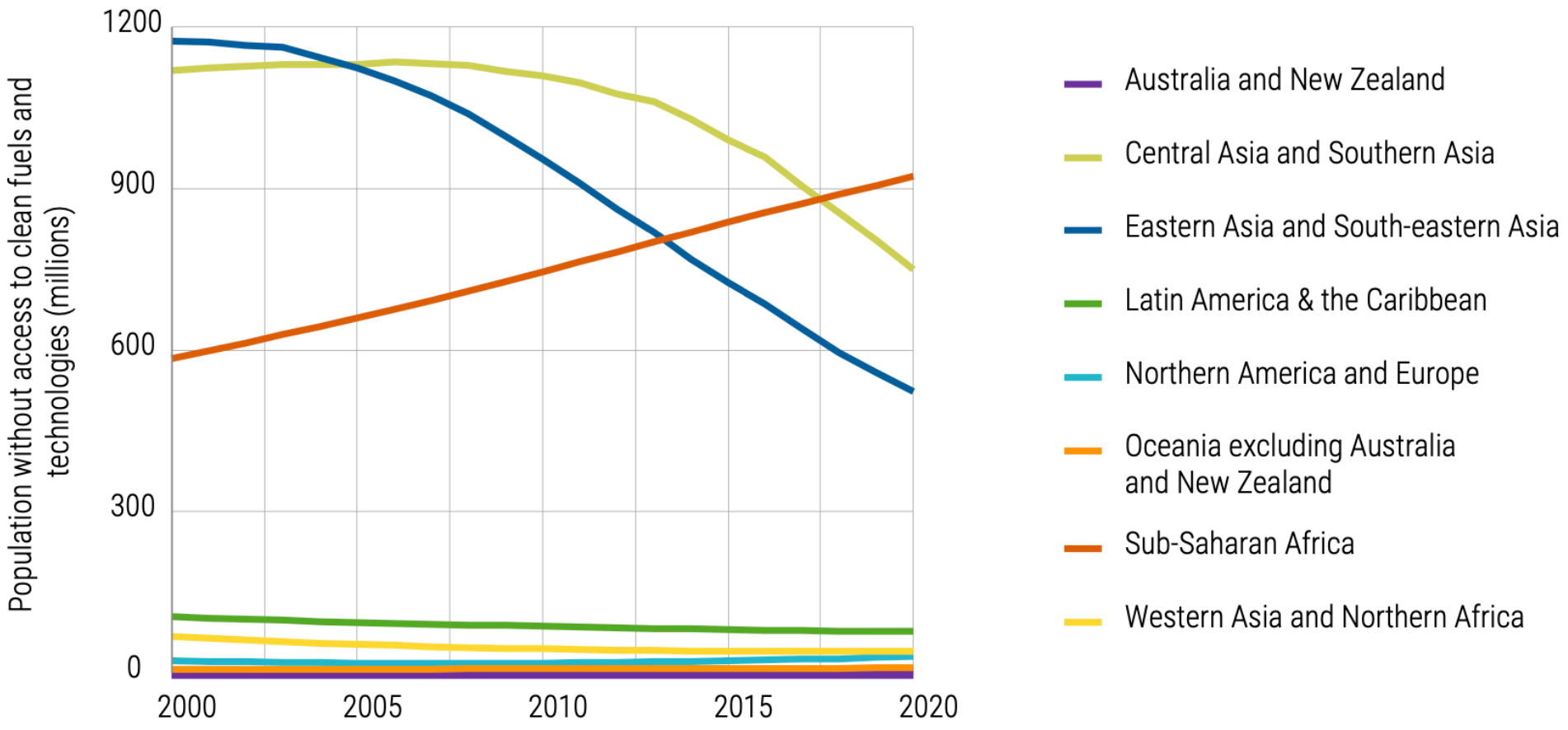
- The proportion of the population primarily using clean fuels and technologies for cooking has only increased by 12% over the last 10 years
- Most progress has been in the 5 most populous LMICs (other LMICs have seen little improvement)
- If current trends continue, a quarter of the world's people, mostly in low- and middle-income countries, will lack access to clean cooking fuels in 2030



Source: Tracking SDG 7
https://trackingsdg7.esmap.org

5 most populous LMICs: Brazil, China, India, Indonesia, Pakistan

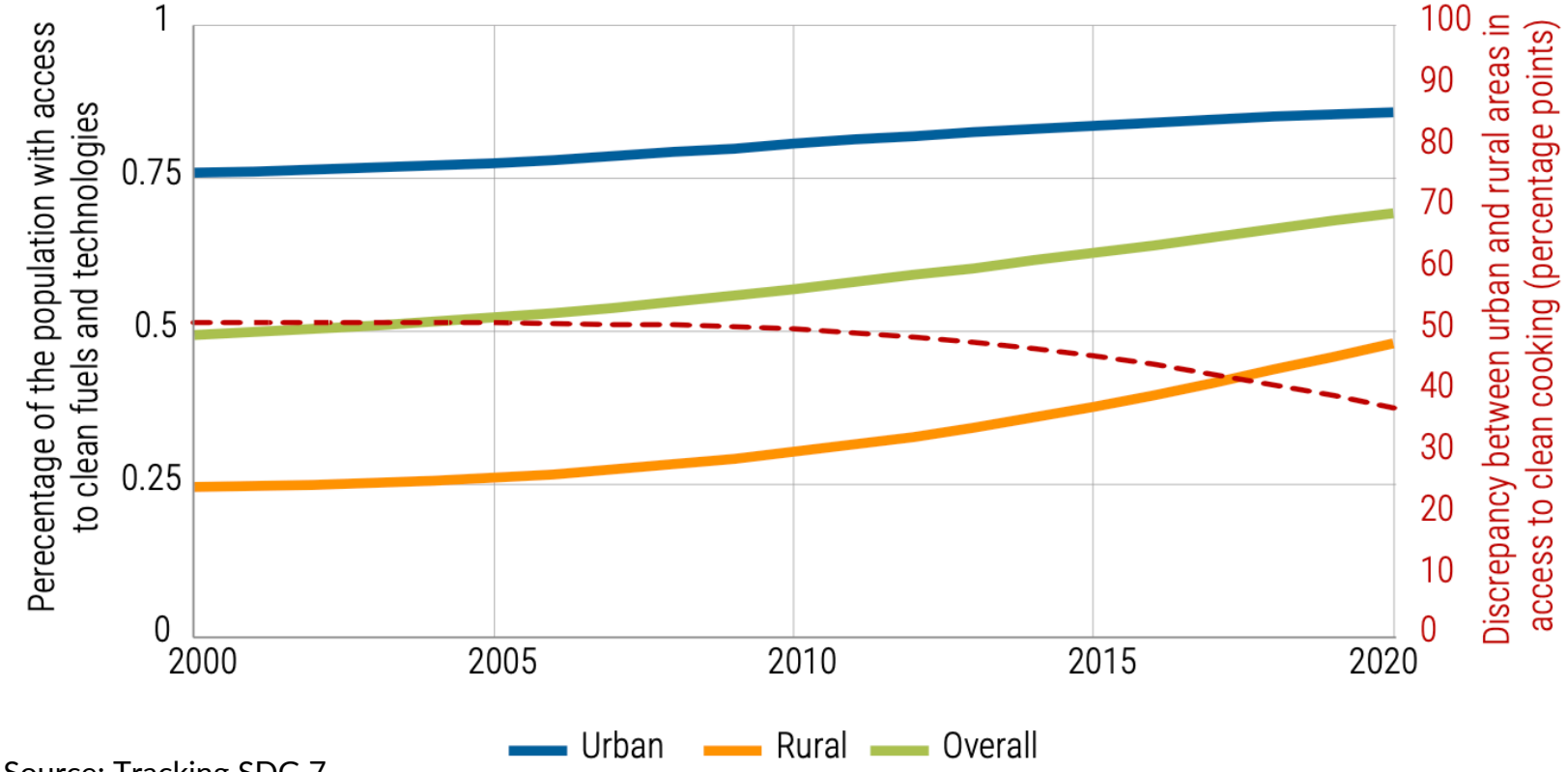
Number of people lacking access to clean fuels and technologies, by region, 2000–20



Source: Tracking SDG 7
https://trackingsdg7.esmap.org

Urban vs Rural Access – Equity & trends changing with time

In 2020, 86 percent of people living in urban areas and just 48 percent of the rural population had access to clean fuels and technologies. In Sub-Saharan Africa, more than 93 percent of the rural population lacks access to clean cooking fuels and technologies.



Source: Tracking SDG 7
https://trackingsdg7.esmap.org

Challenges in achieving universal clean household energy adoption

Considering the full picture!

One of the problems faced is that, often, polluting and clean energy sources **co-exist** at the household level.

FUEL or STOVE STACKING = parallel use of multiple types of fuel and technologies in a single household as "stacking".

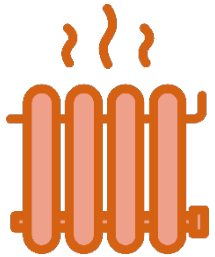
World Health Organization

	Developing country households		
Energy service	**Lower-income**	**Middle-income**	**Higher income**
Cooking	COAL, WOOD, AGRICULTURAL RESIDUES, DUNG	COAL, WOOD, AGRICULTURAL RESIDUES, KEROSENE, LPG/ NATURAL GAS, BIOGAS, SOLAR	LPG/ NATURAL GAS, SOLAR, ELECTRICITY, BIOGAS, PELLETS
Lighting	CANDLE, OPEN FIRE, KEROSENE	KEROSENE, SOLAR, ELECTRICITY, BIOGAS, BATTERIES/TORCH	LPG/ NATURAL GAS, ELECTRICITY, BIOGAS, SOLAR
Heating	COAL, WOOD, KEROSENE, AGRICULTURAL RESIDUES, DUNG	COAL, WOOD, AGRICULTURAL RESIDUES, KEROSENE, LPG/ NATURAL GAS	COAL, WOOD, KEROSENE, ELECTRICITY, LPG/ NATURAL GAS, PELLETS, OIL

As countries transition to higher income levels, households transition to cleaner cooking, heating and lighting enery sources.
Source: Adapted from Sovacool (2012)

Stacking: Important to Consider Full Picture
All uses (cook, light, heat) must be clean to protect health

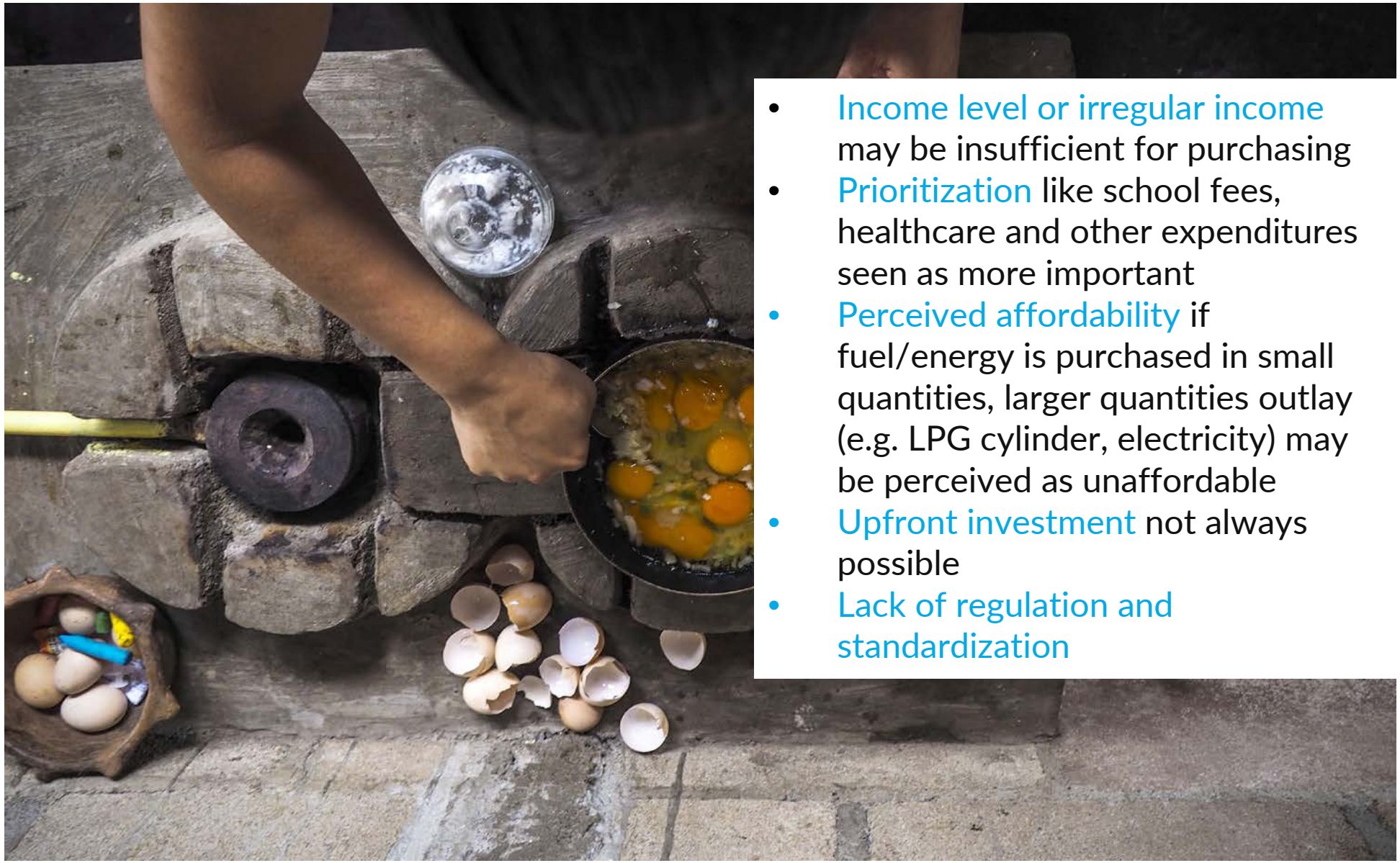
World Health Organization



Barriers / 1 – Socio Cultural

- Cultural beliefs
  preferences, best cooking practices, familiar taste
- Gender norms
- Size of the house
  the larger the more energy is required, the less incentive to change
- Community interactions
  poor/good experiences with stoves can influence the whole community
- Level of education
  lower level associated with greater reluctance to change

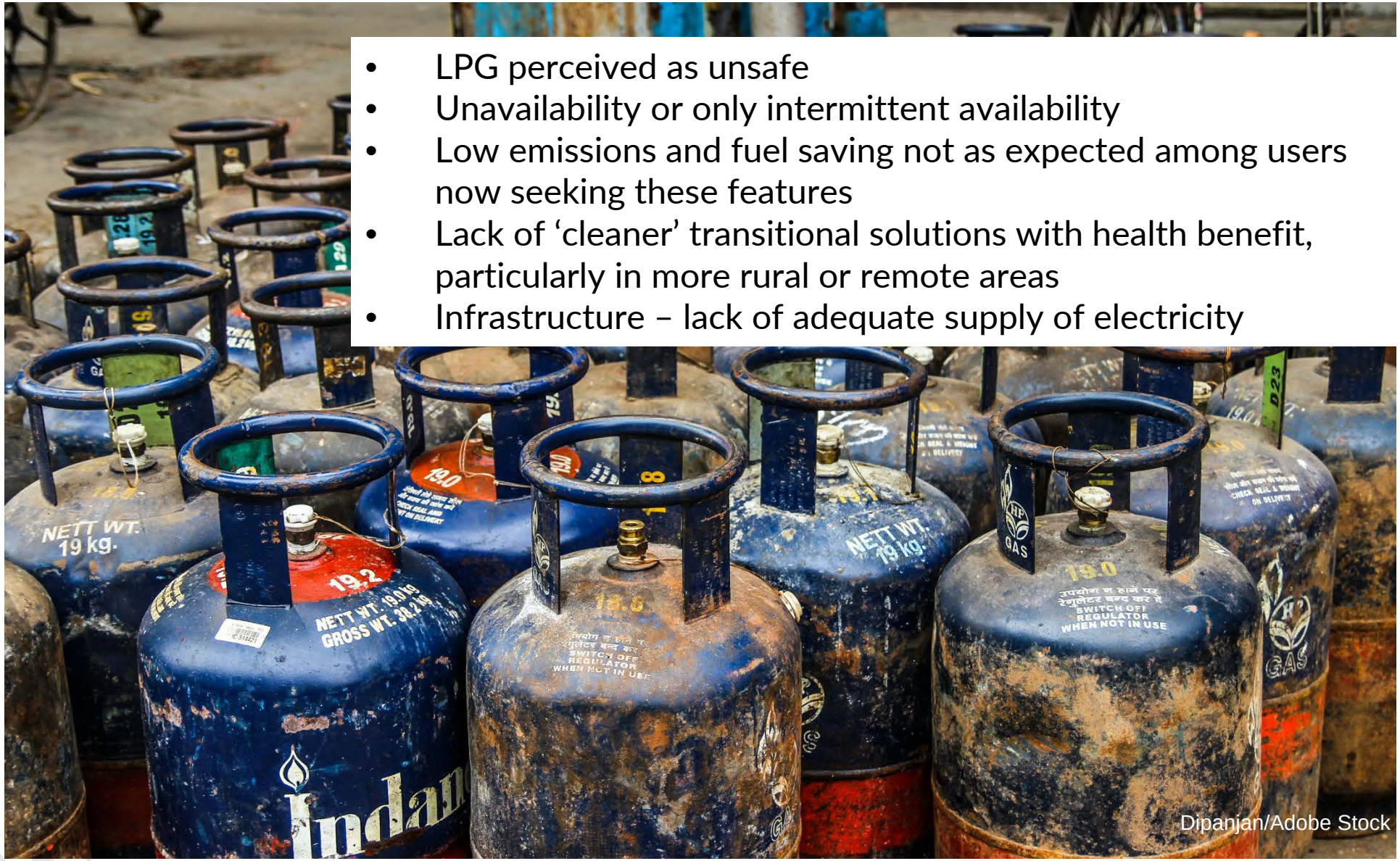
Barriers / 2 – Economic



- Income level or irregular income may be insufficient for purchasing
- Prioritization like school fees, healthcare and other expenditures seen as more important
- Perceived affordability if fuel/energy is purchased in small quantities, larger quantities outlay (e.g. LPG cylinder, electricity) may be perceived as unaffordable
- Upfront investment not always possible
- Lack of regulation and standardization

Barriers / 3 – Other factors

- LPG perceived as unsafe
- Unavailability or only intermittent availability
- Low emissions and fuel saving not as expected among users now seeking these features
- Lack of ‘cleaner’ transitional solutions with health benefit, particularly in more rural or remote areas
- Infrastructure – lack of adequate supply of electricity



Dipanjan/Adobe Stock

World Health Organization

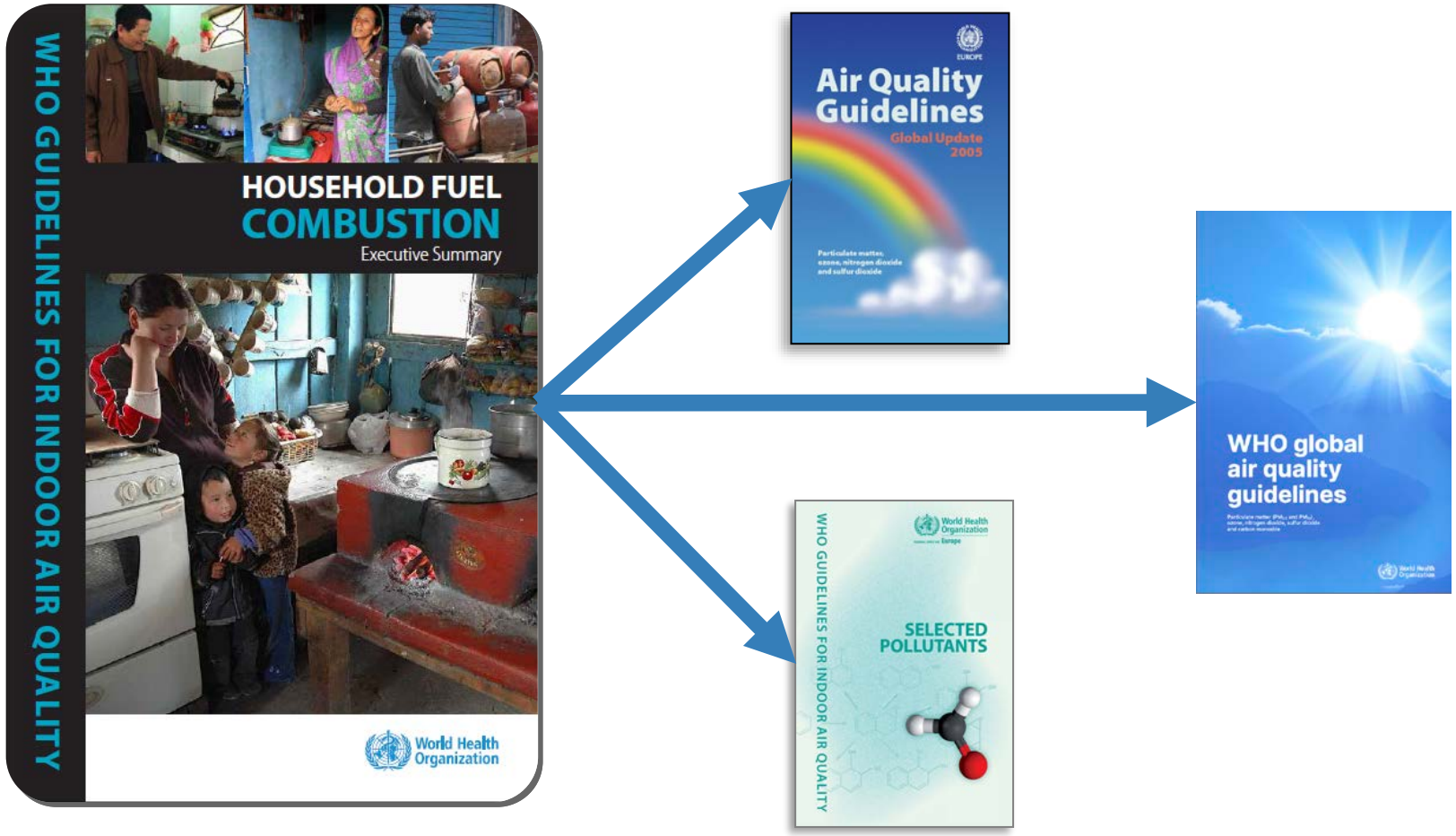
What are some tools & resources available to support accelerating action to clean household energy for public health?

What can the health sector do?

World Health Organization

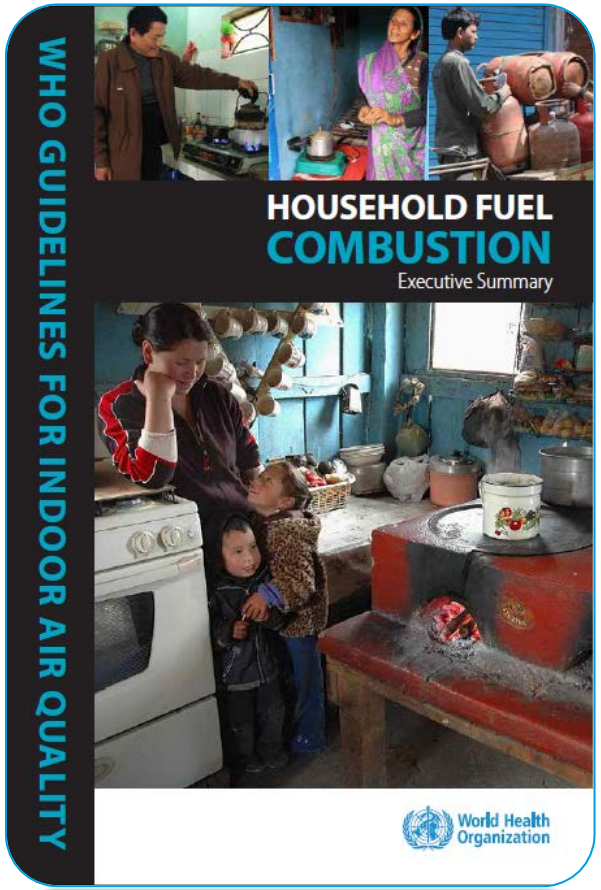
- Provide evidence on health impacts of sustainable development & green economy strategies/technologies
- Develop evidence-based guidelines supporting effective interventions
- Use Health Impact Assessment (HIA) and other tool to assess policies and their health impacts
- Define and monitor health indicators to measure results and contribute to the tracking of SDGs (i.e. 3, 7, 11)
- Convene and advise Ministries of Health and other stakeholders to effectively address public health issues
- Leverage the 'health argument' to convene and advance policy discussions impacting health

WHO Guidelines for Indoor Air Quality: Household Fuel Combustion



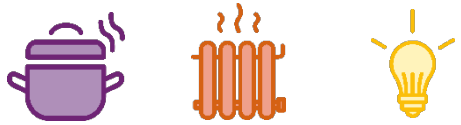
Defining “Clean” Energy for Health

WHO Guidelines for indoor air quality: household fuel combustion



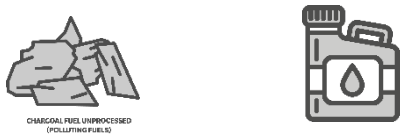
Summary of Guideline Recommendations

- Address **ALL** household energy end-uses



- Provides **performance** PM & CO **targets** for fuels & stove/lamp combinations

- No unprocessed **coal** use, avoid **kerosene**



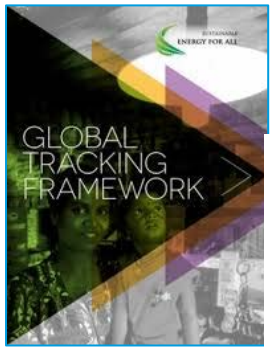
- Prioritize the healthiest or ‘cleanest’ options in the transition to clean household energy

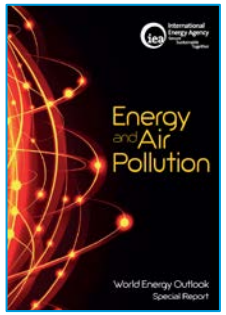
- Synergies with climate change mitigation

Definition “Clean” Energy for Health

Harmonizing efforts and definitions

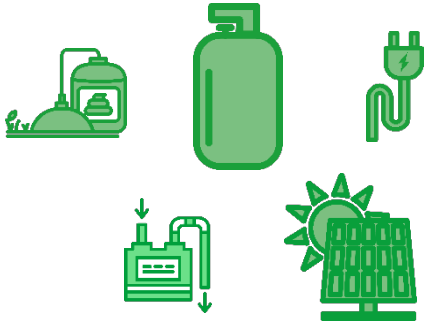
World Health Organization

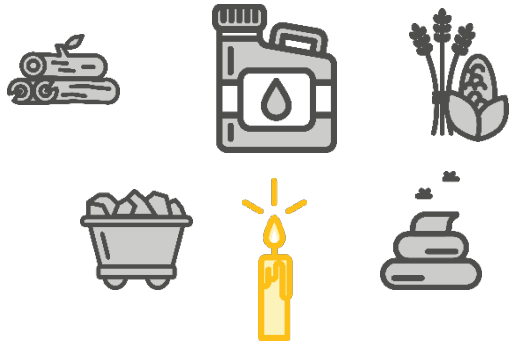




Clean - unexposed

Polluting- exposed

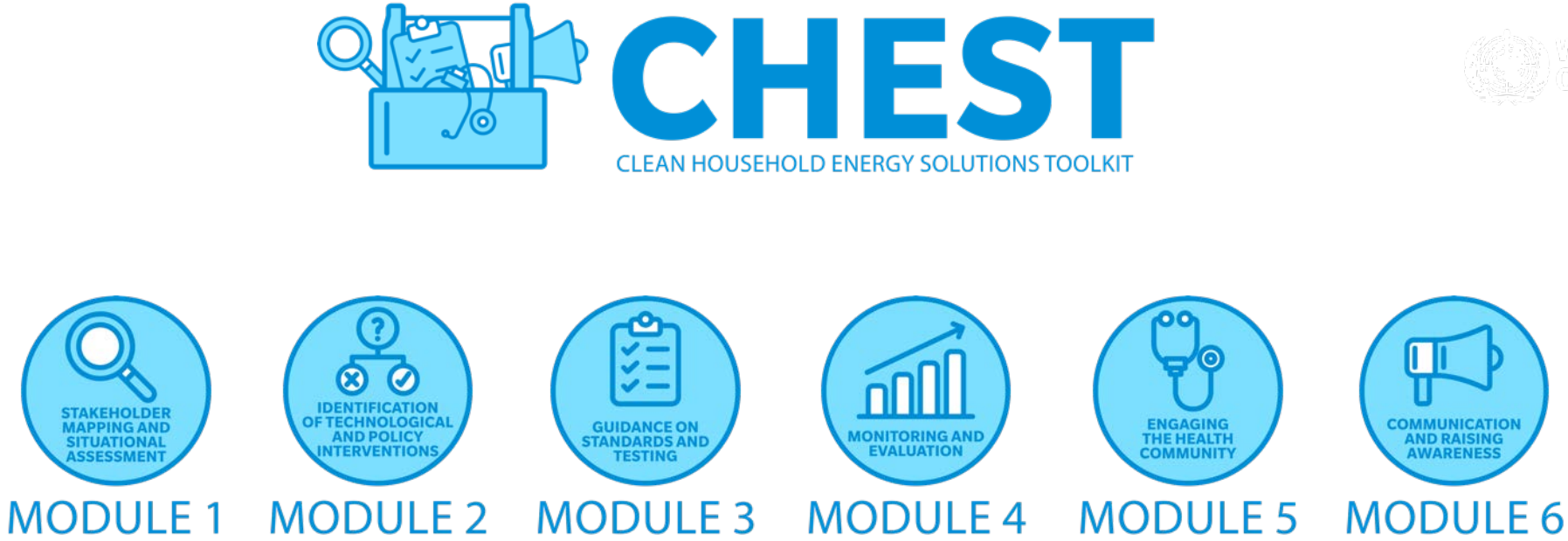




ISO International Organization for Standardization

WHO Tools to support countries in implementing the recommendations to achieve air quality guidelines

World Health Organization



https://www.who.int/tools/clean-household-energy-solutions-toolkit/

Thank you

World Health Organization

Air Quality and Health Unit

Heather Adair-Rohani

adairrohanih@who.int