



# **BURNING OPPORTUNITY:**

Clean Household Energy  
for Health, Sustainable  
Development, and Wellbeing of  
Women and Children

EXECUTIVE SUMMARY



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**Burning Opportunity: Clean Household Energy for Health, Sustainable Development and Wellbeing of Women and Children. Executive Summary.**

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Cover photo: SEWA, the Self Employed Women's Association, helps women learn to build and repair solar lanterns in areas where no electricity exists, India (Credit: Annie Griffiths/National Geographic Creative/Corbis)  
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# EXECUTIVE SUMMARY

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There is a global consensus and ever-growing body of evidence that expanding access to clean household energy for cooking, heating and lighting is key to achieving a range of global priorities, such as improving health, gender equality, equitable economic development and environmental protection. In September 2015, Member States of the United Nations (UN) adopted the Sustainable Development Goals (SDGs), including Goal 7, which seeks to “ensure access to affordable, reliable, sustainable and modern energy for all” by 2030 and would be measured as the percentage of the population relying primarily on clean fuels and technology.

This and other important developments, such as the UN Secretary-General’s Sustainable Energy for All (SE4All) campaign show that prospects have never been brighter

for cleaning up air in and around the home, throughout the world.

However, success is not guaranteed. The new analyses stemming from the WHO Household energy database demonstrate that progress towards the goal of universal access remains far too slow: more than three billion people still rely on polluting, inefficient energy systems to meet their daily cooking needs. And too many depend on polluting fuels and devices for heating and lighting.

These key findings, which are described below, lead to an urgent, inescapable conclusion: the global community must redouble its efforts to expand and accelerate access to clean energy. In so doing, we have an unprecedented opportunity to eliminate an enormous health burden that currently weighs down nearly half the world, especially its women and children, and thereby free up a vast amount of human potential.



*A young girl carries a load of fuel wood home in Gatlang, Nepal.  
Credit: Nigel Bruce*

## 1. A HEALTH CRISIS

**Household air pollution (HAP) is driving a global health emergency.**

**Household air pollution is the single most important environmental health risk factor worldwide.** Based on estimates of solid fuel use for cooking in 2012, exposure to HAP causes 4.3 million premature deaths each year. Of those deaths, 3.8 million are caused by noncommunicable diseases (NCDs): HAP is estimated to cause 25% of all deaths from stroke, 15% of deaths from ischaemic heart disease, 17% of deaths from lung cancer, and more than 33% of all deaths from chronic obstructive pulmonary disease in low- and middle-income countries (LMICs). HAP exposure is responsible for close to one quarter of the disease burden from cataract, the leading cause of blindness in LMICs.

**Women and children are at a particularly high risk of disease from exposure to HAP. Sixty percent of all premature deaths attributed to household air pollution occur in women and children.** Women experience higher personal exposure levels than men, owing to their greater involvement in daily cooking and other domestic activities. The single biggest killer of children aged under five years worldwide is pneumonia. This disease cuts short almost a million young lives each year. More than 50% of those pneumonia deaths are caused by exposure to HAP.

**HAP has other important impacts on disease and disability.** Emerging evidence links exposure to HAP with risk for other adverse health outcomes, such as low birth weight and stillbirths, cervical cancer, tuberculosis, asthma, ear and upper respiratory infections, and with nasopharyngeal and laryngeal cancers.

**Improving health in urban environments depends in part on addressing pollution from household fuel burning.** In India, for example, new research estimates that almost 30% of outdoor air pollution is from household sources.

**Globally, household energy is an important source of outdoor air pollution as well.** HAP from cooking is responsible for 12% of global ambient fine particulate matter pollution (PM<sub>2.5</sub>), and is estimated to cause some 500 000 of the 3.9 million premature deaths each year attributable to outdoor air pollution. Clean household energy is therefore important for reducing the heavy burden of disease from outdoor air pollution as well.

## 2. GENDER INEQUITIES IN ENERGY USE AND FUEL GATHERING

**Women and girls are the primary procurers and users of household energy services, and bear the largest share of the health and other burdens associated with reliance on polluting and inefficient energy systems.** Owing to the considerable amount of time spent in proximity to polluting combustion sources, women and children are at particularly high risk of disease from exposure to HAP. Dependence on polluting fuel and technology combinations can also lead to other negative health impacts that disproportionately affect women and children, particularly girls. These include burns, injuries, poisonings, cataracts, chronic headaches and many other adverse outcomes. Women and girls are the primary gatherers of fuel for cooking in most LMICs. They face safety risks associated with fuel collection and preparation, and significant constraints on their available time for education, rest and productive activities for income generation.

**New analyses find that reliance on polluting fuels and technologies is associated with significant drudgery and time loss for children – especially girls.** Data on wood and water gathering from 30 countries show that both boys and girls in clean fuel-using households spent less time gathering wood or water than those from homes cooking mainly with polluting fuels. Girls living in households that cook mainly with polluting fuels bear the greatest time-loss burden collecting wood or water. Analysis of surveys from a range of African countries shows that in households that primarily cook with polluting fuels, there are high rates – above 70% – of children collecting wood or water. Both boys and girls spend a substantial amount of time in this task – but girls are more likely to gather fuel than boys, and girls spend more time collecting wood or water than boys do. In most of the countries reviewed, children of both sexes who collect wood or water spend at least 15 hours a week on these tasks, and in some countries they spend more than 30 hours per week.



Children show off solar powered lanterns that they use at night when they do their homework for school in Tondo, Manila. Credit: Sherbien Dacalanio/Demotix/Corbis

### 3. ENERGY ACCESS IS KEY TO SUSTAINABLE DEVELOPMENT

**Expanding access to clean cooking, heating and lighting unlocks progress across the entire sustainable development agenda.** Closing the energy access gap is now a firmly fixed priority on the global sustainable development agenda. Accelerating access to clean energy presents an enormous opportunity to make progress toward several SDGs, and exploit the synergies currently offered by initiatives that encompass energy, gender, health and climate change, including SE4All, the Global Alliance for Clean Cookstoves (GACC) and the Climate and Clean Air Coalition (CCAC).

SDG 7 sets an ambitious target for ensuring universal access to clean household energy by 2030. The 2030 Agenda for Sustainable Development reflects new understanding and emerging consensus that household energy is not only the province of environment and energy ministries, but a central concern in almost every facet of human development, from health (SDG 3) to sustainable urban environments (SDG 11) to gender equality (SDG 5) to climate action (SDG 13).

### 4. LIMITED ACCESS TO CLEAN ENERGY

**WHO's new focus on tracking use of "polluting" and "clean" fuels and technologies enables more complete estimates of the health and other impacts of household energy use.** In light of the new WHO *Indoor air quality guidelines: household fuel combustion*, WHO has transitioned to a new indicator, tracking the use of "clean" and "polluting" fuels and technologies for cooking, heating and lighting.



*Clean and polluting fuels and technologies are often 'stacked' for daily cooking activities, as in this home, where a traditional stove and LPG stove are both in use.*  
Credit: Jessica Lewis

The focus of the previous household energy indicator and reporting was on "solid" fuels used as the primary cooking fuel, as a practical surrogate for dirty fuels used in the home. The new indicator – used to track progress towards SDG 7 – is based on scientific evidence of the health risks associated with the full range of household energy end-uses beyond cooking, including space heating and lighting.

This indicator captures the health impacts of kerosene use, and of fuel-stove stacking – the use of multiple fuels and devices in parallel for different purposes. Its focus on polluting fuel and technology combinations will enable a more complete and accurate understanding of the scope of the health challenge posed by HAP. It also facilitates identification of specific opportunities for displacing polluting cooking, lighting and heating systems and mitigating their health impacts.

**According to new analysis of data from the WHO Global Household Energy database, around 3.1 billion people in LMICs rely on polluting fuels and technologies for cooking.** More than 50% of households in all 128 LMICs surveyed use biomass as their primary cooking fuel. These analyses demonstrate that significant differences in energy use patterns exist among the different regions, and between urban and rural areas around the world. According to the new analysis, over 20% of urban households surveyed rely primarily on polluting fuels and technologies, while the ratio is reversed in rural areas, where around 80% rely on polluting fuels and technologies. Survey estimates from 18 countries in the WHO African Region show that more than 95% of all households rely primarily on biomass for cooking. In south-east Asia, biomass is the most common primary fuel used by households for cooking (62%), followed by gaseous fuels (32%). These statistics can inform specific tailored policies at the regional, country, and subnational level to reduce dependence on polluting cooking systems.

**There is a severe lack of data on heating fuel use.** Fewer than 40 surveys provide reliable data on primary heating fuels; only 14 were conducted in LMICs. The available data show, however, that there are several countries in different parts of the world where kerosene, a polluting fuel, is an important source of energy for space heating.

### 5. WIDESPREAD USE OF POLLUTING KEROSENE

**Kerosene is a polluting fuel: WHO recommends that governments and practitioners immediately stop promoting its household use.** New WHO guidelines provide the first definitive guidance

on what counts as “clean” household energy. In November 2014, WHO issued the first-ever health-based normative guidance for household fuel combustion. The WHO *Indoor air quality guidelines: household fuel combustion* include emissions rate targets for fuel and stove combinations that can be considered clean for health, and recommendations against the use of unprocessed coal and discouraging the use of kerosene as household fuels.

Based on extensive evidence reviews, the guidelines are intended to help policy-makers accelerate access to clean fuels and technologies, and advance optimal interim technologies such as efficient biomass-burning stoves. The indoor air quality (IAQ) guidelines are an important tool for planning effective energy, development and public health policy, as they steer stakeholders away from polluting fuels, such as kerosene and unprocessed coal, and towards solutions that are truly clean and beneficial for health.

**New analyses show that kerosene is still widely used for lighting in most LMICs, and in certain countries it is also an important polluting heating and cooking fuel.** About one third of households in LMICs depend on polluting fuels (mostly kerosene) for lighting. In the WHO African Region, based on the latest survey data (which cover 71% of the population), 53% of households use kerosene and oil lamps as their primary lighting source. In the South-East Asia Region – where 79% of the population was covered by the surveys analysed – 32% of households rely on kerosene and oil lamps as their primary lighting source. India has more people using kerosene for lighting than the nine next highest kerosene-using countries combined, at almost 400 million people.

**The reclassification of kerosene as a polluting fuel changes our understanding of access to clean energy dramatically in some countries.**

For example, new analysis shows that over 80% of households in Djibouti use kerosene as their primary source of energy for cooking. Under the previous indicator, Djibouti seemed close to achieving universal access to modern energy. This new assessment shows that the country has much further to go before all of its citizens have access to truly clean energy – and thereby, access to clean air.

New estimates of the burden of disease from kerosene use in the household – based on assessments of the relative risks and exposures associated with its use – will be produced as part of WHO’s burden of disease estimates.

Recent reports demonstrate that solar lighting systems and solar lanterns are being more widely disseminated in many LMICs. However, there are few data available on their durability and sustained

use, or on whether these technologies are being used alongside other polluting lighting sources.

## 6. DATA GAPS HINDER PROGRESS

**Data collection efforts must be improved to inform effective, targeted interventions.** Significant data gaps impede global progress towards cleaning up air in and around the home, especially in LMICs. A lack of detailed data – on heating and lighting energy use, on gender roles and decision-making within the household, and on the gender-related determinants of health inequities – makes it impossible to properly target the use of finite resources to reduce health risks and end energy poverty. These data gaps must be quickly addressed. More coordinated action is needed to develop, harmonize and deploy better survey instruments and indicators.

Harmonized questions on household surveys are urgently needed in order to gain a more complete understanding of the range of health, development, and environmental consequences of household energy use, and to enable the comparison and validation of data across countries. Survey instruments must also be enhanced to capture more detailed information on energy use for heating and lighting, as well as on fuel stacking practices and intra-household decision-making.

**More research is needed into the adoption and sustained use of energy interventions, including user preferences, behaviour change and complex factors of decision-making.**

Substantial benefits for climate and the environment could be obtained through improving access to clean household energy. Rigorous monitoring and evaluation is essential to track the adoption of those interventions that are effective for improving health – and to identify areas that need more focused efforts. The same holds true for verifying the potential economic benefits and climate benefits of clean household energy fuels and technologies. International collaboration between WHO, SE4ALL partners, UNICEF Multiple Indicator Cluster Surveys, USAID Demographic and Health Surveys and national statistical offices play an important role in tracking progress toward clean energy.

## 7. THE NEED FOR A GENDER-RESPONSIVE RESEARCH AGENDA

**Critical data are missing on the gender dynamics of household energy use and the gender determinants of related health risks.**



Women gather to bake bread in a dung-fired oven in front of a home in Zaskar, India.  
Credit: Jonathan Mingle

**Gender roles are major determinants of decision-making about energy in the household.**

Adoption and sustained use of clean energy solutions hinge on a better understanding of these intra-household dynamics, and of sex-specific impacts and opportunities related to involvement in the energy value chain.

**Universal energy access cannot be achieved without more gender-responsive programmes and policies – which in turn require better data collection and targeted indicators.** To address the crisis of HAP, programmes and policies must explicitly take into account the gender dynamics influencing household decision-making, energy acquisition and use, and livelihoods. To inform successful interventions, we need a more robust understanding of the interests and involvement of both women *and* men when it comes to energy.

The relative power of women and men in household decision-making is a critical and often overlooked factor in the adoption and sustained use of clean fuels and technologies. Many household energy programmes, surveys, and research studies have historically been blind to the critical importance of gender roles, both within the household and within societies. Women are typically the primary acquirers and users of energy in the home, and are the ones who would benefit most from switching to cleaner fuels for cooking and other uses in the home.

**The relative lack of empirical evidence on gender, household energy use and health impacts, has impeded the development and implementation of policies and interventions to promote clean and safe household energy.** Policy-makers, health planners and those in charge of public health programming need relevant data to characterize the disparities in health status between and among populations of women and

men. Gender statistics reflect questions, problems and concerns related to specific issues that affect one sex more than the other or which stem from gender relations. Even when health data are disaggregated by sex, many indicators do not reflect the complex interconnections between gender as a health determinant and the resulting health inequities among and between women and men. A critical first step in ameliorating gender-based health inequities is to measure those differences and their determinants with gender-sensitive indicators, to provide a better understanding of the complex interconnections between gender and household energy.

## 8. WHO LEADERSHIP

**The health sector has an important role to play at multiple levels in the fight to reduce HAP.** Building on the work of WHO for over a decade, there is an enormous opportunity waiting to be seized to improve public health around the globe, through the development of comprehensive action plans to tackle HAP at the national level. National governments can reduce the burden of NCDs and childhood pneumonia in their populations by formulating and implementing detailed plans and policies for taking action to clean up household air. Promising models and pilot efforts should be identified for testing and scaling up. Country-level strategies will need to take stock of the emerging evidence on effective interventions, local circumstances, including strengths of institutions and service capacity, as well as opportunities for finance, and delivery mechanisms. WHO provides global tracking of household energy use (i.e. for cooking, heating and lighting) and its health impacts through the WHO Household energy database and the Global Health Observatory. WHO will continue to expand its own efforts to engage the health sector, support planning and programme delivery at the national level, and promote research to address critical data gaps. WHO is increasingly focusing on working with country-level agencies on developing and providing specific tools to support their development of national action plans to address the HAP crisis.

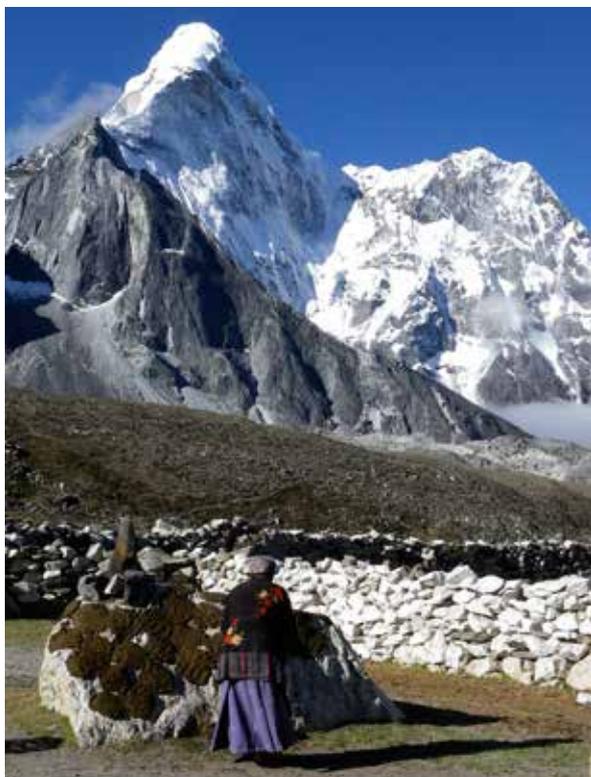
WHO regional offices, such as South-East Asia, have already adopted a resolution to intervene to reduce indoor air pollution as part of their strategy to prevent NCDs. Actors working to reduce NCDs should engage much more actively in efforts to reduce HAP through clean household energy interventions, in view of the substantial impact of air pollution on NCDs and of the high levels of exposure to air pollution in the home. Child survival and other objectives of the Global Strategy for Women's, Children's and Adolescent's Health, launched by the UN Secretary-General and

world leaders, alongside the SDGs in 2015, can be advanced through targeted action to improve household energy, which has the potential to substantially reduce the number of pneumonia deaths and help prevent close to half of the one million annual deaths from chronic obstructive pulmonary disease in women caused by HAP. Targeting household energy is a key element of the Global Strategy for Women's, Children's and Adolescent's Health 2016–2030.

## 9. CLIMATE BENEFITS OF CLEAN HOUSEHOLD AIR

**Reducing HAP offers an unparalleled opportunity to realize climate and health co-benefits.** Household fuel combustion is a significant source of both greenhouse gases and short-lived climate pollutants such as black carbon.

Household combustion is estimated to produce 25% of global emissions of black carbon, which is the second largest contributor to climate change after carbon dioxide (CO<sub>2</sub>), and disrupts regional environmental systems critical to human welfare. As the most strongly light-absorbing component of particulate matter, black carbon absorbs a million times more energy per unit mass than CO<sub>2</sub> – but it exerts its impact over a much shorter period.



*A woman spreads dung to dry for fuel in the shadow of glacier-covered peaks of the Khumbu Valley, Nepal.*  
Credit: Jonathan Mingle

Although black carbon is a significant contributor to global climate change, its impacts are especially magnified on a regional scale, in areas close to the source of emissions. Because of black carbon's short lifespan in the atmosphere (of the order of days to weeks), reducing its emissions can lead to immediate slowing of warming.

Eighty-four per cent of all black carbon emissions from household combustion come from developing countries. Within Asia and Africa, residential solid fuel use accounts for 60–80% of total black carbon emissions. Particulate emissions from kerosene are almost 100% black carbon. Kerosene burned for lighting is the source of 270 000 tonnes of black carbon per year, contributing the warming equivalent of 240 million tonnes of CO<sub>2</sub>.

Accelerating access to clean energy for cooking, heating and lighting can have an immediate beneficial impact in reducing local warming and avert a significant amount of atmospheric warming in the next few decades, as well as protecting vulnerable systems such as the Arctic and high mountain glaciers.

## 10. ACCELERATING ACTION

**Encouraging progress is being made, but the current global transition from polluting to clean household energy use is proceeding too slowly.** To date, international and national policies, programmes and targeted interventions have advanced solutions, but have failed to substantially alter long-term trends. Too many people in LMICs continue to lack access to affordable, life-saving clean energy systems.

Several decades of research, national stove programmes and international initiatives have yet to lead to a significant reduction in the population depending on polluting fuels and technologies to meet their daily energy needs. Roughly the same number of people today cook with polluting energy systems as did 30 years ago. Population growth has outstripped incremental progress in increasing access to clean, modern energy systems. If current trends continue, the total number of people relying on polluting cooking energy will remain roughly the same in 2030 as it is today. The World Bank projects that by 2030, only 72% of the global population will have access to modern energy services for clean cooking – well short of the universal target by 2030.<sup>1</sup>

<sup>1</sup> International Energy Agency (IEA) and the World Bank (2015). Sustainable Energy for All 2015 – Progress toward sustainable energy (June). Washington (DC): World Bank. doi: 10.1596/978-1-4648-0690-2.

The global community must redouble its efforts, and accelerate the pace of its response to this crisis. The level of historical investment in technology development for clean delivery of household energy services is a pittance compared to the estimated value of their potential benefits. Dramatically expanded investment, research and development are needed to develop breakthrough innovations in clean household cooking, heating and lighting.

To achieve the SDG 7 target of universal access by 2030, two parallel efforts should be continued and accelerated. One is the ongoing project of making energy solutions that are clean for health at the point-of-use – gas, electricity, biogas, and others – more widely available, especially among the poor in the developing world.

The other is the task of creating the next generation of efficient stoves that can cleanly burn biomass fuels – fuels that are already widely available in many parts of the world. Supporting research and development of such innovative, low-emissions technologies to provide household energy services should be a top priority for the global development agenda.

Without increased ambition and investment, more effective targeted policies and interventions, and a greater sense of urgency, the global community will miss the target of universal access by 2030. And with it, we will miss an enormous opportunity to improve human health, slow down climate change and lift some of the heaviest burdens from the most vulnerable among us.



*A girl in Mombasa, Kenya with the solar lantern that lets her study at night.  
Credit: Andrew Aitchison/In Pictures/Corbis*



Solar panels are set up and will catch the sun to power homes in Hyderabad, Pakistan.  
Credit: Rajput Yasir/Demotix/Corbis







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