





# INTRODUCTION



The SDG 2030 universal access to clean cooking and 2050 net-zero goals will be missed unless current efforts to expand energy access are drastically accelerated. Reducing the cooking sector's CO<sub>2</sub> emissions to net zero by 2050 is viewed as one of the most immediate and cost-effective solutions available for achieving the 2050 net-zero-emissions goal. A global roadmap including key milestone and priority actions by 2050 is presented here.

Enabling the world's poor to cook with modern fuels and technologies is an urgent environmental, and advancement toward gender equity. However, the world is not on track to achieve clean cooking for all by 2030—the ambition of Sustainable Development Goal (SDG) 7. The stark reality is that 2.3 billion people rely on polluting traditional fuels and technologies to cook their meals. Globally, the number of people gaining access to clean cooking has outpaced these improvements, particularly in Sub-Saharan Africa where the number of people without access reached 0.9 billion in 2021.<sup>2</sup> Without accelerated action, 1.9 billion people can be expected to remain in cooking poverty in 2030, at a staggering annual cost of US\$2.4 trillion due to the impacts on health, gender, and the global climate.

Advancing clean cooking access and delivering on the Paris Climate Agreement are inextricably linked. Universal access to clean cooking is an integral part of transitioning to a just net-zero-emissions energy system. In 2020, total emissions from the cooking sector were estimated at 1.69 gigatons (Gt) of carbon dioxide equivalent (GtCO<sub>2e</sub>), of which 0.4 Gt are from traditional biomass. Cooking sector emissions account for about 3 percent of global greenhouse gas (GHG) emissions and 56 percent of emissions from buildings.<sup>4</sup> Promoting access to clean cooking can also advance gender equity for women and children, who are often primarily responsible for cooking and fuel collection tasks, through time savings, improvements in health and well-being, and empowerment and livelihood opportunities.

By adapting this global roadmap to their local context, countries can develop their national-level roadmaps. The top priority action for low- and middle-income countries (LMICs) is to ensure access to cleaner cooking energy for all by 2030, while making sure vulnerable populations, including those who are displaced or in fragile settings, are integrated in an inclusive manner. High-income countries should support those efforts while also working to decarbonize their own cooking and heating sectors to align with the net-zero-emissions goal by 2050.

Following people-centered, energy-access approaches and addressing the common practice of fuel-and-stove stacking, this global roadmap uses the Multi-Tier Framework (MTF) for cooking (see Annex for description of the MTF). Households are considered to move out of cooking poverty and have gained access to cleaner cooking solutions when they primarily or mainly cook with fuels such as LPG, natural gas, electricity, biogas, ethanol, or very low-emission biomass stoves meeting at least tier 3 of the MTF.<sup>5,6</sup>

## Emission Trends and Transition Requirements

### FIGURE 2

Envisioned just and inclusive clean-cooking transition pathway toward net zero, 2020–50



## Key Milestones

No. 1: Eliminating cooking poverty and achieving cleaner cooking for all by 2030

To achieve the 2030 target, the share of the population mainly cooking with



As of March 2023, 98 LMICs had included household energy or clean cooking-related  
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on climate change and national clean cooking strategies and commitments; of those,





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cooking. To achieve universal access to clean cooking and eliminate cooking poverty by  
2030 and exclusive cooking with MECS by 2040, public investment needs to be scaled up  
from the tens of millions to tens of billions, along with dedicated policies. Such investment



Clean Cooking—For this road map, clean cooking refers to a household that primarily  
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combination that meet the recommendations of WHO guidelines for indoor air quality:  
household fuel combustion<sup>12</sup>. Common fuels and technologies considered ‘clean’  
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fuels, solar cookers.

Cooking Poverty—A household context reliant on traditional, polluting cooking fuels and  
technologies considered Tier 0-2 on the MTF.

Multi-Tier Framework (MTF) for cooking—Multidimensional, tiered approach to measuring  
household access to cooking solutions across six technical and contextual attributes  
with detailed indicators and six thresholds of access, ranging from Tier 0 (no access)  
to Tier 5 (full access). The aggregate MTF tier is the lowest tier rating across the six  
attributes: convenience, (fuel) availability (a proxy for reliability), safety, affordability,  
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cooking activities).

Modern Energy Cooking Services (MECS)—Refers to a household context that has  
met the standards of Tier 4 or higher across all six measurement attributes of the  
Multi-Tier Framework.

Improved cooking solutions

## ANNEX 2. METHODOLOGY

8 LI QSHIPMRK I\IVGMWI JSV XLI 2IX >IVS )QMWWMSRW 7GIF approach to estimate the GHG emissions pathways of achieving universal access to clean cooking for the global population in the 2020–50 time frame. This note describes the methodology used to (1) model the 2020-2050 transition to eliminating cooking poverty on a pathway to exclusive use of MECS and (2) estimate the associated GHG emissions trajectory. The modeling work follows the analytic framework developed under ESMAP's Clean Cooking Planning Tool;<sup>14</sup> and uses the World Bank's country database developed for the ESMAP report, The State of Access to Modern Energy Cooking Services for the FEWIPMRI ZEPYIW SJ TISTPI [MXLSYX EGGIWW XS GPIER GS sizes the number of households/people to transition by 2050, using estimates of the 9RMXIH 2EXMSRW (ITEVXQIRX SJ )GSR SQMG ERH 7SGMEP %JJ for population growth and urbanization at the global level. By 2050, it is expected that the global population will have reached 9.7 billion, with 68 percent living in urban areas.

2IX XLI KVETL QSHIPW XLI TEXL[E]W JVSQ XLI FEWIPMRI scenario in terms of percentage of the global population with access to improved cooking solutions, MECS, and traditional cookstoves. By 2030, it is expected that cooking poverty will have been eliminated through the promoted use of improved cookstoves (ICS) (MTF Tier 3) and MECS (MTF Tier 4 or higher), with exclusive cooking with MECS reached by 2040. The modeling results show that, in order to reach universal access to MECS by 2040, a projected population of 352 million per year will need to have transitioned by 2030, with 357 million per year gaining access to MECS between 2030 and 2040.

The model then estimates GHG emissions from various cooking fuels and technologies XVEHMXMSREP FMSQEW FMSJYIPW ?IXLERSP ERH FMSKEWA respective segments of the global population with access to traditional, low-emission biomass, and modern-energy cooking solutions. The annual emission factors for these cooking fuels and technologies, in terms of tCO<sub>2e</sub> per urban or rural household, are estimated, based on ESMAP's MECS model. A weighted average value for each cooking fuel is then calculated, based on the evolving rural-and-urban-household ratios over the

- TIVMSH -R XLI 2IX >IVS )QMWWMSRW 7GIREVMS E HMZI is deployed to reach full access to MECS by 2040, while continuing to reduce GHG IQMWWMSRW YRXMP 8LI QSHIP ZMI[W IPIGXVMG GSSOMRK rapid scale-up and achievement of universal access to MECS and continued efforts on decarbonizing electricity, power grids and other network infrastructure, and cooking JYIPW I K 04+ 8LI HIGEVFSRM^EXMSR IJJIGXW EVI VI½IGXIH of cooking fuels and technologies over the period.

9RHIV XLI 2IX >IVS )QMWWMSRW 7GIREVMS )71%4...W 'PIER 'SS XS IWXMQEXI XLI ERRYEP MRZIWXQIRX RIIHIH ERH FIRI¼XW SJ elimination by 2030 and full MECS access by 2040.

<sup>1</sup> +YRXLIV & 1EWGLIYPERH ERH . ^VK 4IXIVW ^) ¼GMIRX & MSQEW W 'SSOMRK MR % J Mitigation and Development," One Earth, 4 (6): 879–90. <https://doi.org/10.1016/j.oneear.2021.05.015>.

<sup>2</sup> International Energy Agency, International Renewable Energy Agency, United Nations Statistics Division, World Bank, and World Health Organization (IEA, IRENA, UNSD, WB, and WHO) Locking SDG 7: The Energy Progress Report (Washington, DC: World Bank, 2022).

<sup>3</sup> Food and Agriculture Organization (FAO) statistics

<sup>4</sup> International Energy Agency (IEA), Net Zero by 2050: A Roadmap for the Global Energy Sector (Paris: IEA, 2022).

<sup>5</sup> [[[ [LS MRX XSSPW GPIER LSYWILSPH IRIVK] WSPYXMSRW XSSPOMX QSHYPI HI

<sup>6</sup> Energy Sector Management Assistance Program (ESMAP) The State of Access to Modern Energy Cooking Services (Washington, DC: World Bank, 2020).

<sup>7</sup> International Energy Agency (IEA), Net Zero by 2050: A Roadmap for the Global Energy Sector (Paris: IEA, 2022).

<sup>8</sup> Clean Cooking Alliance.





