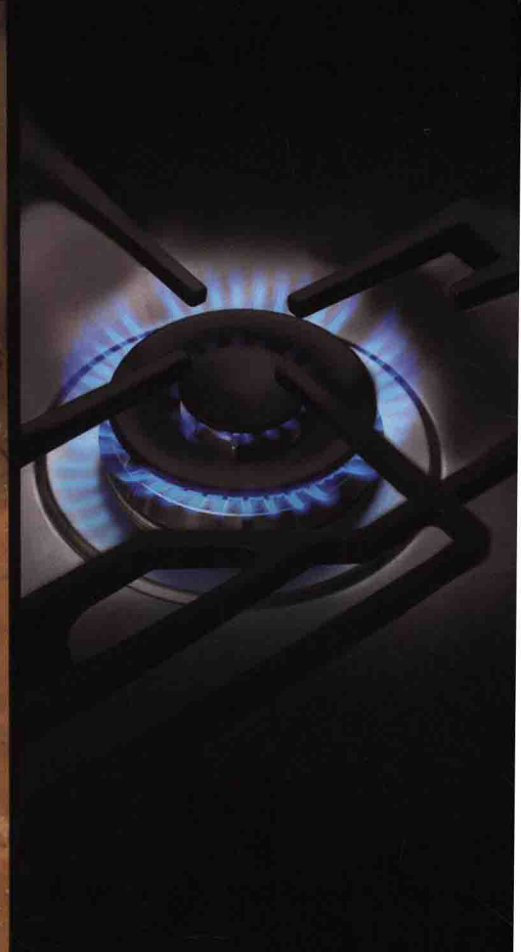


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Cleaner Hearths, Better Homes

New Stoves for India
and the Developing World

Douglas F. Barnes • Priti Kumar • Keith Openshaw



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Cleaner Hearths, Better Homes

About ESMAP

The Energy Sector Management Assistance Program (ESMAP), a global knowledge and technical assistance program administered by the World Bank, supports low- and middle-income countries to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, Finland, France, Germany, Iceland, Lithuania, the Netherlands, Norway, Sweden, and the United Kingdom, as well as the World Bank.

Preface

For people in developed countries, burning fuelwood in an open hearth evokes nostalgia and romance. But in developing countries, the harsh reality is that several billion people, mainly women and children, face long hours collecting fuelwood, which is burned inefficiently in traditional biomass stoves. The smoke emitted into their homes exposes them to pollution levels 10–20 times higher than the maximum standards considered safe in developed countries. And the problem is not out of the ordinary. The majority of people in developing countries at present cannot afford the transition to modern fuels. Today, close to one half of the world's people still depend on biomass energy to meet their cooking and heating needs.

To be sure, the term 'hearth' in developed countries connotes feelings of warmth and closeness of families. In fact, many people in developed countries still use firewood for ambience and to heat their living rooms or even entire homes, sometimes in state-of-the-art, high-efficiency stoves. In the developed world, wood-burning stoves and fireplaces are tested and approved by various agencies responsible for ensuring that appliances meet strict safety standards. Even before the twentieth-century transition from coal-burning and biomass stoves to gas and electricity, public agencies in developed countries often insisted on major retrofits for original cooking and heating systems to meet fire and pollution codes. The implication for developing countries is that, even without making a complete transition to electricity, kerosene, or Liquefied Petroleum Gas (LPG) or other various types of cooking gases, there are intermediate options for eliminating human drudgery and indoor air pollution.

Cleaner Hearths, Better Homes: New Stoves for India and the Developing World has a twofold goal: describing India's best legacy improved biomass stove programs and recommending ways in which the international community

can promote stoves that are commercially viable, convenient for users, and more energy efficient. By implication, there also would be a reduction of indoor air pollution to more reasonable levels than is common today. To date, the effectiveness of many of the world's stove programs has been hindered by their small scale. Even India's best case examples faced serious challenges. But hard-learned lessons from these cases, combined with varied experience from stove programs around the world, can well serve the international development community's efforts to address the energy problems faced by the poorest populations on our planet.

This book should be of interest to policymakers and scientists across a broad spectrum of disciplines—from health, environment, and economics to sociology, anthropology, and physics. Indeed, the hands of many specialists are required to ensure successful stove programs, which call for social marketing, stove engineering, development of standards, promotion of private and commercial enterprises, and appropriate subsidy schemes. That the book's authors represent diverse disciplines—sociology, physics, and forest economics—underscores the range of perspectives needed to tackle the issues involved in the commercial promotion of improved stoves.

The impetus for writing this book started at the end of a World Bank project on the health implications of indoor air pollution, which coincided with the Government of India's (GoI) cancellation of its 20-year program on improved stoves. The government's decision came as no surprise, given the program's mixed results. They echoed those of other stove programs around the world, which similarly suffered from the many fits and starts of donor interest. There was no lack of evidence in India or, indeed, from around the world, to support skeptics of improved stoves. But diminishing government interest was incongruous with the urgent need to address the health and welfare concerns of people dependent on biomass energy for their livelihoods and subsistence, as well as growing environmental concerns associated with greenhouse gas emissions.

One may rightfully ask: What motivated the authors to produce this book on India's improved stoves? In the face of many doubts, we discovered that users in areas where programs enjoyed relative success valued the benefits of the improved stoves. Also, a large group of dedicated people was genuinely committed to facilitating the acceptance of stoves in many areas. To our surprise, many programs previously branded as hopeless had promising, innovative features. These findings motivated us to dig even deeper until we were convinced that it was incumbent on us to review past experiences and translate them into a set of recommendations that could aid the world's several billion people that depend on biomass cooking and heating energy. In short, despite the myriad difficulties involved in finding solutions, the human dimension of the problem was too big to ignore.

Lessons from the six case studies in India and other stove programs around the globe confirm that there are no magic solutions to alleviating indoor air pollution and the other problems associated with cooking on traditional stoves. Even if households adopt improved biomass stoves, without chimneys or other venting devices, family members cannot escape the negative respiratory effects of breathing smoke emitted into their homes. Yet, for many decades, small and intermittent funding in many countries has hampered learning from experience. One stove expert that reviewed this manuscript asked whether we had given stoves a fair chance to succeed, indicating that financing one scrubber on one power plant is probably equivalent to all of the funding provided for stove programs worldwide over decades. This comparison—albeit a bit exaggerated—nevertheless reveals a need for the international development community to prioritize its handling of indoor air pollution and the human and environmental cost of burning biomass in traditional stoves.

Acknowledgments

This book is the product of years of household energy research from around the world. The World Bank's Energy Sector Management Assistance Program (ESMAP) has been a leader in this field for many years, providing both encouragement and funding for this and other works. The book would not have been possible without the support of past and present ESMAP management and staff. Jamal Saghir, Ede Ijjasz-Vasquez, Amarquaye Armar, and Dominique Lallement provided valuable support to bring this work to fruition. Also, Kulsum Ahmed provided a variety of encouragement for this project and type of work over the years; she was responsible for a study on improved stoves and indoor air pollution in Guatemala, which is cited in this book.

Most of the background work for the India case studies was conducted by two of India's leading Nongovernmental Organizations (NGOs) involved in energy and environmental research: The Energy and Resources Institute (TERI) and Winrock International India. The two organizations completed this research as part of a World Bank study on indoor air pollution and household energy in India, which was managed by Kseniya Lvovsky. In fact, the chapter on stoves in the World Bank study *India: Household Energy, Indoor Air Pollution and Health* that was managed by her is based on the more detailed results reported in this book. TERI synthesized many of this work's findings in a previously published report entitled *Fire without Smoke*. Edited by Ibrahim Hafeezur Rehman and Preeti Malhotra, the report describes all six of the case studies included in this book. Other TERI staff members, responsible for producing original versions of the case studies of Andhra Pradesh, Karnataka, and West Bengal, are C.K. Jalajakshi, S.N. Srinivas, Debajit Palit, and Nandita Hazarika. From Winrock International India, based in New Delhi, the original case studies of Gujarat, Haryana, and

Maharashtra were prepared by Anjali Bhardwaj Sharma, Sunandan Tiwari, Soma Dutta, and Koshy Cherail. This Winrock International India team was supervised by Venkata Ramana Putti. In addition, we extend our gratitude to Sachin Agarwal for his significant contributions during the early stages of this work, including the rewriting of several of the original case studies. Finally, Priyadarshini Karve and Anand Karve of Appropriate Rural Technology Institute (ARTI) provided comments on the relevant materials for the work in Maharashtra.

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The internal and external reviews of this book were responsible for a significant reshaping of the book's introduction and conclusion. Internal World Bank reviews by Marlon Lezama, C. Mark Blackden, Sameer Akbar, Kseniya Lvovsky, and Anjali Acharya were extremely thoughtful and pointed us in the right direction for finalizing the manuscript. Sameer Akbar in particular has been very helpful in updating the work on climate change issues and more recent developments in stoves. Rogerio de Miranda also provided much of the information on Latin America that is part of this book.

The contributions of the external international reviewers were invaluable. All are international experts in the field of indoor air pollution and improved stoves, and their reputations speak for themselves. They include Kirk Smith of the University of California at Berkeley, generally regarded as the founder of the work on indoor air pollution as it relates to health, and Robert van der Plas of MARGE International in The Netherlands, who brings decades of experience in implementing improved stove programs in Africa, Asia, and Latin America and the Caribbean. Eva Rehfuess, formerly of the World Health Organization (WHO), is known for her recent advocacy and excellent publications on the health effects of indoor air pollution. Mitali Sen of the United States Census Bureau contributed to this work through her expertise in gender and energy in India. Veena Joshi of the Swiss Agency for Development and Cooperation has been involved in rural energy and improved stoves within India for most of her career. Finally, the work of Jyoti Parikh, an advocate of clean household energy, strongly influenced the policy recommendations offered in this book. Without these reviewers' insightful comments, this book would not have been possible.

Without the support of ESMAP, the publication of this work would not have been possible. In particular, we thank Rohit Khanna for his support in the final stages of this publication. ESMAP staff members, Heather Austin,

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Abbreviations

ARTI	Appropriate Rural Technology Institute
CIFOR	Center for International Forestry Research
CSIR	Council of Scientific and Industrial Research
ESMAP	Energy Sector Management Assistance Program
FAO	Food and Agriculture Organization
GoI	Government of India
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
IEA	International Energy Agency
IHDS	India Human Development Survey
IIT	Indian Institute of Technology
KENGO	Kenya Energy and Environment Organization
LPG	Liquefied Petroleum Gas
MDG	Millennium Development Goal
MNRE	Ministry of New and Renewable Energy
NCAER	National Council of Applied Economic Research
NEDCAP	Non-conventional Energy Development Corporation of Andhra Pradesh Ltd
NGO	Nongovernmental Organizations
NISP	National Improved Stove Program
OECD	Organisation for Economic Co-operation and Development
ORG	Operations Research Group
OTA	Office of Technology Assessment
PM	Particulate Matter
R&D	Research and Development

SEW	Self-employed Worker
TERI	The Energy and Resources Institute
UNDP	United Nations Development Programme
WHO	World Health Organization

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