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To: Mitchell, John [Mitchell.John@epa.gov]
Subject: Register Today for "Charcoal Briquette Enterprise Development" Cookstoves Webinar on March 5!

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Charcoal Briquette Enterprise Development:
Lessons from the Harvest Fuel Initiative

March, 5, 2014
10:00 a.m - 11:30 a.m Eastern Standard Time (EST)

ore than 110 individuals have already registered for the upcoming Winrock d U.S. EPA-organized webinar titled "Charcoal Briquette Enterprise velopment". Don't miss your chance to be part of this exciting webinar!

gister today to hear lessons from the Harvest Fuel Initiative's business- d technology-driven partnership approach for scaling up carbonized quettes as quality, sustainable, and viable alternatives to charcoal in East rica. The Harvest Fuel Initiative is a collaboration between The Charcoal oject and the Massachusetts Institute of Technology (MIT)'s D-Lab to omote biomass fuel alternatives and clean combustion technologies in the veloping world.

te and time: March 5, 2014 at 15:00 – 16:30 UTC/GMT, which is 10:00 – 11:30 am Eastern Standard Time (EST).

About the speakers:

Mr. Jean Kim Chaix
Kim co-founded The Charcoal Project (TCP) in 2009 in response to th lack of energy efficient solutions available for the 3 billion people who depend on solid fuels as their primary fuel source. Before TCP, Kim spent two decades as a television reporter documenting international current events and the intersection between population and the environment. In 2004 Kim joined The Nature Conservancy where he ran the organization's strategic marketing and communications division. Kim holds a degree in biology and is a graduate of Columbia University's Graduate School of Journalism.

Ms. Sylvia Herzog
Sylvia joined TCP as the Chief Operating Officer in 2010 because of a strong interest in finding renewable energy solutions to combat global warming and deforestation. She manages TCP's on-the-ground

ebinar participation is free. For the web portion, a high-speed internet nnection is required. **Please note the webinar technology has changed d you can now listen to audio through your computer, or call in by one if you prefer**. Additional log-in information will be provided upon gistration.

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Appropriate Rural Technology Institute – Tanzania (ARTI-TZ) briquetting extruder

projects and develops new projects, like the Harvest Fuel Initiative. Sylvia oversees the day-to-day operations of TCP and contributes to policy work. Previously Sylvia worked in banking and finance. She ha an MBA, a Masters of Public Policy and a BA in Economics, all from the University of Michigan.

Ms. Saida Benhayoune

Saida is the Program Director for 'Scale-Ups' at the Massachusetts Institute of Technology (MIT) D-Lab. Captivated by D-Lab's mission of poverty alleviation through technology design and dissemination, Said joined in 2011 to launch Scale-Ups: an acceleration platform for MIT social innovators and entrepreneurs bringing technologies to market fo large-scale social impact in the developing world. Saida holds a biochemical engineering degree and an MBA, and has 10 years of experience in manufacturing, sourcing and sustainability for the food industry.

Ms. Kendra Leith

Kendra is an Assessment Coordinator at the MIT D-Lab. She first cam to D-Lab in 2006 before earning a master's degree in City Planning from MIT. Kendra returned to D-Lab in 2011 to help shape and overse market research for individual D-Lab Scale-Ups projects and establish an overall evaluation strategy for D-Lab. Her goal is to document D-Lab's impact and provide accurate information to help D-Lab make informed decisions.

Dr. Dan Sweeney

Dan is a Solid Biomass Fuel Research Associate at the MIT D-Lab. Dan provides technical assistance to Scale-Ups partners and perform lab and field-based research and development on biomass and waste conversion processes. After finishing a PhD at the University of Utah, he moved to Sweden for a Fulbright Fellowship focused on the development of advanced processes for converting biomass residues to energy and
fuels.

he U.S. Environmental Protection Agency (U.S. EPA) and Winrock International have been engaged in the household energy field for many years, ncluding through coordination of the Partnership for Clean Indoor Air (PCIA) and its 590 Partners working in 117 countries from 2002-2012. Since the ntegration of PCIA and the Global Alliance for Clean Cookstoves in 2012, Winrock and the U.S. EPA have continued working to increase the exchange of echnical information among public and private organizations working in the global household energy and health sectors through local capacity building, argeted technical assistance and field studies and global knowledge sharing. The goal of these activities is to promote effective approaches that lead to ncreased use of clean, reliable, affordable, efficient, and safe home cooking and heating practices.

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Charcoal Briquette Enterprise Development:
Lessons from the Harvest Fuel Initiative

March, 5, 2014
10:00 a.m - 11:30 a.m Eastern Standard Time (EST)

ear Colleagues,

hank you for attending the "**Charcoal Briquette Enterprise evelopment"** webinar held on March 5, 2014. We hope you njoyed the presentation and found it useful to hear lessons from the arvest Fuel Initiative's business- and technology-driven partnership pproach for scaling up carbonized briquettes as quality, sustainable, nd viable alternatives to charcoal in East Africa. Below, please find nks to resources discussed during the webinar:

- The Harvest Fuel Initiative: http://www.harvestfuel.org/
- The Charcoal Project: http://www.charcoalproject.org/
- MIT D-Lab: https://d-lab.mit.edu/

on't forget that HFI will be holding its own follow up discussion on Vednesday, March 26th at 10:00 am Easten Standard Time EST). For more details please visit http://www.harvestfuel.org/

lease let us know how we can tailor future webinars to meet your eeds by completing this brief evaluation by March 12, 2014. It will ake less than five minutes of your time and will help us plan future ebinars.

n the next few weeks you will be able to access the full webinar udio/visual recording, a copy of the presenters' slides and answers o questions submitted by participants during the webinar live Q&A. ou will receive email notification once these proceedings are vailable online. Thank you again for your participation in the ebinar and for providing your feedback. Should you have other uestions, please send us an email at: **noderator@cookstovesandindoorair.org.**

Ve look forward to joining you on future webinars!

Winrock International & U.S. EPA

Photo credit: Sylvia Herzog

The U.S. Environmental Protection Agency (U.S. EPA) and Winrock International have been engaged in the household energy field for many years, including through coordination of the Partnership for Clean Indoor Air (PCIA) and its 590 Partners working in 117 countries from 2002-2012. Since the integration of PCIA and the Global Alliance for Clean Cookstoves in 2012, Winrock and the U.S. EPA have continued working to increase the exchange of technical information among public and private organizations working in the global household energy and health sectors through local capacity building, targeted technical assistance and field studies and global knowledge sharing. The goal of these activities is to promote effective approaches that lead to increased use of clean, reliable, affordable, efficient, and safe home cooking and heating practices.

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Subject: Webinar proceedings now available -- don't miss follow-up webinar March 26th!

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Dear Colleagues,

Thank you for your interest in the Winrock International and U.S. EPA webinar "Charcoal Briquette Enterprise Development." This email is to inform you that you can now find the webinar proceedings at www.pciaonline.org/webinars. This is a temporary website for all Winrock/EPA webinars that were held after June 1, 2012.

Here you will find a full recording of the webinar as well as the presentation slides and the follow-up written Q&A. We will send another message once these proceedings have been posted on the permanent U.S. EPA Cookstoves and Indoor Air website.

We also want to remind you about **the Harvest Fuel Initiative's follow-up webinar taking place next Wednesday, March 26th at 10:00am EDT**. Please join Sylvia Herzog, Chief Operating Officer of The Charcoal Project, and Dan Sweeney, Solid Biomass Fuel Research Associate of MIT D-Lab, as they answer questions about enterprise development in this field. You can register for the webinar at https://attendee.gotowebinar.com/register/8785683371225702 5, or find out more information at http://www.harvestfuel.org/news.

For those who attended the March 5th webinar and would like to provide feedback about the webinar, or suggestions for upcoming webinars, there's still time to fill out the post-webinar evaluation HERE.

Please stay tuned for news on upcoming webinars, and feel free to contact moderator@cookstovesandindoorair.org with any questions. We look forward to our continued collaboration with you in promoting high quality, clean and efficient cooking technologies and fuels.

Best regards,

Winrock cookstoves and indoor air team

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WORLD SURVEY ON THE ROLE OF WOMEN IN DEVELOPMENT 2014

GENDER EQUALITY AND SUSTAINABLE DEVELOPMENT

UN WOMEN

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The World Survey on the Role of Women in Development, on the theme of "gender equality and sustainable development", was first issued by the United Nations in 2014 as a report of the Secretary-General (A/69/156).

ABOUT THE COVER

The cover depicts the three dimensions of sustainability – environmental, economic and social – as three separate sections of a braid that interweave and intersect, becoming one. The braid is a symbol of strength and interconnections and thus alludes to a comprehensive approach to sustainable development. The cover image, taken as a whole, is a representation of a woman, reminding us that a commitment to gender equality and the realization of women and girls' human rights is fundamental to achieving sustainable development.

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WORLD SURVEY ON THE ROLE OF WOMEN IN DEVELOPMENT 2014

GENDER EQUALITY AND SUSTAINABLE DEVELOPMENT

UN WOMEN
United Nations Entity for Gender Equality and the Empowerment of Women

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PREFACE

The immense social, economic and environmental consequences of climate change and loss of essential ecosystems are becoming clear. Their effects are already being felt in floods, droughts, and devastated landscapes and livelihoods. Among those most affected are the women and girls, given the precariousness of their livelihoods, the burden of securing shelter, food, water and fuel that largely falls on them, and the constraints on their access to land and natural resources. As the global community grapples with the challenges of sustainable development and the definition of the Sustainable Development Goals, the 2014 *World Survey on the Role of Women in Development* asserts the central role of gender equality. It charts the rationale and the actions necessary to achieve sustainable development.

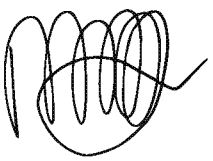
Linking gender equality with sustainable development is important for several reasons. It is a moral and ethical imperative. Efforts to achieve a just and sustainable future cannot ignore the rights, dignity and capabilities of half the world's population. To be effective, policy actions for sustainability must redress the disproportionate impact on women and girls of economic, social and environmental shocks and stresses. Finally, women's knowledge, agency and collective action has huge potential to improve resource productivity, enhance ecosystem conservation and sustainable use of natural resources, and to create more sustainable, low-carbon food, energy, water and health systems. Failure to capitalize on this would be a missed opportunity. Women should not be viewed as victims, but as central actors in moving towards sustainability.

The *World Survey* does not attempt to cover the exceedingly wide range of aspects of sustainable development. It identifies a select range of issues that are fundamental to women's lives and are strategic for achieving gender equality and sustainability. It analyses patterns of growth, employment generation and the role of public goods; food production, distribution and consumption; population dynamics and women's bodily integrity; and water, sanitation and energy.

Three criteria are employed to assess the likelihood of policy actions achieving gender equality. Do they support women's capabilities and their enjoyment of rights? Do they reduce, rather than increase, women's unpaid care work? And do they embrace women's equal and meaningful participation as actors, leaders and decision-makers?

The *World Survey* 2014 is a serious and thoughtful contribution to our understanding of how gender equality relates to sustainable development. This is a resource that strengthens the hands of policy actors in different parts of the world – whether in government, civil society, international agencies, or the private sector. It is my firm hope that it will lead to policies and actions that enhance gender equality and the full enjoyment by women and girls of their human rights.

The *World Survey* will be presented to the General Assembly in October 2014.



Phumzile Mlambo-Ngcuka
Under-Secretary-General
and Executive Director, UN Women

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UN Women would like to thank a number of experts and representatives across the United Nations System for their inputs into *The World Survey on the Role of Women in Development 2014: Gender Equality and Sustainable Development*.

The contributing authors who developed background papers that formed the basis of the chapters of the publication include: Melissa Leach and Lyla Mehta, Institute of Development Studies, University of Sussex (United Kingdom); Elissa Braunstein, Colorado State University (United States); Sakiko Fukuda-Parr, The New School (United States); Elizabeth Hartmann, Anne Hendrixson and Jade Sasser, the Population and Development Program, Hampshire College (United States), and Isha Ray, Energy and Resources Group, University of California at Berkeley (United States).

In order to ensure that the report reflected a balanced range of experiences and the diversity of policy, advocacy and research activities around gender and sustainable development, UN Women organized several consultations to receive guidance and input on the content of the report.

An initial brainstorm on the key issues in gender and sustainable development was organized jointly with the United Nations Research Institute for Social Development (UNRISD) in Geneva in May 2013 with a small group of experts. The attendees were Bina Agarwal, Institute of Economic Growth, University of Delhi and The University of Manchester (United Kingdom); Sarah Cook, UNRISD; Wendy Harcourt, International Institute of Social Studies, Erasmus University (the Netherlands); Melissa Leach; and Anita Nayar, The Dag Hammarskjöld Foundation (formerly, United Nations Non-Governmental Liaison Service).

Subsequently, a two-day concepts and methods workshop was organized at UN Women headquarters in New York with presentations by experts on various key topics identified at the brainstorm. Participants at this workshop included Andrew Fischer, International Institute of Social Studies, Erasmus University (the Netherlands); Sakiko Fukuda-Parr; Elizabeth Hartmann; Anne Hendrixson; Melissa Leach; Michael Levien, John Hopkins University (United States); Anita Nayar; Isha Ray; Dianne Rocheleau, Clark University (United States); and Margarita Velasquez, Regional Centre for Multidisciplinary Research (Mexico).

An expert group meeting was organized jointly with the Food and Agriculture Organization of the United Nations (FAO) in Rome in late February 2014, to review and discuss the first drafts of the background papers, on the basis of which the authors made revisions for a second draft. Apart from the authors, the attendees included researchers and practitioners with expertise and experience on the different thematic areas covered: Denisse Cordova, FIAN International (Germany); Wendy Harcourt; Marjorie Mbilinyi, Tanzania Gender Networking Programme (Tanzania); Mohan Rao, Jawaharlal Nehru University (India); Liane Schalatek, Heinrich Böll Foundation North America (United States); Stephanie Seguino, University of Vermont (United States); and Simon Thuo, Global Water Partnership Eastern Africa (Uganda). Representatives from the United Nations system included Martina Otto, United Nations Environment Programme; Patricia Colbert and Jennifer Nyberg, World Food Programme; Solomon Asfaw, Chiara Brunelli, Ida Christensen, Chiara Cirulli, Francesca Di Stefano, Carol Djeddah, Susan Kaaria, Eric Jesper Karlsson, Regina Laub, Leslie Lipper, Dominique Mortera, Ana Paula de la

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O Campos, Martha Osorio, Inna Punda, Terri Raney, Gina Seilern, Jomo Kwame Sundaram, and Rob Vos from FAO.

Through an extensive peer review process, a number of experts and United Nations technical staff provided substantive contributions and guided the finalization of the report. The peer reviewers included: Bina Agarwal, Carmen Diana Deere, University of Florida (United States); Jennie Dey De Pryck, Gender in Agriculture Partnership (Italy); Soma Dutta, ENERGIA Asia (India); Diane Elson, University of Essex (United Kingdom); Andrew Fischer, Wendy Harcourt, Jennifer Olmstead (United Nations Population Fund); Stephanie Seguino, Gita Sen, Bangalore Institute of Management (India); Dzodzi Tsikata, University of Ghana (Ghana); and Peter Utting, UNRISD.

At UN Women, the substantive work on the World Survey was coordinated by Shahrashoub Razavi and Seemin Qayum under the guidance of Saraswathi Menon and John Hendra. Somali Cerise and Laura Turquet made valuable contributions to finalize the text; Sophie Browne and Norberto Rodrigues undertook fact-checking and research assistance; and Talita Mattos provided administrative support. Comments on the chapters were provided by Ginette Azcona, Christine Brautigam, Sylvia Hordosch, Papa Seck and Silke Staab. The design and production was coordinated by Mika Mansukhani and Carlotta Aiello.

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CHAPTER 1

ABOUT THE WORLD SURVEY ON THE ROLE OF WOMEN IN DEVELOPMENT

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The twin challenges of building pathways to sustainable development and achieving gender equality have never been more pressing. As the world moves towards the post-2015 development agenda, the present *World Survey* not only shows why each challenge is so important, but also why both challenges must be addressed together, in ways that fully realize the human rights of women and girls and help countries to make the transition to sustainable development.

Dominant patterns of production, consumption and distribution are heading in deeply unsustainable directions (see A/CONF.216/PC/7). Humanity has become a key driver of earth system processes and the overexploitation of natural resources, the loss of key habitats and biodiversity and the pollution of land, seas and the atmosphere are becoming increasingly evident. Scientific understandings are clarifying the huge economic, social and environmental challenges posed by such threats as climate change and the loss of essential ecosystem services, as humanity approaches or exceeds so-called "planetary boundaries" (Intergovernmental Panel on Climate Change, 2013; Rockström and others, 2009). Already, human interactions with the environment are producing unprecedented shocks and stresses, felt in floods, droughts and devastated urban and rural landscapes and livelihoods, while many people and places have suffered from a nexus of food, energy, environmental and financial crises. These unsustainable patterns add to poverty and inequality today, especially for the third of the world's population directly dependent on natural resources for their well-being, and create deep threats for future generations (Unmüßig, Sachs and Fatheuer, 2012).

The causes and underlying drivers of unsustainability and of gender inequality are deeply interlocked

The effects of unsustainable patterns of development intensify gender inequality because women and girls are often disproportionately affected by economic, social and environmental shocks and stresses (Neumayer and Plümper, 2007). The causes and underlying drivers of unsustainability and of gender inequality are deeply interlocked. Both are produced by development models that support particular types of underregulated market-led growth and the persistence of unequal power relations between women and men (Wichterich, 2012). Such development patterns rely on and reproduce gender inequalities, exploiting women's labour and unpaid care work. The same development trajectories also produce environmental problems, as market actors seek and secure profit in ways that rely on the overexploitation of natural resources and the pollution of climates, land and oceans. Such market-led pathways are leading in directions that are unsustainable in social and ecological terms, and ultimately in economic ones too, undermining the conditions for future progress.

Growing international debate now highlights the need to move economies and societies onto more sustainable paths, whether to avert crisis and catastrophe, or enable prosperity through "green economies". Policy responses to date have not always emphasized that the realization of human rights must guide such efforts, or prioritized the need to address gender inequality. Also frequently missing in such debates is a sense of the trade-offs involved. Sustainability is often presented as if policy solutions were clear-cut. Yet many dilemmas arise: for instance between finance for different kinds of low-carbon energy; between prioritizing food or biofuels in land use; and between preserving forests to mitigate global climate change or to meet local livelihood needs, to name a few. In many instances, policy approaches that seek to promote sustainability or "green economy" goals can undermine women's rights and gender equality. How such dilemmas are addressed has profound implications for who gains and loses, both among social groups and between local, national and global interests.

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Yet this is also a time of opportunity. There are many examples around the world of alternative development pathways that move towards sustainability with gender equality. Gender equality and sustainable development can reinforce each other in powerful ways (Agarwal, 2002; Buckingham-Hatfield, 2002; Cela, Dankelman and Stern, 2013; Johnsson-Latham, 2007).

A/ GENDER EQUALITY AND SUSTAINABLE DEVELOPMENT: SYNERGIES AND TENSIONS

The centrality of gender equality, women's empowerment and the realization of women's rights in achieving sustainable development has been increasingly recognized in recent decades. This recognition is evident in a number of international norms and agreements, including principle 20 of the Rio Declaration on Environment and Development,[1] adopted in 1992, in its statement regarding the full participation of women being essential to achieving sustainable development. In the Beijing Declaration and Platform for Action,[2] adopted by Member States in 1995, governments were called upon to integrate gender concerns and perspectives into policies and programmes for sustainable development. The centrality of gender equality has also been articulated in the outcome document of the United Nations Conference on Sustainable Development, entitled "The future we want", adopted in 2012, which included recognition of the importance of gender equality and women's empowerment across the three pillars of sustainable development, economic, social and environmental, and resolve to promote gender equality and women's full participation in sustainable development policies, programmes and decision-making at all levels (General Assembly resolution 66/288, annex).

Linking gender equality and sustainable development is important for several reasons. First, it is a moral and ethical imperative: achieving gender equality and realizing the human rights, dignity and capabilities of diverse groups of women is a central requirement of a just and sustainable world. Second, it is critical to redress the disproportionate impact of economic, social and environmental shocks and stresses on women and girls, which undermine the enjoyment of their human rights and their vital roles in sustaining their families and communities. Third, and most significantly, it is important to build up women's agency and capabilities to create better synergies between gender equality and sustainable development outcomes.

There is growing evidence of the synergies between gender equality, on the one hand, and economic, social and environmental sustainability, on the other. For example, when women have greater voice and participation in public administration, public resources are more likely to be allocated towards investments

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in human development priorities, including child health, nutrition and access to employment (Chattopadhyay and Duflo, 2004). Ensuring women's access to and control over agricultural assets and productive resources is important for achieving food security and sustainable livelihoods (Food and Agriculture Organization of the United Nations (FAO), 2011). Women's knowledge, agency and collective action are central to finding, demonstrating and building more economically, socially and environmentally sustainable pathways to manage local landscapes; adapt to climate change; produce and access food; and secure sustainable water, sanitation and energy services.

premised on maintaining gender inequalities, such as through maintaining gender wage gaps and entrenching gender discriminatory norms, values and institutions (Seguino, 2000; Kabeer and Natali, 2013).

Further, as governments and donor agencies increasingly target women as critical agents for community adaptation to climate change; in their role as smallholders as the mainstay of sustainable food production; and through limiting their reproductive rights as the answer to population-environment problems; there is a danger of entrenching gender stereotypes and inequalities.

Achieving gender equality and realizing the human rights, dignity and capabilities of diverse groups of women is a central requirement of a just and sustainable world

Increasingly, women's full participation is recognized as central to policymaking. For example, their decisive involvement in community forest management bodies yields positive outcomes for both forest sustainability and gender equality (Agarwal, 2010). Further, certain aspects of gender equality, such as female education and women's share of employment, can have a positive impact on economic growth, although this impact is dependent on the nature of growth strategies, the structure of the economy, the sectoral composition of women's employment and labour market segregation, among other factors (Kabeer and Natali, 2013).

However, while gender equality can have a catalytic effect on achieving economic, social and environmental sustainability, the reverse does not always hold true. Hence, a simple "win-win" relationship between gender equality and sustainability cannot be assumed. Indeed, some patterns of economic growth are

Policy responses that view women as "sustainability saviours" draw upon and reinforce stereotypes regarding women's roles in relation to the family, the community and the environment. Such responses often add to women's already heavy unpaid work burdens without conferring rights, resources and benefits. Power imbalances in gender relations determine whether women's actions and work translate into the realization of their rights and capabilities. While the participation of women is vital, their involvement in policy interventions aimed at sustainability does not automatically mean greater gender equality, particularly when the structural foundations of gender inequality remain unchanged.

There are, however, alternative approaches that move towards sustainability and gender equality synergistically. Some are rooted in the everyday practices through which women and men access, control, use and manage natural resources in ways that sustain livelihoods and

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well-being. Joint initiatives between the State and the community in the Amazon Basin, for example, have the potential to conserve forest biodiversity and address climate change mitigation while providing for local sustainable livelihoods of women and men (Rival, 2012). Others are evident in movements and collectivities, many of them led by women, to build food and resource sovereignty and sustainable communities and cities. For example, in South Asia, a network of grass-roots women leaders are working to scale up capacity to reduce risks and vulnerabilities to climate change in their communities and build a culture of resilience.[3]

B/ MESSAGES OF THIS WORLD SURVEY

The aims of the present *World Survey* are to chart why and how gender equality must be at the centre of sustainable development and the actions necessary to achieve sustainable development with gender equality. The overall messages of the report are:

(a) Forging any sustainable development pathway must include an explicit commitment to gender equality, women's empowerment and women's rights in its conceptualization and implementation;

(b) Achieving sustainable development means recognizing the synergies between gender equality and sustainability and engaging with the tensions and trade-offs that inevitably arise between the three dimensions of sustainability and with the integration of gender equality;

(c) Addressing the trade-offs and negotiating the policy dilemmas to achieve sustainable development and gender equality requires inclusive deliberation processes and ways to monitor exclusions and trade-offs. The active participation, leadership and creativity of civil society and women's organizations, communities and concerned individuals are critical to such deliberations.

The survey does not attempt to cover the exceedingly wide range of important and necessary aspects of sustainable development with gender equality. Rather, it delves into a selected set of topics that are fundamental to women's lives, strategic for achieving gender equality and closely intertwined with the economic, social and environmental dimensions of sustainability: patterns of growth, employment generation and "public goods"[4] provisioning; food production, distribution and consumption; population and women's bodily integrity; and water, sanitation and energy. The chapters thus discuss different tangible elements of sustainable livelihoods for women within the overarching frame of gender-responsive economic, social and environmental sustainability.

Chapter II articulates what sustainable development with gender equality means for policymaking purposes: economic, social and environmental development that ensures human well-being and dignity, ecological integrity, gender equality and social justice, now and in the future. Recognizing that governments will need to assess complex policy options, in which there will inevitably be tensions and trade-offs, the survey proposes criteria for policymakers, in order to enable them to

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evaluate policies for sustainable development and gender equality.

Each chapter thereafter shows how unsustainable development patterns and gender inequality reinforce each other. Chapter III, on the green economy, gender equality and care, elaborates on the interactions between growth trajectories and rising inequalities, underscoring the exploitation of women's labour through low wages and reliance on extensive and unpaid care work.

Chapter IV, on food security and gender equality, illustrates how systemic dynamics in the global economy and markets are intersecting with gender relations to have deleterious consequences for both household food security and gender equality. Yet dominant perspectives, in this case the productionist focus that has dominated much international thinking and policy since the 1980s, marginalize the question of the right to food. The chapter shows how the volatility of world cereal markets, low wages and precarious livelihoods interact with gender-specific constraints around resource rights, access and control. The effects of climate change and of large-scale land investments for export crops and biofuels are adding to such constraints. Women farmers are central in producing food for their families and in sustaining the ecologies that enable this, but must often do so under increasingly constrained conditions.

Chapter V, on population, sustainable development and gender equality, shows the continued and indeed, renewed, dominance of policy perspectives that attribute environmental degradation and ecological threats to growing populations. These perspectives distract attention from and thus support the continuation of unsustainable consumption and production patterns and inequities that are actually far more significant in producing environmental problems than are sheer numbers of people. The chapter discusses the dangers of narrowly focused population policies that view women's fertility as a cause of and solution for environmental degradation and that can be coercive and punitive, without providing support for – and in fact, often undermining – women's rights, dignity and control over their bodies.

Each chapter also shows that alternative pathways that move in sustainable directions, economically, socially and environmentally, are possible. They are underpinned by alternative visions and values that emphasize not just profit and growth, but the importance of sustainability, gender equality, inclusivity and social justice. Typically, they involve different combinations of public, private and civil society institutions and require strong state action. States play central roles as duty bearers in delivering on commitments to gender equality, providing appropriate policy contexts, setting standards and regulating resource use, holding private actors to account and, crucially, providing public services and investments for social and ecological sustainability. Social movements are key in initiating and demanding such alternatives and in shaping forms of collective action that maintain them.

Thus, in relation to paid work and public goods (see chap. III), new public and private alliances pushing for and building green economies and green transformations are highlighted. Here, pathways are emerging that link financing, technologies and investments in areas such as low-carbon and renewable energy towards modes of growth that respect ecological limits. Building on existing practices and policy proposals, the chapter underscores the economic, social and environmental pay-offs and benefits for gender equality of improved earnings and employment conditions for workers providing such environmental services as waste-picking and recycling, and also for those providing care-related personal services. In relation to food (see chap. IV), the survey emphasizes a strong focus on securing the right to food. This includes policy and public support for smallholder farming, particularly for women smallholders, enabling them to secure ecologically-sound cultivation, maintain soil

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fertility and ensure their livelihoods. Successful examples often incorporate local knowledge of ecological conditions, soils and seeds; cooperatives for production and marketing; and support, such as credit to enable poorer farmers to access appropriate inputs. State interventions, for instance in setting minimum wages and price regulation, and international negotiations around such issues as export subsidies and the maintenance of reserve stocks to offset price volatility, also support access and rights to food.

The chapter on investments for gender-responsive sustainable development (see chap. VI) highlights the ways in which the poorest women and girls can secure rights to products and services that meet essential everyday needs for water, sanitation, clean cooking and electricity. These investments bring essential benefits both in terms of environmental sustainability and in enhancing people's capabilities, dignity and health. Public investment is key to such initiatives, but so too is innovation to find appropriate technologies and attune them to local social and ecological conditions. The role of local knowledge and grass-roots innovation and action therefore prove to be critical in this context too. The challenge is then to scale up equitably while maintaining a focus on gender equality and sustainability.

Each chapter emphasizes that women's agency is central to many of these sustainable development pathways. They are often at the forefront of social movements, resisting unsustainable models and demanding alternatives. Their knowledge, innovation, action and agency is central to finding, demonstrating and building more economically, socially and ecologically sustainable ways to manage local ecologies, adapt to climate change, produce and access food and secure sustainable and appropriate water, sanitation and energy services. For pathways to be truly sustainable and advance gender equality and the rights and capabilities of women and girls, those whose lives and well-being are at stake must be involved in decision-making and leading the way, through community groups, women's organizations and other forms of collective action and engagement.

The survey concludes with recommendations for concrete policy actions to move towards sustainable development and gender equality. Given the diversity of contexts within which policymakers operate, rather than being prescriptive, the survey identifies three criteria for assessing if policies, programmes and actions taken in the name of sustainability are likely to achieve gender equality and women's rights, especially the rights of marginalized groups, who are likely to bear a disproportionate share of the costs of economic, social and environmental unsustainability. The overall message of the *World Survey* is one of optimism and hope, that the world can forge a more economically, socially and environmentally sustainable future, in which women and girls, men and boys can enjoy their human rights to the full.

For pathways to be truly sustainable and advance gender equality and the rights and capabilities of women and girls, those whose lives and well-being are at stake must be involved in decision-making and leading the way

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CHAPTER /2

GENDER EQUALITY AND SUSTAINABLE DEVELOPMENT

A/ INTRODUCTION

The imperatives of achieving gender equality and attaining sustainable development were clearly acknowledged in the outcome document of the United Nations Conference on Sustainable Development:

We recognize that gender equality and women's empowerment are important for sustainable development and our common future. We reaffirm our commitments to ensure women's equal rights, access and opportunities for participation and leadership in the economy, society and political decision-making. ... We underscore that women have a vital role to play in achieving sustainable development. We recognize the leadership role of women, and we resolve to promote gender equality and women's empowerment and to ensure their full and effective participation in sustainable development policies, programmes and decision-making at all levels. (General Assembly resolution 66/288, annex, paras. 31 and 45).

The *World Survey* articulates what sustainable development with gender equality could mean for policies, programmes and decision-making at all levels in the current global juncture. In doing so it reflects on the early twenty-first century global context, when entrenched poverty and hunger, rising inequalities, ecosystem destruction and climate change, all of which are consequences, in large part, of prevailing economic models and paradigms, pose unprecedented challenges for the realization of women's rights and risk undermining further the sustainability of their households, communities and societies. Dominant development patterns have both entrenched gender inequalities and proved unsustainable as regards many issues covered in the *World Survey*, including economic growth and work; population and reproduction; food and agriculture; and water, sanitation and energy. Yet the overall message of the *World Survey* is one of hope in the possibilities of constructing, through vigorous democratic deliberation that involves states, women and men, civil society organizations, the private sector and global institutions, alternative development trajectories within which gender equality and sustainability can powerfully reinforce each other.

International norms and standards on women's and girls' human rights and gender equality provide a solid basis for advancing action to strengthen the vital role of women in achieving sustainable development. Discrimination on the basis of sex is prohibited under all major international human rights instruments. The Convention on the Elimination of All Forms of Discrimination against Women[5] obligates States parties to take all appropriate measures to ensure the full development and advancement

International norms and standards on women's and girls' human rights and gender equality provide a solid basis for advancing action to strengthen the vital role of women in achieving sustainable development

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of women. International Labour Organization (ILO) conventions have continuously enhanced women's rights to and at work, including, most recently, those of domestic workers.

The series of United Nations conferences convened during the 1990s advanced international norms and agreements on sustainable development and gender equality, the empowerment of women and the human rights of women and girls.

The United Nations Conference on Environment and Development, held in 1992, provided a landmark forum to advance the global policy framework on sustainable development. It launched Agenda 21, a commitment to sustainable development and three global environmental conventions — the United Nations Framework Convention on Climate Change,[6] the Convention on Biological Diversity[7] and the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa.[8] Principle 20 of the Rio Declaration on Environment and Development[1] states that the full participation of women is essential to achieving sustainable development. The Convention on Biological Diversity recognizes that the integration of women's rights and gender equality in biodiversity conservation and sustainable use is not only intrinsically important, but can also improve the efficacy of interventions, programmes and resources.

In 1993, the World Conference on Human Rights, held in Vienna, affirmed, in the Vienna Declaration and Programme of Action, that the "human rights of women and of the girl-child are an inalienable, integral and indivisible part of universal human rights" (A/CONF.157/24 (Part I), chap. III).

The Programme of Action of the International Conference on Population and Development,[9] adopted in 1994, marked the beginning of a new chapter on the interrelationship between population, human rights and sustainable development. The outcome positioned gender equality and the empowerment of women as global priorities and emphasized the well-being of individuals as the key focus of the global agenda on population and sustainable development. The Programme of Action highlights a number of critical areas for advancing gender equality, including universal access to family planning and sexual and reproductive health services and reproductive rights; equal access to education for girls; and equal sharing of responsibilities for care and housework between women and men.

The Beijing Declaration and Platform for Action,[2] adopted in 1995, set a landmark global agenda for women's human rights, gender equality and the empowerment of women. The Declaration provides that "the advancement of women and the achievement of equality between women and men are a matter of human rights and a condition for social justice and ... are the only way to build a sustainable, just and developed society". The Platform for Action calls on governments to integrate gender concerns and perspectives into policies and programmes for sustainable development. The upcoming 20-year global review and appraisal of the implementation of the Beijing Platform for Action provides an important opportunity for renewed commitments for accelerated action.

The Rome Declaration on World Food Security and the World Food Summit Plan of Action[10] adopted in 1996, urged governments to "ensure an enabling political, social, and economic environment designed to create the best conditions for the eradication of poverty and for durable peace, based on full and equal participation of women and men, which is most conducive to achieving sustainable food security for all".

The United Nations Millennium Declaration, adopted in 2000, built upon the outcomes of the major summits and world conferences

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The upcoming 20-year global review and appraisal of the implementation of the Beijing Platform for Action provides an important opportunity for renewed commitments for accelerated action

of the 1990s. In the Millennium Declaration, Member States affirmed six fundamental principles essential to international relations, namely freedom, equality, solidarity, tolerance, respect for nature and shared responsibility, and called for action in key areas, including development and poverty eradication, peace and security, and democracy and human rights. Governments also confirmed their resolve to promote gender equality and the empowerment of women as effective ways to combat poverty, hunger and disease and to promote sustainable development (General Assembly resolution 55/2).

More recently, the importance of women's participation in decision-making regarding climate change has been recognized at the global level. The Conference of the Parties to the United Nations Framework Convention on Climate Change, at its eighteenth session, in 2012, adopted a decision to promote the goal of gender balance in the bodies of and delegations to the sessions of the Conference of the Parties and to include gender and climate change as a standing item on the agenda of the Conference (See FCCC/CP/2012/8/ADD.3, decision 23/CP.18).

Recent resolutions adopted by the General Assembly have further reaffirmed the centrality of gender equality to sustainable development. In General Assembly resolution 68/139 on the improvement of the situation of women in rural areas, adopted at its sixty-eighth session, the Assembly urged Member States to mainstream gender considerations in the governance of natural resources and to leverage the participation and influence of women in managing the sustainable use of natural resources. The resolution also called upon governments to support women smallholder farmers by facilitating their access to extension and financial services, agricultural inputs and land, water sanitation and irrigation, markets and innovative technologies. In resolution 68/227 on women in development, adopted at the same session, the Assembly encouraged governments to take measures to ensure equal access to full and productive employment and decent work.

Similarly, the agreed conclusions of the Commission on the Status of Women have advanced the global policy framework on gender equality and sustainable development. At its fifty-eighth session, the Commission urged governments to promote the full and equal participation of women and men as agents and beneficiaries of people-centred sustainable development (see E/2014/27). The Commission also emphasized the need for governments to value, reduce and redistribute unpaid care work by prioritizing social protection policies, accessible and affordable social services and the development of infrastructure, including access to environmentally sound time- and energy-saving technologies.

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B/ A TIME OF CHALLENGES AND OPPORTUNITIES

It is increasingly clear that dominant patterns of development and growth are unsustainable in economic, social and environmental terms (ILO, 2012; A/CONF.216/PC/7). They have led to increasingly precarious livelihoods, with 1.2 billion people living in extreme poverty (United Nations, 2013a) and many more without access to basic services and social protections. Current patterns of growth have coincided with rising inequalities in wealth, income and capabilities worldwide, across and between nations (United Nations, 2013b; United Nations Development Programme (UNDP), 2013a). Although some developing countries with rising incomes are catching up with developed countries, incomes in the latter are still much higher than those in the converging countries. The poorest 5 per cent of the population in a high-income developed country tends to be richer than two thirds of the population in a low-income developing country. Income still "depends on citizenship and location" (United Nations Research Institute for Social Development (UNRISD), 2012a). In this context, gender inequalities across economic, social and environmental dimensions remain widespread and persistent.

Human activities have become key drivers of earth system processes and are manifested in the depletion and degradation of natural resources; the loss of key ecosystems, habitats and biodiversity; the pollution of land, oceans and the atmosphere; and in climate change, with concomitant severe and unpredictable weather effects as humanity approaches or exceeds what have been referred to as "planetary boundaries" (Intergovernmental Panel on Climate Change, 2013; Rockström and others, 2009). In recent years such processes have produced unprecedented shocks and stresses, reflected in floods, droughts, devastated urban and rural landscapes and livelihoods, with many people and places suffering from a confluence of food, climate and financial crises. These crises of unsustainability potentially affect all and carry profound risks for future generations, as described in 1987 in the Report of the World Commission on Environment and Development, "Our common future" (A/42/427, annex).

1. Patterns of unsustainable development and gender inequality

The underlying causes and consequences of unsustainability and gender inequality are deeply intertwined and rooted in the dominant economic models (Fukuda-Parr, Heintz and Seguino, 2013). These involve economic liberalization and the concentration of productive and financial activity geared to short-term profits; unrestrained material consumption; unparalleled levels of militarism; and the privatization of public goods and services, all at the expense of state regulation and redistribution. Such processes have caused, in many places, crises of care, which means the breakdown in the abilities of individuals, families, communities and societies to sustain, care for and educate themselves and future generations, thereby undermining people's rights and dignity (United Nations Entity for Gender Equality and the Empowerment of Women (UN-Women), 2014).

Financial crises and recessions, which have taken hold in many countries with severe repercussions across the world, have brought to the fore the risks and vulnerabilities inherent to liberalized and financialized market models. These risks and vulnerabilities undermine the viability of market models even on their own terms. The fruits of economic growth have also been unequally divided. Over the past three decades, economic disparities between and within countries and regions have increased. The richest 1 per cent of

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the world's population owns some 40 per cent of all assets while the poorer half of the population owns just 1 per cent of global assets (UNDP, 2013a). The world's most rapidly growing economies, including those of Asia, Southern Africa and Latin America, have also seen rapid rises in inequality. Inequality itself threatens economic sustainability, fuelling unrest and conflict and undermining the stability, level playing field and consumer demand on which growth relies (Stiglitz, 2012).

The dominant economic models are unsustainable, not only in economic terms but also in social and environmental terms, perpetuating gender and other inequalities and damaging ecosystems and biodiversity (ILO, 2012; A/CONF.216/PC/7). Export-oriented models of growth in many areas of industry and agriculture have contributed to the rising labour force participation of women, as discussed in the 1999 *World Survey* (A/54/227).[11] Yet gender-based discrimination and segregation in labour markets, as well as the weak regulation of those markets, have served to confine women to jobs that are low-paid and of poor quality in terms of working conditions and access to social protection. They reinforce the status of women as secondary earners within their households (Chen and others, 2005).

Moreover, markets can continue to function as they do because of their reliance on the unpaid work that is allocated to caring for children, the sick and the elderly and the domestic work that sustains households and communities (UNRISD, 2010). Economic growth could not take place without this unpaid and often invisible work. Dominant growth models also rely on the exploitation of natural resources as if these were unlimited. The environmental costs of production, such as pollution, toxic waste and greenhouse gas emissions are externalized. That is, "climate change, like other environmental problems, involves an externality: the emission of greenhouse gases damages others at no cost to the agent responsible for the emissions" (Stern, 2006). Such patterns of development create profits at environmental expense, whether through the entrenched fossil fuel systems that supply industry, energy and automobiles, or through industrial agriculture that generates short-term gain by mining soils and depleting water resources. Such patterns are unsustainable, compromising future production and consumption and threatening the integrity and resilience of ecosystems and biodiversity (Millennium Ecosystem Assessment, 2005).

Economic growth cannot take place without unpaid work

Declines in ecosystem services and productive capacity destabilize people's livelihoods and health, both in the present and for future generations. In the pursuit of profit, the social and environmental costs of production are shifted onto the state, private households and local communities, or onto the natural environment. The costs and consequences of socio-environmental change are manifested in different forms of gender inequality. National disasters, including those related to climate change, disproportionately affect poor women (Neumayer and Plümper, 2007). Women often bear the brunt of coping with climate-related shocks and stresses or the health effects of indoor and urban pollution, which add to their care burdens. As land, forest and water resources once held in common are increasingly enclosed, privatized or "grabbed" for commercial investment, local communities and indigenous peoples, particularly women, whose livelihoods depend on them, are marginalized and displaced (White and White, 2012; Levien, 2012; FAO, 2012). In this process, sustainable livelihoods, health, rights and dignity are jeopardized (Unmüßig, 2014).

2. Responding to the challenges

Growing international attention and debate has recognized the clear need to move economies and societies onto more sustainable paths, whether to avert crisis and catastrophe, or enable prosperity through green economies. In an attempt to regulate greenhouse gas emissions, carbon emissions have been monetized and traded on world markets. Biodiversity offset

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schemes posit that the destruction of biodiversity can be compensated by creating similar habitats elsewhere. Payments for ecosystem services compensate communities and individuals for conserving and protecting such essential natural goods as water sources and forests. Such schemes aim to assign value to natural capital so it can be internalized in economic calculations. However, the resulting transactions and markets have often militated against equal access to and benefit from natural resources for women and men because of power differentials and the lack of participation in decision-making and negotiations (McAfee, 2012; UNRISD, 2012b) (see box 1). They have also further intensified pressures on natural resources through land, water and green "grabs" (Unmüßig, 2014; Fairhead, Leach and Scoones, 2012; Mehta, Veldwisch and Franco, 2012).

Women's knowledge, agency and collective action are central to finding, demonstrating and building more economically, socially and environmentally sustainable pathways to manage local landscapes; adapt to climate change; produce and access food; and secure sustainable water, sanitation and energy services. For example women's decisive involvement in community forest management bodies yields positive outcomes for both forest sustainability and gender equality (Agarwal, 2010) (see box I). Thus governments and donor agencies target women as critical agents for community adaptation to climate change; in their role as smallholder farmers, the mainstay of sustainable food production; and through limiting their reproductive rights, as the answer to population-environment problems. Indeed, perspectives that view women narrowly as "sustainability saviours" are evident in many areas, from the conservation of biodiversity, water and soils to building socially and environmentally sustainable services.

Yet viewing women as sustainability saviours carries dangers. Such approaches are based on the assumption that women's time is an "infinitely elastic" (Elson, 1996) and unlimited resource that can be drawn upon to sustain people and environments, without due consideration for women's own health and well-being and the competing demands on their time. Policies that are based on stereotypical assumptions regarding women's caring role in the family, community and environment treat women as a homogeneous category. They ignore the vital intersections with other inequalities that shape women's interests, knowledge, values, opportunities and capabilities. Power imbalances in gender relations, in the exercise of rights, access to and control of resources, or participation in decision-making, determine whether women's actions and work translate into enhanced rights and capabilities, dignity and bodily integrity. Thus women's involvement in policy interventions ostensibly aimed at sustainability does not automatically mean greater gender equality; on the contrary, intensifying women's workloads to benefit the community and the environment can entrench and worsen gender inequalities.

Despite some of the shortcomings in the ways in which policy actors have responded to sustainability challenges, this is also a time of opportunity. There are many concrete examples from around the world of alternative pathways that move towards sustainability and gender equality. Some of these are emerging from women's and men's everyday practices of accessing, controlling, using and managing forests, soils, water and urban landscapes in ways that sustain their livelihoods and enhance their well-being.

Women have been and can be central actors in pathways to sustainability and green transformation. However, crucially, this must not mean adding environmental conservation to women's unpaid care work. It means recognition and respect for their knowledge, rights, capabilities and bodily integrity, and ensuring that roles are matched with rights, control over resources and decision-making power. Gender equality and sustainable development can reinforce each other in powerful ways and charting such pathways and concrete areas for policy action is a central aim of the *World Survey*.

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Box I

Sustainable forest management and gender equality

Forest landscapes illustrate well the interaction between economic, social and ecological processes in shaping change. Vegetation cover and quality reflect the dynamic interaction of ecologies with people's livelihoods. The same forests and trees may be valued by different people for their timber and gathered products, for their services in shade and ecosystem protection, or for their cultural values.

Forests have been subject to policies and interventions, with varying outcomes for gender equality. From colonial times onwards, successive state, donor-led and non-governmental programmes have focused on goals ranging from sustaining supplies of timber and non forest products to protecting watersheds and biodiversity. The latest round of interventions focuses on mitigating climate change. The objective is to manage forests in order to protect and enhance carbon stocks as a means of offsetting emissions produced in industrialized settings. The many schemes that have emerged, associated variously with the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD process), the Clean Development Mechanism, the Verified Carbon Standard or unaccredited private deals, all re-value forests as a source of a carbon commodity to be exchanged in emerging markets. As these forest carbon projects play out on the ground, they have tried to meet global sustainability needs but have often excluded local forest users and undermined their livelihoods, thereby contributing to dispossession (Corbera and Brown, 2008; Corbera and Schroeder, 2010). The result is often greater inequality and injustice for local users vis-à-vis external agencies and global actors. A recent study on REDD+* concludes that women are not "key stakeholders or beneficiaries of REDD+ because of their invisibility in the forest sector — largely viewed as a masculine domain" (Women Organizing for Change in Agriculture and Natural Resource Management and others, 2013).

Alternatives have focused on community-based and joint forest management. Such approaches have the potential to foster and support local rights and capabilities, including those of women. Yet the outcomes of community forest management for gender equality have varied considerably. In many cases, gendered interests and values in forest management have been subordinated to a generalized notion of "the community", through institutions dominated by men and community leaders. However, work in Nepal and in Gujarat, India, provides evidence to show that gender equality in joint forest management processes is associated with positive outcomes both for forest ecology and for gender equality (Agarwal, 2010). Gender-related inequality (unless mitigated by specific measures) is often associated with low or failed cooperation within forest management committees. Where women are full participants, with a voice and power in committee structures, their equal access to resources is enabled along with a more equitable sharing of benefits and improved forest sustainability.

* The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. REDD+ goes beyond deforestation and forest degradation, and includes the role of conservation, the sustainable management of forests and enhancement of forest carbon stocks. See www.un-redd.org (accessed 29 June 2014).

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C/ SUSTAINABLE DEVELOPMENT WITH GENDER EQUALITY: DEFINITIONS AND CONCEPTS

The understanding of sustainable development for the present survey is in line with the definition proposed, in 1987, in the landmark report of the World Commission on Environment and Development: sustainable development should "meet the needs of the present without compromising the ability of future generations to meet their own needs" (A/42/427, annex), which involves integrating the three pillars of sustainability: economic, social and environmental.

Sustainable development is economic, social and environmental development that ensures human well-being and dignity, ecological integrity, gender equality and social justice, now and in the future

The *World Survey* builds on this broad definition in several important respects that contribute to the on-going deliberations on the post-2015 development framework. It re emphasizes normative values, anchoring its policy analysis within a human rights and human capabilities framework, as elaborated below, and underlines that questions of equality and justice are important for present as well as future generations. In both aspects, gender equality is central.

Sustainable development, therefore, is economic, social and environmental development that ensures human well-being and dignity, ecological integrity, gender equality and social justice, now and in the future.

The understanding of gender equality for the purpose of the *World Survey* is that elaborated by the Committee on the Elimination of Discrimination against Women, which clarified that: "... a purely formal legal or programmatic approach is not sufficient to achieve women's de facto equality with men, which the Committee interprets as substantive equality. In addition, the Convention requires that women be given an equal start and that they be empowered by an enabling environment to achieve equality of results" (see A/59/38, part one, annex I, General Recommendation No. 25). Substantive or de facto equality therefore entails women's equal enjoyment of their rights, especially in regard to results and outcomes. To ensure this, States must not only eliminate all forms of discrimination against women, including structural and historic discrimination, by building on the foundations of formal or legal equality, but ensure the realization of their rights.

This concept of substantive gender equality resonates strongly with the capabilities framework, which draws attention to the substantive freedoms that people have "to lead the kinds of lives they value — and have reason to value" (Sen, 1999). The human rights and capabilities frameworks share a common motivation, which is the freedom and dignity of the individual, and both stand in sharp contrast to dominant economic approaches that emphasize the expansion of gross domestic product (GDP) as their principal goals (Vizard, Fukuda-Parr and Elson, 2011). Deprivation of elementary capabilities, which may be reflected in premature mortality, significant undernourishment and widespread illiteracy (Sen, 1999, p. 20),

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continues to mark the lives of millions of people around the world, even in countries with high rates of economic growth. Such deprivation in rights and capabilities can also be experienced by women and girls who are members of households that may not be considered poor or deprived at an aggregate level, underlining the need to always look behind averages and aggregates. While the removal of such inequalities in basic well-being is of utmost importance, the capabilities framework, like the human rights approach, also draws attention to the significance of the agency of women because of its intrinsic value and because the "limited role of women's active agency seriously afflicts the lives of all people — men as well as women, children as well as adults" (Sen 1999, 191). Both human rights and capabilities frameworks underscore the potential synergy between women's agency and well-being outcomes, and the indivisibility of their rights.

The issue of intergenerational justice, which is a key component of the definition of sustainability in the report of the World Commission on Environment and Development, remains an important concern today, especially in a post-crisis context when the prospect of realizing the rights to decent and sustainable livelihoods for younger and future generations looks dim (United Nations, 2013b). The issue of intergenerational justice demands that the actions of the present generation do not compromise the ability of future generations to live fulfilling lives. As Anand and Sen (2000) remark "there would, however, be something distinctly odd if we were deeply concerned for the well-being of the future — and as yet unborn — generations while ignoring the plight of the poor today". This concern directs attention to inequalities now. The depth and scale of multiple inequalities that characterize the bulk of countries today, both developing and developed, demand action. Inequality harms economic dynamism and poverty reduction, can trigger economic crises, creates social exclusion and feeds into political tensions and conflicts. Redistributive measures that address inequalities and realize human rights and capabilities need to be prioritized as central to sustainable development. The participation and voice of marginalized groups in decision-making at multiple levels is also essential (UNDP, 2013a).

D/ LOOKING BACK, MOVING FORWARD: LEARNING FROM ACTION ON GENDER EQUALITY AND SUSTAINABLE DEVELOPMENT

From the early 1970s, social and environmental movements in Asian, Latin American and African settings mainly focused on the negative impacts of economic development on the livelihoods, rights and well-being of local and indigenous peoples. Examples include movements resisting large dams and accompanying displacements, and mining and forest destruction (Doyle, 2005). The Chipko movement that resisted industrial logging in the Himalayas was primarily motivated by forest and livelihood protection. It went on to

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become a celebrated symbol for non-violent environmental protest and the significance of women's participation. Similar symbolism is associated with Kenya's Green Belt Movement, founded by Wangari Maathai in 1977, which encouraged rural women to collectively plant trees for sustainable livelihoods and forest conservation.

In developed countries, movements have focused on combating pollution, resource depletion and habitat loss as well as militarism and nuclear power, and on promoting peace. Together with cornerstone publications such as *Silent Spring* (Carson, 1962) and *The Limits to Growth: A Report to the Club of Rome's Project on the Predicament of Mankind* (Meadows and others, 1972), they fuelled a growing public and political consciousness of the environmental and social downsides of prevailing models.

The United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, in 1992, provided a landmark forum where diverse approaches to sustainable development were debated by governments, civil society and social movements. The "local Agenda 21" initiative envisaged sustainability being built from the bottom up through initiatives by local governments, community groups and women and men. It stimulated a plethora of community-based and joint state-local sustainable development projects and programmes across the world, around sustainable agriculture and land use, water, fisheries, forests, wildlife, urban environments and other issues. These initiatives embodied important recognition of local resource rights and collective action. Yet many suffered from an overly homogeneous view of "the community" that failed to account for socially- and gender-differentiated perspectives and priorities (Dressler and others, 2010; Leach, Mearns and Scoones, 1999), or involved women only in a tokenistic manner in project management committees. The lack of attention to gender inequalities and other inequalities has continued, to the present day, in many initiatives for community-based sustainable development (Harcourt, 2012).

In the run-up to the United Nations Conference on Environment and Development, a wide coalition of non-governmental organizations and social movements, including the Women's Environment and Development Organization, Development Alternatives with Women for a New Era and others, advocated to integrate gender concerns into emerging sustainable development debates. Development Alternatives with Women for a New Era, along with other groups, called for the transformation of growth-based development models towards gender-responsive development (Wiltshire, 1992). Women's Action Agenda 21, a platform of various groups, critiqued existing development pathways and free market thinking, instead embracing the concept of sustainable livelihoods and highlighting the need to link everyday practices of care with resource justice (Wichterich, 2012). Yet many of the alternatives put forward by women's groups and networks in the global women's lobby at the Conference were overshadowed by the prevailing optimism about economic efficiency, technology and markets.

Agenda 21 and debates from 1992 onwards recognized women as important actors in environmental protection and poverty alleviation, but tended to treat women in an instrumentalist way. Women were considered the primary users and effective managers and conservers of the environment at the local level (see, for example, Dankelman and Davidson, 1988; Rodda, 1991). This underpinned the view that women should be harnessed as sustainability saviours, based on the assumption that women are especially close to nature. Women-environment connections, especially in domestic and subsistence activities such as collecting fuelwood, hauling water and cultivating food, were often presented as if they were natural and universal, rather than as the product of particular social and cultural norms and expectations. Ensuing projects and policies often mobilized and instrumentalized women's labour, skills and knowledge, thereby adding to

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Policies should ensure women's effective participation in and equal benefit from sustainable development projects and actively address entrenched discriminatory stereotypes and inequalities

their unpaid work without addressing whether they had the rights, voice and power to control project benefits.

A number of useful lessons emerge from this history for policymaking. First, policymakers should avoid making broad and stereotypical assumptions about women's and men's relationships with the environment. Rather, policies should respond to the specific social context and gender power relations. For instance, women's close involvement in gathering wild foods and other forest products might reflect labour and land tenure relations and their lack of access to income with which to purchase food, rather than reflecting their closeness to nature (Rocheleau, 1988; Agarwal, 1992). Second, policies should be responsive to differences in how diverse groups of women and men engage with land, trees, water and other resources. Third, policies should pay special attention to women's rights in regard to tenure and property, as well as control over labour, resources, products and decisions within both the household and the community. Finally, policies should ensure women's effective participation in and equal benefit from sustainable development projects and actively address entrenched discriminatory stereotypes and inequalities.

United Nations Conference on Sustainable Development: three important policy debates

In the run-up to the United Nations Conference on Sustainable Development, held in 2012, the potential pathways to sustainable development were the subject of deliberation in the context of climate, food and finance crises. In that context, many policy and business actors embraced positive alignments between economic growth and environmental concerns through such notions as the green economy, in the name of sustainable development. Social movements, on the other hand, proposed alternative perspectives on issues such as climate change, water privatization, genetically modified organisms, biodiversity and "land grabbing", and advocated pathways that link sustainable development firmly with questions of social justice. In this context, debates have continued between key actors on the topics of climate change, planetary boundaries and the green economy, which are elaborated upon below, with a focus on their gender dimensions.

Since the 1990s, climate change has become one of the defining challenges of the modern world. The relative successes and setbacks of global climate change frameworks and negotiations, difficulties in implementing the principle of common but differentiated responsibilities in mitigating far-reaching threats, and the plight and coping strategies of people who must adapt to climate-related shocks and stresses have galvanized public reaction.[12] This has taken the form of renewed and globalized social and environmental movements and campaigns, stretching across local and global scales. The United Nations Framework Convention on Climate Change was weak on gender equality, and despite the sustained engagement and efforts of gender equality advocates, subsequent efforts to mainstream gender issues into climate change debates have been piecemeal (UN-Women and Mary Robinson Foundation – Climate Justice, 2013).

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Responses to climate change that address gender issues tend to view women as victims of climate impacts, or entrench stereotypes and roles of women as natural carers keeping their communities resilient or adopting low-carbon options. Yet gender and class relations, rights and inequalities shape differences in women's and men's vulnerabilities to climate change and their opportunities to be agents in mitigation and adaptation (Agarwal, 2002). In contexts of entrenched discrimination, where women's active participation and decision-making power is constrained, women's formal inclusion in technical committees for low-carbon technologies can be a first step, but women's participation can only be effective and meaningful when underlying gender power relations are transformed and when attention and support are given to women's specific knowledge and capacities (Wong, 2009; Otzelberger, 2011).

Much of the debate on gender and climate change has focused on adaptation and local-level vulnerabilities. Only recently, more limited attention has been given to gender perspectives in discussions involving large-scale technology, market initiatives and climate finance (Schalatek, 2013; World Bank, 2011). Commitments to achieve gender equality, such as those contained in the Convention on the Elimination of All Forms of Discrimination against Women, are insufficiently reflected in national adaptation or low-carbon development plans (Otzelberger, 2011). This poor integration is a reflection of and in turn, reinforces, the tendency for policy to focus on simplistic solutions, rather than the more structural political and economic changes needed to redirect pathways of climate unsustainability and gender inequality.

A second contemporary debate centres on notions of planetary boundaries. A series of nine planetary boundaries has been identified, referring to the biophysical processes in the Earth's system on which human life depends (Rockström and others, 2009). These boundaries, together, serve to keep the planet within a so-called "safe operating space" for humanity. Influential scientific analyses suggest that the world has entered the Anthropocene, a new epoch in which human activities have become the dominant driver of many earth system processes including the climate, biogeochemical cycles, ecosystems and biodiversity. Potentially catastrophic thresholds are in prospect, it is argued, providing a new urgency and authority to arguments that growth and development pathways must reconnect with the biosphere's capacity to sustain them (Folke and others, 2011).

While the science is still developing, the concept of planetary boundaries has become influential within policy debates. But the concept is also critiqued, with some actors interpreting it as anti-growth and development, while others suggest that "planetary boundaries" thinking privileges universal global environmental concerns over diverse local ones, justifying top-down interventions that protect the environment at the expense of people and their livelihoods. The renewed visions of impending scarcity and catastrophe implied by some interpretations of planetary boundaries could justify policies that limit people's rights and freedoms, as the present *World Survey* shows in relation to population. Steering development within planetary boundaries should not compromise inclusive development that respects human rights, as proposed by Raworth (2012)

Women's participation can only be effective and meaningful when underlying gender power relations are transformed and when attention and support are given to women's specific knowledge and capacities

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whose "doughnut" concept takes the circle of planetary boundaries and adds an inner "social foundation". In between these is a "safe and just operating space" for humanity, within which sustainable development pathways should steer (International Social Science Council, and United Nations Educational, Scientific and Cultural Organization (UNESCO), 2013). Raworth notably introduces gender equality as one dimension of this social foundation, but other discussion and advocacy arising from the planetary boundaries concept has largely been gender-blind.

Mainstream approaches to defining and developing green economies have paid little attention to their differentiated implications for women and men

Finally, green economies are now being vigorously discussed by governments, businesses and non-governmental organizations alike. According to the United Nations Environment Programme (UNEP), which launched its Green Economy Initiative in 2008, a green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities; it is low-carbon, resource-efficient and socially inclusive (UNEP, 2011). This general definition integrates economic, social and environmental concerns in ways akin to sustainable development. Yet in practice, as the survey shows, there are many versions of green economy thinking. Dominant versions assume continued, even enhanced, market-led economic growth, through green business investments and innovations that enhance energy and resource efficiency and prevent the loss of ecosystem services. It is argued that the emerging green technology economy will be worth $4.2 trillion annually by 2020.[13] Other strands emphasize market-based approaches to environmental protection through financial valuation of natural capital, payments for ecosystem services and schemes for trading carbon and biodiversity credits and offsets.

Others argue that environmental constraints require rethinking growth and market strategies. The concept of decoupling proposed by UNEP and others (Fischer-Kowalski and others, 2011) suggests that economic growth should be delinked from the increasing consumption of material resources such as construction minerals, fossil fuels and biomass. Jackson (2011) argues for a shift in focus towards prosperity and well-being with reduced or no growth, in which investments in services and care, as well as in green action in the areas of sustainable food production and clean energy, are key.

Mainstream approaches to defining and developing green economies have paid little attention to their differentiated implications for women and men (Guerrero and Stock, 2012; Cela, Dankelman and Stern, 2013). Many gender analysts and activists criticize the United Nations Conference on Sustainable Development for having missed a chance to break with the business-as-usual global economic model, which produces environmental destruction, social exploitation and inequalities (Schalatek, 2013; Wichterich, 2012; Unmüßig, Sachs and Fatheuer, 2012). They see the green economy as a market-based approach that justifies the commodification of resources and commons, which undermines livelihoods and dispossesses local peoples, especially women food producers. Gender equality advocates call instead for green development that respects commons and livelihoods (Agarwal, 2012); and for recognition and value of care in green economy debates (Vaughan, 2007; Mellor, 2009).

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E/ TOWARDS SUSTAINABLE DEVELOPMENT AND GENDER EQUALITY: IMPLICATIONS FOR POLICY ACTION

The attainment of sustainable development and gender equality potentially involves trade-offs that need to be openly discussed among different social groups (UNDP, 2011). In such negotiations, the social dimensions of sustainability – too often neglected – must be fully integrated, and states and other powerful actors must be held accountable for delivering sustainable development.

1. Bringing social sustainability to the fore

Achieving sustainable development means not only reconciling economic and environmental sustainability, but also prioritizing social sustainability. The realization of women's human rights, capabilities and well-being now and in the future requires paying specific attention to the care economy, that is, the provision of care through the family and/or household, markets, the non-profit sector and the public sector and/or state, especially the "private" domain of non-market or unpaid care work. How societies organize this work is central to their social sustainability. Policymakers rarely consider the production of human resources in the economy, apart from formal education, which is recognized for its contribution to human capital, and yet economic growth cannot take place without this unpaid and often invisible work (Folbre, 1994; UNRISD, 2010). In all societies, women typically spend more time on these non-market activities than men do, especially in contexts of environmental stress and poor infrastructure. Thus the gender division of labour between paid work and unpaid work represents a significant structural source of gender inequality.

The fact that the bulk of unpaid care work is carried out by women and girls has significant implications for their capacity to realize their rights to education, paid work, a decent standard of living and political participation (see the report of the Special Rapporteur on extreme poverty and human rights, A/68/293). In this and other domains, gender and other inequalities intersect, and it is women and girls from marginalized social groups whose capabilities and rights are most often compromised and in need of realization. Poverty and exclusion increase the amount and intensity of unpaid care work, as a result of limited access to public services and inadequate infrastructure and the lack of resources to pay for care services and time-saving technology. Unpaid care work is also intensified in contexts of economic crisis, health crises, environmental degradation, natural disasters and inadequate infrastructure and services. A just and sustainable society is one that recognizes unpaid care work by making it visible through statistics and by ensuring that policies are in place to reduce its drudgery, through appropriate public investments in infrastructure and social services, and to redistribute it between women and men within households, and between households and society more broadly.

2. Tensions and trade-offs

It is important to recognize that there may be tensions and trade-offs between the different dimensions of sustainability and with substantive gender equality, regarding the areas into which sustainability should be integrated and considerations as regards the beneficiaries

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of sustainable approaches (UNDP, 2011). For example, current models of economic growth increase GDP but have also led to deepening inequalities based on multiple factors. While such economic models may well perpetuate themselves over time and across regions, undeniably increasing GDP, the fact that they leave significant environmental and human costs in their wake means that they are not sustainable and thus stymie efforts to meet commitments to sustainable development.

In the pursuit of sustainability, the question of what is sustained and who benefits is central. Yet the challenges are often seen in technical and managerial terms, as a matter of getting the technologies, prices and regulations right, rather than in terms of the more profound restructuring of social, economic and political systems and power imbalances that would be required to transform unsustainable patterns. How the challenges are addressed has profound implications for who gains and who loses, among social groups and local, national and global interests.

There are many policy dilemmas to reconcile in order to ensure that women's rights and gender equality concerns are taken into account in sustainable development policies. For example, the strict conservation of carbon sinks to mitigate global climate change could undermine the local livelihood needs of women and men living near forests and intensify women's unpaid care work. Biofuel production policies could run counter to local food security needs. Carbon mitigation policies in countries which are members of the Organization for Economic Cooperation and Development (OECD), for example, that entail higher prices for consumers, can have a regressive impact on poorer households, particularly given that they spend a higher proportion of their overall income on electricity (Gough, 2011). Market-based instruments that attempt to redress or prevent environmental degradation and mitigate climate change by valuing and putting a price on nature can risk exacerbating the very problems they were designed to solve. In order to reduce such risks, global and national governance and regulatory policy frameworks are necessary, as is appropriate attention to local knowledge and practices of women and men (Unmüßig, 2014; Fairhead, Leach and Scoones, 2012).

As such, women's rights advocates call for approaches that respect the commons and local livelihoods, recognize and value care, restructure production and consumption and pave the way for green transformations (Agarwal, 2010; Wichterich, 2012; Women's Major Group, 2013). Recent research on consumption patterns in Europe shows that women on average generate fewer greenhouse gas emissions than men, as a result of their greater reliance on public transport, lower consumption of meat and higher levels of energy poverty, some of which may be related to women's lower incomes (European Institute for Gender Equality, 2012). But the same study also shows women's greater responsiveness to environmental, health and climate concerns, compared with men. These findings may very well apply globally and would have implications, for example, in terms of better provisioning of sustainable and accessible public transport and universal access to modern energy services.

Women's rights advocates call for approaches that respect the commons and local livelihoods, recognize and value care, restructure production and consumption and pave the way for green transformations

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3. Accountability and renewed social contracts

Reconciling the policy dilemmas in order to achieve sustainable development with gender equality requires robust democratic spaces for deliberation, grass-roots voices and accountability mechanisms at multiple levels. Women's voices and participation in diverse forums is of critical importance, both as an issue of justice and equality and because the active presence of women can put gender-specific concerns on the agenda and contribute to collective actions that are more effective in meeting the three dimensions of sustainability (Agarwal, 2010). Enabling women's meaningful participation, however, should not mean that women carry the sole responsibility for prioritizing gender equality concerns in sustainable development policies. All decision-makers, women and men, must take responsibility.

Moving towards sustainable development and gender equality will require action at many levels by a diversity of actors and can only be achieved through democratic alliances between the state, policymakers, donors, the private and civil sectors and women and men. For such alliances to be viable, the reach and organizing power of the state are necessary. Sustainable development pathways can be conceived, inspired and piloted by non-governmental organizations, donors and private enterprises, but only the state can take them to scale, offer universal access which reaches the populations of the poor and marginalized, and provide the regulatory and institutional power to ensure sustainability. However, to ensure that the state actually delivers, civil society and social movements must have the space and mechanisms to hold decision-makers to account, which calls for renewed social contracts between the state and its people, where states fulfil their obligations, as the duty bearer, and rights holders claim and enjoy their human rights.

An enabling global context is indispensable for such social contracts to hold. The extent of global economic integration over the past decades has increased the influence and impact of a number of actors (e.g., multinational corporations or international financial institutions) on the enjoyment of human rights in many countries. These actors have an influence on the protection of labour standards, the development of infrastructure, the accessibility of public services, the protection of natural resources and access to information — all of which have serious implications for women's and girl's human rights. Hence, global governance must ensure that the actions of those actors are aligned with the efforts of governments to facilitate the realization of rights, the enhancement of capabilities and initiatives to achieve sustainable development.

States need to use their capacity and ability to deliver in ways that respect sustainability and gender equality, rather than relying on market forces. This requires accountability frameworks that secure human rights, gender equality and non-discrimination in areas like work and employment, reproduction and health, food and land and natural resource tenure. Governments also have central roles to play in providing public goods and services, supporting health, education and care for children, the elderly and the sick, which are so essential to people's capabilities, and for assuring the social dimensions of sustainability and care work. Public investment is also necessary for nurturing and scaling up key innovations for gender-responsive public goods, such as the provision of modern energy services, water supplies and appropriate sanitation facilities.

There are growing opportunities for businesses and the private sector to contribute to sustainable development solutions, as emerging green economy prospects emphasize. Nevertheless these often require state support to be viable, at least in the early stages. Meanwhile, growing evidence shows that partnership and co-production arrangements, in which private, public and civil society actors work jointly to deliver health, housing or energy services, or to manage forests, biodiversity or water, are

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often most effective. In order for such co-produced arrangements to work effectively for gender equality and sustainability, it is vital that women are centrally involved in planning and implementation and as such, policies must enable women's participation. Adequate financial resources are also required for achieving the goals of sustainable development (Schalatek, 2013). Approaches to participatory and gender-responsive budgeting offer prospects for gender-responsive decisions in funding allocation decisions and for ensuring accountability for tracking and reporting on gender-specific financing benchmarks.

National policies are increasingly shaped by international regimes and frameworks, globalization processes and transnational policy transfer and learning. International human rights frameworks offer important standards for holding states accountable. However, to achieve sustainable development with gender equality at its centre, women's rights need to be brought far more fully into policy frameworks. Global efforts to integrate gender equality and sustainable development thus far have been mixed, ranging from "exclusion to nominal inclusion" (Cela, Dankelman and Stern, 2013). Far more inclusion of gender equality concerns and women's participation is needed in ongoing international policy processes, through alliance-building between women's rights advocates and responsive states, as well as alliances between women's movements and other movements working on issues of social justice, equality and sustainability.

Growing evidence and analysis shows that sustainable development requires governance and action that extends from the global scale to national and local scales. This suggests a need for questions concerning gender equality and for representation of women's interests to be included by institutions from the local to the global level. Action and pressure from social movements are central in challenging and reworking the discriminatory cultures, practices, biases and stereotypes that are often evident in policy institutions and organizations.

Indeed, the growth of movements around gender equality and sustainable development is one of the most promising developments of recent years. In many countries and regions, informal economy workers, producers and consumers are organizing collectively, both to contest dominant development models and to advocate for and indeed, demonstrate, alternatives. Examples are multiplying rapidly. They include La Via Campesina, which since the 1990s has grown into a globally-networked movement to defend the rights of smallholder farmers in the face of pressures from large-scale corporate agriculture. Promoting a vision of small-scale farming rooted in agroecological techniques, local markets and food sovereignty (Borras, 2004; McMichael, 2009), some strands, though by no means all, emphasize the rights of women as small-scale food producers. The National Association of Rural and Indigenous Women in Chile, with its 10,000 members, is linked to La Via Campesina and is launching an agroecology institute to train women smallholder farmers in South America.[14] Other examples include movements initiated by groups of poor urban dwellers in many cities in Asia, Africa and Latin America, linking well-being and rights to homes and livelihoods with the design of decent, sustainable urban spaces (Satterthwaite, Mitlin and Patel, 2011). In the case of Shack/Slum Dwellers International, groups initiated around women's savings and credit associations and waste-pickers cooperatives have networked into a federated global structure that now covers 33 countries, linking local action with campaigning around global agendas. Many other examples are emerging around alternative and solidarity economies, food and land, water and energy.

In such examples, collective action, organization and cooperation provide the basis for alternative trajectories towards economic, social and environmental sustainability. Networking and alliance-building provides routes through which the everyday actions and knowledge of women and men around work, industry, land, food, water, energy and climate in diverse places can begin to scale up with appropriate state support.

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4. Criteria for policymaking

Given the diversity of contexts within which policymakers operate, rather than being prescriptive, the *World Survey* identifies three criteria for assessing whether policies, programmes and actions implemented in the name of sustainability are likely to achieve gender equality and women's rights, especially the rights of marginalized groups who are likely to bear a disproportionate share of the costs of economic, social and environmental unsustainability.

The first criterion is with respect to women's capabilities and their enjoyment of human rights, particularly the capabilities and rights of the poorest and most marginalized groups. As a core criterion, policies, programmes and investments in the name of sustainable development should be assessed against compliance with human rights standards and their ability to enhance the capabilities of women and girls. No development pathway can be considered sustainable if it reduces women's capabilities and denies their human rights. In the case of population policies, for example, family planning methods that constrain women's reproductive choices and/or expose them to health risks through inappropriate contraceptive methods cannot meet the minimal criteria of sustainability proposed here.

If policies and programmes that are intended to enhance environmental sustainability inadvertently increase women's unpaid care work, then they are not on a sustainable development pathway

The second criterion is with respect to the impact on the unpaid care work of women and girls, especially from poorer and marginalized households and communities. If policies and programmes that are intended to enhance environmental sustainability inadvertently increase women's unpaid care work, then they are not on a sustainable development pathway. While there is a clear and urgent need for decarbonizing the global economy, this should include attention to local livelihoods and gender equality. For example, strict regulation of forest use that undermines

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In Krang Lahiong village (Cambodia) where she is deputy chief, Meas Sophea, a rice farmer, assists women in the community with their finances

local livelihoods and intensifies women's unpaid care work is unsustainable. Conversely, investments in locally adapted and ecological technology that facilitates women's access to water sources by ensuring their affordability and quality while minimizing the distance between water sources and dwellings are clearly desirable.

The third criterion relates to the full, equal and meaningful participation of women in sustainable development, as actors, leaders and decision-makers in the processes that shape their lives as well as the future of their households, communities, nations and the world. In the area of food security, for instance, policy efforts aimed at national and local food sufficiency and low-chemical and environmentally sustainable agriculture, which are desirable objectives from the perspective of ecological sustainability, need to consult smallholder farmers, particularly women, about their priorities and constraints rather than assume that their interests are already aligned with preconceived policy aims and visions.

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CHAPTER /3

GREEN ECONOMY, GENDER EQUALITY AND CARE

A/ INTRODUCTION

Growth trajectories should be assessed for their capacity to generate sustainable development. In order to ensure sustainable development with gender equality at its centre, any development policy framework needs to address a number of goals in addition to promoting growth: to reduce gender inequality, but also inequality on the basis of other factors; to create decent work and sustainable livelihoods for all; to internalize the costs of environmental degradation and climate change; and to ensure human well-being by providing public goods and supporting the care economy.

This chapter will therefore address the issue of growth and gender equality, incorporating the three dimensions of sustainable development within its analysis. It evaluates whether the dominant global economic paradigm has delivered growth and development in ways that generate sustainable livelihoods and decent work for women, considers alternative models of green economy and their implications for gender equality, as well as the implications of the current development model for people's capacity to care for each other, both within and across generations. In doing so, the chapter goes beyond the potential for "greening" jobs, to recognize that, in the light of the economic crisis of 2007-2008, more fundamental changes will be needed to meet the economic, social and environmental dimensions of sustainability; dominant production and consumption patterns will have to change. The final part of the chapter, therefore, sets out the need to create new production systems that will be supportive of the realization of rights, of gender equality and of ecological integrity, through the provisioning of social protection and other public goods and investing in the care economy.

B/ BROADER DEVELOPMENT AND POLICY CONTEXT

Over the past two decades, income inequality has been growing both within and across countries (UNDP, 2013a). The sharpest increases in income inequality have occurred in those developing countries that have been most successful in pursuing vigorous growth strategies that have placed them into higher income brackets (UNDP, 2013a). One of the reasons for this growing inequality has been the changing nature of labour markets. Across a wide range of countries, over the past two to three decades, wage earners have lost out while those relying on profits and rents have increased their relative share of income (International Institute for Labour Studies, 2008; United Nations Conference on Trade and Development (UNCTAD), 2013a; Stockhammer, 2013). At the same time, informal employment

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continues to be highly prevalent in many parts of the world.[15] Women are more likely than men to be in informal employment, and even within informal employment, men are generally more likely to earn a wage while women are more likely to be in more precarious forms of informal self-employment (Vanek and others, 2014).

The increases in income inequality have been largely driven by processes of globalization, namely, trade and financial liberalization, that have weakened the bargaining position of relatively immobile labour compared to fully mobile capital. But domestic policy choices have also played their part. The experience of a number of developing countries, many of them in Latin America, which have bucked the trend of growing income inequality shows that it is possible to reduce income inequality through economic and social policies while remaining integrated with the global economy (UNDP, 2013a).

Globally too, the distribution of income and wealth remains very unequal. In 2010, high-income countries that accounted for only 16 per cent of the world's population generated close to 55 per cent of global income; low-income countries, by contrast, created just over 1 per cent of global income, even though they were home to 72 per cent of the world's population. The average GDP per capita of $2,014 in sub-Saharan Africa stands in sharp contrast to the average GDP per capita of $27,640 in the European Union and $41,399 in North America (United Nations, 2013b).

Not only is the rise in inequality of concern in terms of its human rights and social implications, it can also have highly adverse economic, environmental and political implications (United Nations, 2013b). For example, high levels of inequality within countries make it harder for societies to reduce poverty through economic growth. Moreover, high levels of inequality, both within and between countries, can in some contexts act as a catalyst for financial crises as a result of underconsumption and the creation of various so-called "bubbles", which can destabilize the economy, as was witnessed in 2008 (Galbraith, 2012; Saith, 2011).

Adding to the social and economic challenges are the risks from another brewing crisis with a global impact, which is likely to reinforce existing inequalities: climate change. The world's poor are especially vulnerable to climate-induced phenomena, including rising sea levels, coastal erosion, storms and desertification. Poorer households and other socially marginalized groups are also among those most likely to lack sufficient clean water, as its availability will increasingly be affected by changing patterns of precipitation, melting glaciers and droughts. Although the causes of these multiple crises vary, they all share a common feature: "in the last two decades much capital has been poured into property, fossil fuels and structured financial assets with embedded derivatives, but relatively little has been invested in renewable energy, energy efficiency, public transportation, sustainable agriculture, and land and water conservation" (UNEP, 2011).

1. Economic and social policy

Macroeconomic policies can have gender-differentiated impacts, as previous issues of the *World Survey* have amply illustrated (see A/54/227; A/64/93).[16] This chapter refers to the sources of gender bias and builds on that analysis by putting the spotlight on the social and environmental dimensions of sustainable development.

The macroeconomic policy agenda that has been dominant over the past three decades is characterized by a core triad of economic liberalization (of both domestic and international markets), macrostability and privatization.[17] Economic liberalization refers to liberalizing domestic markets, including labour and product markets, as well as liberalizing international trade and investment. Trade liberalization has reduced import controls and promoted exports as a promising

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development strategy and employment generator (UNCTAD, 2010; 2013a). On the investment side, liberalization has been geared towards both foreign direct investment and short-term capital flows. Macrostability is widely understood to mean simply price stability (as opposed to, for instance, employment stability), based on a policy regime, sometimes referred to as deflationary, which tends to weaken the employment-generating capacities of the economy.

With regard to monetary policy, at present, central banks typically try to keep inflation as low as possible by adopting explicit inflation targets. If a low rate of inflation is the only objective, this is likely to lead to higher rates of interest. The result is that the rate of unemployment is kept higher than it would otherwise be. There may be a gender bias to this approach to monetary policy. One empirical analysis, on the basis of data from 17 low- and middle-income countries, assessed the employment outcomes of 51 "inflation reduction episodes" (Braunstein and Heintz, 2008). The study looked at actual employment trends during each inflation reduction episode, disaggregated by gender, and compared these to long-term employment trends. Two significant findings emerged: first, periods of inflation decline are highly likely to be associated with job losses, for both women and men; second, more women than men lose jobs, in percentage terms, when employment contracts. Moreover, in the fewer cases where employment expands during inflation reduction episodes, women do not gain employment faster than men. These results suggest that contractionary monetary policy aimed at reducing inflation often has a disproportionately negative impact on women's employment.

Dominant fiscal policies and public sector reforms constrain the social welfare functions of the state, with negative consequences for social and environmental sustainability. Such dominant policies have focused on cutting back deficit financing of public expenditure and minimizing the tax burden on private enterprises. The emphasis on privatization undermines government action. It is argued that government spending is not only inflationary, but also tends to crowd out private investment. This perspective ignores the fact that public investment can "crowd in" or encourage private investment, for example, when the public provision of infrastructure, education and training, or credit, makes private investment opportunities more attractive. This is especially true in developing economies, where market imperfections are extensive. Public goods are undersupplied by markets relative to what is socially or economically optimal because their social returns are greater than their private returns (Sen, 1999; United Nations, 2013b).

Contractionary monetary policy aimed at reducing inflation often has a disproportionately negative impact on women's employment

Fiscal constraints that limit the state's capacity to provide public goods often have disproportionately negative impacts on women (and children) in low-income households, partly because of their status in the household and partly because the content of their work is so closely linked with the care economy (Ortiz and Cummins, 2013). This is confirmed by evidence from post-2010 fiscal austerity measures undertaken in a wide range of countries affected by the 2008 global financial crisis, which saw cuts in housing benefits, in child/family allowances, in old age benefits and in care services — cuts that have been disproportionately borne by women (UN-Women, 2014; World Bank, 2012). This perspective also ignores the fact that the public sector has traditionally been an important

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source of employment, offering women relatively better quality of employment, higher wages and access to pensions and other social benefits (Lund, 2010). Data from ILO confirm that women have historically constituted a significant share of public sector workers in many countries (often higher than their share in total employment) and show that in the countries for which data are available, women constituted 35 per cent of public employees in developing countries, 46 per cent in transition countries and 50 per cent in OECD countries (Hammouya, 1999). Public sector downsizing has led to a disproportionate impact on formal employment opportunities for women and is likely to increase women's concentration in less formal, non-regular jobs (Lee, 2005).

Turning from social to environmental sustainability, the diminished social welfare functions of the state also produce and reinforce vulnerability to climate change (Fieldman, 2011). The inadequacy of state provisioning of infrastructure, services and social protection means that measures for adaptation or building resilience to climate change that take into account gender equality and social justice, such as investments in flood defences or research on drought-resistant seeds, remain under-funded. The state's capacity to regulate, manage and tax a broad range of policy areas related to the environment in order to finance effective conservation efforts is thus vital (UNDP, 2011).

Taken together, the macro policy conventions of liberalization, privatization and macrostability create a deflationary economic environment characterized by reduced capacity to generate employment, fiscal squeeze and limited public policy space, with implications for the achievement of social and environmental sustainability. In such a context, it may appear that the best, or indeed the only, avenue for generating employment and raising incomes is to pursue an export-led growth strategy. But, in the past decade or so, two new economic developments have emerged that make pursuing such an externally-oriented agenda even more complex. First, as more countries shift to production for export markets, competition between producers in far-flung corners of the world has intensified. This in turn has exerted pressure on wages and wage-related entitlements, especially in labour-intensive sectors such as garments, apparel and electronics, which employ significant numbers of women (Seguino, 2000). As a result, the achievement of a decent work agenda necessary for social sustainability is compromised. The shift of production processes to developing countries also relocates the ecological and health costs of polluting production processes to countries with less stringent environmental regulations (UNCTAD, 2013b). The second recent development concerns intensified global imbalances, which threaten the economic sustainability of the model, to which the chapter now turns.

2. Inequality and economic unsustainability

Rising levels of income inequality are contributing to the unsustainability of the dominant economic model, even on its own limited terms. For some countries, the long-term decline in savings and the accumulation of private debt has increased consumption in spite of stagnant earnings, resulting in large current account deficits. At the same time, countries with a current account surplus used export markets as a way to sustain employment in the absence of sufficient domestic aggregate demand (Blecker, 2012; UNCTAD, 2010). The collective result was a state of underconsumption in some regions and overborrowing in others, financed in part by global financial flows from current account surplus countries to deficit countries. This process was further facilitated by the rising tide of financialization[18] and the shift in emphasis from production to financial profit-making (Cripps, Izurieta and Singh, 2011).

Such terms of production and exchange are economically unsustainable and have led to global imbalances,[19] which played an important role in the recent global economic crisis (Bernanke, 2011; UNCTAD, 2010). Although global imbalances did not set off the financial crisis of 2007-2008, they helped transmit its contagion. While the particular national circumstances of these imbalances differed, they all produced

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a trajectory of wage growth that lagged far behind productivity growth and resulted in rising levels of inequality across both the global North and South (Blecker, 2012). They demonstrate the systemic paradox of relying on exports coupled with wage stagnation to deliver growth and development.

Developed countries, for the most part, continue to exhibit sluggish growth and high unemployment as many governments wield austerity-type policies in the hope of reducing deficits and restoring economic confidence. In developing countries, the most affected by the global crisis were emerging market economies with current account deficits that could not withstand the drop in capital inflows resulting from the crisis (UNCTAD, 2010). But for low-income countries that had little involvement with global capital markets, and for countries with current account surpluses and/or substantial international reserves, the negative impact of the financial crisis has been shorter lived and less severe. For instance, many Asian and Latin American countries employed counter-cyclical monetary and fiscal policies, turning towards domestic sources of demand to counter declines in global trade (UNRISD, 2010). These countries have in fact led the global recovery, but the re-emergence of growth, trade and employment generation is far from complete (World Bank, 2014). In significant ways, there has been a shift of global production and consumption to large emerging economies, which in turn has helped smaller economies that cannot rely on their own domestic demand by providing new markets for export (Gereffi, 2014; UNCTAD, 2013a).

However, the rise of emerging economies is not nearly sufficient to launch a renewed era of export-led growth opportunities. While it is true that emerging market economies have added to global demand, the issue is one of scale and structure. In terms of scale, for instance, demand from middle-income countries is a very long way from replacing that of large developed countries as the global engine of consumption growth (Cripps, Izurieta and Singh, 2011). In terms of structure, a shift away from demand in industrialized countries means a shift away from demand for manufactured goods to a demand for raw materials, energy and food, while the latter also figure more prominently in the demand of emerging market economies. This shift in demand towards raw materials, energy and food has consequences for global commodity prices, which will increase, as well as for terms of trade, whereby countries with labour-intensive manufacturing will buy fewer imports (UNCTAD, 2010).

Restoring growth and jobs on the basis of the "brown economy", with its dependence on low-energy efficiency and non-sustainable energy sources is deeply problematic. In the immediate post-crisis period, stimulus packages that were allocated to restoring the automobile industry, rather than investing in public transport and renewable energy sources, were a source of concern. Such investments risk reproducing the imbalances and vulnerabilities that caused the multiple crises, rather than using the crisis as an opportunity to steer economies and societies along more sustainable pathways. There has been increasing public awareness that current consumption patterns are depleting key natural resources and placing unsustainable burdens on the planet's ecosystem. There is an urgent need for discussing, designing and adopting policies to establish clear resource and environmental limits and integrate these into economic and social systems (Jackson, 2011).

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C/ SEARCHING FOR ALTERNATIVES: GREEN ECONOMY AND GENDER EQUALITY

Given the unsustainability of global imbalances and the limited prospects for a renewed era of export-led growth, it is important to consider what rebalancing should look like. In its *Trade and Development Report* (2010), UNCTAD essentially argues for two things: first, high-income countries with current account surpluses need to turn away from export dependence and start importing, implementing policies that encourage wage and consumption growth; and second, a global macro policy shift is needed towards a growth regime that is led by wages and supports the expansion of domestic aggregate demand. For smaller or low-income economies with insufficiently large domestic markets, exporting to a wider variety of importers, or trading within regional blocs where the old model of global export dominance no longer holds sway, will serve as supplemental engines of growth and development.

It is not clear if rebalancing the global economy along the lines proposed by UNCTAD (2010), through the expansion of domestic demand, would improve the prospects for women's employment. There is some work to suggest that expanding domestic sources of aggregate demand enables a rise in female wages and a decline in the gender wage gap without sacrificing economic growth (Blecker and Seguino, 2002; Seguino and Grown, 2006). Furthermore, given the association between women's income and spending on basic needs, there may also be positive ripple effects for domestic production to the extent that demand shifts away from imports (Benería and Roldán, 1987; Blumberg, 1991; Haddad, Hoddinott and Alderman, 1997). The issue of the balance of payment constraints remains, however, if there is a shift from more export-oriented strategies to greater reliance on domestic demand. It is possible that improvements in capabilities that are a consequence of higher incomes for women, will compensate for the loss in foreign exchange a scenario that is more likely in low-income agricultural economies than in semi-industrialized ones (Seguino, 2010).

A further important consideration is whether a demand-led growth model would be better for environmental sustainability. The answer would hinge on the kind of demand that is encouraged: for example, demand that is characterized by consumption of low-carbon and climate-resilient goods and services is very different from one that is based on fossil fuels and natural resource extraction. As such, pursuing a shift to demand-led growth, on its own, is unlikely to address the environmental costs associated with sustained growth, unless the higher wages and earnings of lower income groups that will result from such a shift are spent on goods that are less reliant on fossil fuels and natural resource extraction, and increased public expenditure and investment is also allocated to fuel-efficient sectors and technologies. This is where proposals for green economy become relevant.

1. Green economy

The environmental and social costs associated with dominant patterns of growth have motivated the search for alternative models of development that are sustainable. A case in point is the green economy agenda, where the greening of investment and public policy in both developing and developed countries is intended to enhance environmental protection while also

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creating jobs and stimulating economic growth (ILO, 2012; UNCTAD, 2013a). There are, however, different variants of green economy.

Dominant variants of green economy assume continued, even enhanced, market-led economic growth, through green business investments and innovations that increase energy and resource efficiency and prevent the loss of ecosystem services. Other strands emphasize market-based approaches to environmental protection through financial valuation of natural capital (e.g., Natural Capital Committee, 2013), payments for ecosystem services and schemes for trading carbon and biodiversity credits and offsets. For the proponents of such approaches, markets fail to price natural assets and ecosystem services, which are ultimately factors of production much like capital and labour. The result is that this natural capital is overexploited relative to what is socially or economically optimal. In this context, where negative externalities render market outcomes socially inefficient, market interventions, such as taxing carbon or legislating so that forest management rights are given to local communities, are aimed at properly pricing natural assets and defining property rights. In doing so, they bring market-determined growth processes more closely in line with environmental values (World Bank, 2012).

These market-based approaches can be problematic from a social perspective, leading to greater inequality and injustice for local users vis-à-vis external and global actors. As a recent report by the United Nations Research Institute for Social Development (UNRISD) puts it, payments for ecological services, the process relating to the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) and incentives to produce biofuels often involve trade-offs with smallholder agriculture, biodiversity, livelihoods and food security. Moreover, market-based approaches often promote corporate interests, which in turn may constrain the scope for policy and regulatory reform that is conducive to social and sustainable development (UNRISD, 2012b). As such, there is not enough integration of the social dimensions of sustainable development in these market-based approaches to green economy.

A green economy, according to UNEP, is one that ends extreme poverty, improves human well-being and enhances social equity while reducing carbon dependency and ecosystem degradation and furthering sustainable and inclusive growth (UNEP, 2009; 2011). This definition corresponds to the general understanding of sustainable development and its three dimensions, economic, social and environmental. Green Keynesianism, also presented as green stimulus or a "global green new deal" (GGND), argues for directing government spending towards technology and employment generation in ways that enhance environmental protection and raise efficiency, for instance by retrofitting energy-inefficient buildings or infrastructure (e.g., UNEP, 2009). These sorts of green investments were a much-discussed and promoted part of countercyclical macroeconomic policies adopted in the wake of the global recession of 2008, in both developed and developing countries. The proposal by UNEP emphasized the principle of common but differentiated responsibilities with regard to developed countries, emerging economies, countries with economies in transition and the least developed countries. A "fair and just GGND, therefore, should consider including developed countries' additional support to other countries, especially least developed countries, in the areas of finance, trade, technology and capacity building in the interest of effectiveness as well as fairness" (UNEP, 2009). Gender equality is a marginal concern in most of these proposals.

An alternative to the green economy approaches discussed above is the work of those linked with the environmental justice movements, who see environmental preservation as an opportunity to understand and redress multiple forms of inequality. For example, maintaining crop biodiversity enables future food producers to deal with new pests and diseases that threaten the food supply. Today, crop biodiversity is sustained largely by farmers in the global

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South, but they receive no compensation for this tremendously valuable social and ecological service (Boyce, 2011). Compensating farmers in the global South for their contributions to long-term food security should appeal to green economy advocates, but it also directly addresses questions of development and sustainability in economically just and pro-poor ways. Explicitly incorporating women's traditional work in agriculture, for example, in seed selection and preservation to maintain crop biodiversity, is important in these analyses. Moreover, gender inequality in land rights and access to resources, as well as in the burden of unpaid care work, poses substantial barriers to greening agriculture in sustainable and pro-poor ways (Herren and others, 2012).

2. Women and green jobs

A part of the green growth agenda targets the expansion of green jobs, which are understood primarily in terms of their environmental impact, but also seek to comply with ILO notions of decent work (International Labour Foundation for Sustainable Development, 2009; ILO, 2012; UNEP and others, 2008).[20] In terms of industry, where it is estimated that 80 per cent of green jobs will be located, a small number of manufacturing industries are responsible for a large share of resource and energy use as well as greenhouse gas emissions and other pollutants (International Labour Foundation for Sustainable Development, 2009). These include energy, construction, transportation and, among basic industries, aluminium, iron and steel (ILO, 2012).

Most of the projected employment gains are expected to come from activities involved in transitioning to a low-carbon economy, including developing renewable energy resources, producing more fuel-efficient vehicles, constructing and retrofitting buildings, transport and infrastructure, and waste management and recycling. In manufacturing, the emphasis is on introducing clean processing techniques and controlling pollution, with less of an apparent total employment effect (International Labour Foundation for Sustainable Development, 2009).

Green jobs are generally middle-skill jobs, and expanding sectors are seen as more skill- and knowledge-intensive than their counterparts in conventional industry; the concomitant pay and benefits are also higher (Chan and Ching Lam, 2012; Muro and others, 2011). These features make the association between green jobs and decent work a seemingly natural one, but the connection is closer in some sectors than others. Investments in agriculture, for example, which continues to be the single largest sector in terms of employment, and which is the main sector of employment in rural areas, where the majority of the world's poor and extremely poor live and work, are potentially very promising. The shift to green jobs is also sometimes seen as an opportunity to draw women into non-traditional, more highly paid sectors such as engineering, construction and manufacturing because they are perceived as less limited by entrenched gender stereotypes (International Labour Foundation for Sustainable Development, 2009).

Though the goals of greening jobs are laudable, benefits for women may not be automatic and the potential impacts on women's employment requires explicit consideration. Given the extent of gender segregation in labour markets generally, and within industry in particular, where women constitute only 30 per cent of the global workforce, there is a risk that efforts to green industry will not only bypass women, but actually marginalize them. Sectors targeted for green employment expansion, such as energy, construction and basic industry, are very male-dominated and recent trends indicate that sectoral segregation is increasing rather than decreasing.[21] Among green jobs that already exist, women tend to have low representation and/or occupy the lower value-added rungs. For instance, in OECD countries, where women earn more than half of university degrees, only 30 per cent of degrees in science and technology (key areas of study for green jobs) go to women. In developing economies, women are highly concentrated on the low value-added end of extant green jobs, for instance as informal workers in waste collection and recycling (Strietska-Ilina and others, 2011).

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Envisioning environmentally sustainable industrial transformation means targeting specific skill development and education for women, as well as ensuring equal pay and the elimination of workplace discrimination, as part of the broader decent work agenda (ILO, 2012; International Labour Foundation for Sustainable Development, 2009; UNEP and others, 2008). Efforts to break down stereotypes are also necessary. Gender stereotyping takes place from an early age and is pervasive across society: at home, in schools, in the media and through day-to-day social attitudes and interactions which embed and reinforce them. This contributes to the clustering of women and men into different subject areas in secondary school and higher education. As various studies have shown, the low representation of women in science, technology, engineering and mathematics is related to attitudes rather than ability: girls, for example, do not receive lower scores in mathematics. Even though differences in occupational choices can be traced back to subjects studied, occupational segregation between women and men is further reinforced in the transition from post-secondary education to employment. In OECD countries, for example, even if women choose science, technology, engineering and mathematics as subjects, they are less likely than men to pursue a career in science, although there is no gender difference in performance (Organization for Economic Cooperation and Development (OECD), 2012).

There are several examples of green jobs that have included women. For example, in the "Working for Water" project in South Africa, a part of its expanded public works programme that trained people to remove invasive alien plants in order to enhance water access, ultimately successful efforts were made to specifically recruit women, youth and people with disabilities to take part in the project (Strietska-Ilina and others, 2011). In Bangladesh, as part of a larger project to extend electricity to rural areas by installing solar home systems, women were trained to install and repair solar panels and electrical outlets, serving as "rural electricians" in ways that are revolutionary by traditional labour market standards (ILO, 2012; Sidner, 2011). In the United States of America, a number of programmes aim to encourage women into green jobs through skill development and networking, including the Women in Apprenticeship and Non-traditional Occupations programme, which gives grants to community-based organizations that provide openings for women into non-traditional occupations, such as pre apprenticeship programmes, with recent rounds emphasizing green jobs.

While these efforts are instructive and promising, they do not directly address structural inequalities associated with the low wages, poor working conditions and precarious livelihoods of large numbers of women and men who are beyond the reach of these innovative but small-scale initiatives. Some of this promise can be seen in the case of waste pickers, where efforts for greening work have gone beyond patchy skill development to address informality and marginalization.

In developed countries, the waste management and recycling industries are highly formalized and automated, and they are dominated by men. But in developing and emerging economies, an estimated 15 to 20 million waste pickers, many of them women and children, driven into this work by poverty, reclaim reusable and recyclable materials from what others have discarded, providing an essential environmental service in areas experiencing rapid urbanization with limited public services (ILO, 2012; Samson, 2009). The work is largely informal, the earnings low and unstable, and it is typically associated with strong social stigma and very poor, even hazardous working conditions (ILO, 2012). For example, 20-50 million tons of electronic waste, containing valuable metals, are discarded each year, with much of the discarded equipment exported to countries such as China and India for dismantling. The materials often go to small, informal family workshops or other informal facilities to be processed, where knowledge is limited and dangers are high (ILO, 2012). However, the contributions waste pickers make to social and environmental sustainability are

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Organizing benefits waste pickers by raising their social status and self-esteem, as well as their incomes

substantial: they improve public health and sanitation; divert materials from the waste stream; reduce the need to use new materials; provide very cost-efficient waste management systems for municipalities; and provide livelihoods for the poor and marginalized.[22]

Efforts to organize and enfranchise waste pickers worldwide, both among the waste pickers themselves and with help from global institutions such as ILO, provide a useful example of using green jobs as a channel for greater social inclusion (ILO, 2012). Women are more likely than men to participate in organizations for waste pickers, perhaps because they tend to be concentrated in lower-earning waste-picking activities, and are typically paid lower rates than men for equivalent work. Organizing benefits waste pickers by raising their social status and self-esteem, as well as their incomes. Organized waste pickers are better able to circumvent middlemen and negotiate fair prices for their materials from buyers. Collectively, they are also better able to prevent harassment and violence. There are also attempts to better incorporate waste pickers into waste management and recycling value chains, countering the push towards commercialization, which is linked with incineration and landfill technologies. These attempts instead promote zero waste strategies that maximize recycling and provide decent employment for the poor (ILO, 2012). Examples of such efforts abound in all regions of the world, with most focused on expanding the social power and safety that comes with collective organization, legalizing and formalizing relationships with municipalities and increasing access to social protections.

D/ ALTERNATIVE RESPONSES TO UNSUSTAINABILITY: INVESTING IN PUBLIC GOODS AND THE CARE ECONOMY

A gender-responsive green economy that enhances women's employment prospects and the quality of their work along the lines of the decent work agenda is an important step towards addressing both social sustainability and gender inequality. But it is not sufficient. In order to redress gender inequality and promote the three dimensions of sustainable development, policymakers need to pay attention to investments in public goods and the care economy.

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Nohra Padilla, a waste picker since the age of 7, organizer, and activist from Bogota has brought the struggle for livelihood rights for waste pickers to the global stage. She was awarded the Goldman Environmental Award in 2013. Here Nohra is speaking to waste pickers from around the world at the First Global Workshop of Waste Pickers in Pune, India

Since the crisis of 2007–2008, there have been important calls for the reform of the global financial system. But there is growing recognition that not only will the global financial system have to be changed in order for economies to meet the economic, social and environmental dimensions of sustainability, but dominant production and consumption patterns will also have to change. "Measures to end the crisis will fail if they simply seek to restore growth and greed" (Elson, 2011). More sophisticated criteria than simple GDP measures will need to be developed in order to assess success.

Measures to end the crisis will fail if they simply seek to restore growth and greed

There are calls for an ecological macroeconomics, the starting point of which must be to abandon the presumption of perpetual consumption growth as the only basis for economic stability and to identify the conditions that define a sustainable economy, including strong resilience to external shocks and avoiding internal contradictions, which create social tensions during recessions; secure livelihoods with equality; and sustainable levels of resource use that protect the ecosystem (Jackson, 2011).

Across the world, an increase in privately produced and consumed goods and services, rather than the increase in the enjoyment of human rights, expanded capabilities and well-being, has been used as the hallmark of success. Women, too, have been encouraged to understand gender equality and empowerment in terms of being able to buy more consumer goods (Elson, 2011). It is frequently assumed that policymakers should first try to maximize the economic pie (GDP), and then address issues of equality, well-being and justice by redistributing the pie. Another assumption is that the best way to create wealth is through production by privately owned, profit-seeking businesses operating in markets that are regulated in ways that promote competition between such businesses. The human rights- and capability-based approaches have a different aim, which is the expansion of people's substantive choices to live a life they have reason to value. This means being able to enjoy a richer set of rights, far beyond the utility that would come from consuming more. It would include the right to be free from poverty and hunger, the right to health and social security, and the right to participate in decisions that affect one's life.

Feminist economics shares many of the values of the human rights and capability approaches, but it places a particular emphasis on an economic and social system that includes not only paid work but also non-market unpaid care work (Grown, Elson and Cagatay, 2000). Most mainstream economic approaches that inform policymaking tend to privilege production for the market. The sphere of unpaid work is taken for granted. Feminist economics challenges this exclusion, arguing that as well as the economy of the market and the state, policymakers need to take into account the unpaid economy in which people produce goods and services for their families, friends and neighbours on the basis of social obligation, altruism and reciprocity, and in some cases, coercion. In this unpaid economy, people produce food and clothing, fetch fuel and water, cook and clean, and take care of others, especially children, frail elderly people and those who are sick (Elson, 1998; 2011; Folbre, 1994; 2001; UNDP, 1995; UNRISD, 2010). There are two reasons for underscoring the centrality of the unpaid economy for policymaking: first, because it makes a fundamental contribution to people's well-being, which is critical for social sustainability; and second, even though unpaid care is not adequately measured through statistics and taken into account in policymaking, it affects the operation of other parts of the economy, including private firms (large and small), the public sector and the non-governmental sector, by affecting the quantity and quality of labour needed to run these

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entities; as such, it creates the foundation for economic sustainability (Elson, 1998; 2011). These alternative ways of thinking about economic success and failure direct attention to two sets of issues that are fundamental for policymaking.

First, policymakers need to address the issue of how people can be guaranteed the exercise of their human rights and capabilities (to be well-nourished, healthy, literate, able to take part in the life of the community) when the resources they obtain through their existing entitlement relations, through paid work or subsistence agriculture for example, are not sufficient. The insufficiency of their market-based earnings may be as a result of working in low-paid sectors of the economy, or having unpaid care obligations that do not allow them to earn an adequate income, or attributable to not owning capital or land that would generate sufficient earnings from self-employment. But there are also structural factors that often explain such entitlement failures: for example, highly unequal and discriminatory property relations that prevent significant numbers of people, especially women, from accessing land and other productive assets; and high levels of structural unemployment, underemployment and informality that do not allow people, in particular women, to realize their right to work and their rights at work.

In response to such failures in recent years, policymakers in different parts of the world have directed their attention to social security systems.[23] Many useful lessons have been learned from the narrowly targeted safety nets of the early 1990s that aimed to identify the needy through various means tests: in the context of weak administrative capacity, means tests can be administratively costly; inadequate information about household circumstances adds to this complexity and can exclude the poor (through so-called errors of omission); social assistance measures need to be institutionalized, rather than ad hoc measures, and financed where possible through a robust tax-and-transfer system; and in contexts of pervasive poverty, broad-based and universal systems can be more accessible, more transparent and more effective than narrowly targeted measures (Mkandawire, 2005; UNRISD, 2010; Sepúlveda and Nyst, 2012).

Indeed, the need for social security systems that are responsive to changing circumstances is now more urgent than ever, as recognized by the Social Protection Floor Initiative. Recurring and multiple crises have highlighted the importance of social protection as a buffer against sudden drops in income and employment. In addition, rapid rates of urbanization, changes in family and household structures, demographic transitions, migration and health crises of various kinds call for innovative approaches that are able to protect people and help them adjust in the face of new challenges. In doing so, social protection measures can bolster the realization of economic and social rights, but also foster economic development and transformation (UNRISD, 2010).

However, the potential of social protection measures is still far from being realized. Only 27 per cent of the world's population enjoys access to comprehensive social security, whereas 73 per cent are covered partially or not at all (ILO, 2014). Similarly, it is estimated that about one third of the global population lacks access to any health care, and for an even greater share, health costs are a major burden and an important factor pushing households into poverty and indebtedness. Progress on the attendance of girls at secondary school, the number of births assisted by skilled health professionals and access to improved water sources and sanitation facilities has also been mixed. While many countries have seen significant improvements in these indicators over the past two decades, access among lower-income women and girls lags well behind that of higher-income women and girls (United Nations, 2013b). Disturbingly, inequalities between women from different income groups have widened rather than narrowed in a number of countries (Elson, 2014).

Women are disproportionately affected, and in different ways, by the lack of access to social security and social services, compared

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to men (Razavi and Hassim, 2006). Gender inequality is particularly visible in contexts where public provision is weak, since women's more constrained access to income, savings and assets means that they are less likely to be able to access private insurance schemes and are more affected by user fees for social services. The absence of adequate public support also reinforces the reliance on informal social security systems. Dependence on kinship and community networks can be deeply problematic from a gender perspective. On the one hand, these networks usually rely, to a significant degree, on women's unpaid care work. On the other hand, prevailing social norms and gender power relations in households and communities may limit the extent to which women's own needs are acknowledged and addressed.

Greater state involvement does not in and of itself resolve these problems. Examples abound of gender gaps in access to public social security and gender-blind social service delivery. In some contexts, social security and services are delivered in ways that marginalize, stigmatize or overburden women, especially those from poor, ethnic minority, disabled and indigenous backgrounds (Sepúlveda and Nyst, 2012). As a result, women's enjoyment of basic human rights, including the right to an adequate standard of living, is severely hampered. Greater state involvement in the regulation, financing and provision of social goods is not a sufficient condition for substantive gender equality. From a human rights perspective, the state is the duty bearer that must guarantee the enjoyment of human rights. The human rights system underscores the positive duties of the state to respect, protect and fulfil rights.[24] These principles have been used by the Committee on Economic, Social and Cultural Rights, in its General Comments on specific rights including the rights to education; health; water; work; and social security.[25]

The second element that needs policy attention is the system of production and consumption. It is important to critically examine the dominant systems of production and to create new production systems that will be supportive of the realization of rights, of gender equality and of ecological integrity.

An important element of this alternative production system is the need to pay far greater attention to social production, investment and consumption (Elson, 2011). This would mean production by for-profit as well as non-profit institutions such as cooperatives and community enterprises, community management of forest and irrigation systems, as well as community kitchens and childcare centres. While states may be active in some of these arrangements, they would not be the only actors. The advantage of these hybrid systems is that they can be responsive to the needs and demands of all, irrespective of income or wealth. "It is often argued that private production is more responsive to consumer demand, but the response is only to consumers with enough money" (Elson, 2011). It is important that social production responds not only to the rights and interests of producers but also to the rights of users. This would require the strengthening of rights of users and building direct links between producers and users.

Social production and investment are vital to ensure a sufficient quantity of public goods, that is to say goods whose benefits spill over to those who do not directly utilize them: education, public health, good public transport systems, water and sanitation and clean energy systems. It is now increasingly recognized that a sustainable climate is an important public good. What is not sufficiently recognized is that a sustainable care system is also an important public good (Folbre, 2001). Much of this care is provided on an unpaid basis (Budlender, 2010). But paid care services also make up a growing part of the economy and of employment in many countries, especially of women's employment (Razavi and Staab, 2010).[26] The availability of care services, whether these are provided through households and communities on an unpaid basis, or through markets and the public sector which employ care workers, is essential for the well-being of all persons. When

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care work is decently paid and protected, it can meet the interests of both care workers and users of services. It can also reduce the burden that is placed on women and girls in their role as unpaid carers.

To date, the care economy has been largely isolated from the ongoing policy debates on the green economy. Part of the problem lies in how economists think about growth. By the standards of a typical growth model, the process of development is simply a process of accumulation of capital and growth in productivity. Though most contemporary growth models incorporate some measure of human as well as physical capital, human capital is rarely treated as a component of investment.[27] And while growth prescriptions almost always call for investment in skills, such calls are limited to increasing formal education. This approach to growth and development ignores the significant amount of unpaid and paid care work that goes into sustaining people from day to day and from one generation to the next.

One way for policy to support the care economy is by shifting towards more care-intensive or social services-intensive activities, which would also have environmental benefits, since providing care does not generally entail intensive use of environmental resources (Jackson, 2011). The service sector is the largest employer of both women and men in high-income countries, and an increasingly important contributor to productivity growth in developing economies. The service sector, however, is highly uneven. Higher value-added services (e.g., information and communications technology) tend to generate very little employment relative to their added value in emerging economies (UNCTAD, 2010). Care-related services, in addition to their added value, are both labour-intensive and traditional sources of employment for women, and so offer the potential to increase women's employment.

Governments are increasingly recognizing this potential. In the Republic of Korea, for example, since 2000, the government has significantly expanded social care provision in the form of universal long-term insurance schemes for the elderly and publicly subsidized childcare.

When care work is decently paid and protected, it can meet the interests of both care workers and users of services

These and other social policy measures, such as statutory parental leave, which were adopted to support the care economy, are seen as an engine for economic growth by redistributing care responsibilities more equally between state, market, family and community (Peng, 2012).

Another example is Pakistan's "Lady health worker" programme, which establishes a vital link between households and health services, particularly for women in rural areas, whose mobility is restricted. The programme is also a major employer of women in a country where employment opportunities for women are rather limited. The women who are recruited undergo training from a qualified doctor at the closest primary health-care centre for 15 months. They can then work from home, where they attend to community members, hold meetings and store basic medicines, including contraceptives. Lady health workers work an average of 30 hours per week. The programme is an important source of regular and predictable income for these women. It also offers women expanded mobility and enhances the visibility and credibility of working women (Khan, 2014). As such, it can be seen as a catalyst of positive change and a source of empowerment through the state-sponsored expansion of health-care employment. It is important to note, however,

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that these workers earn less than the national minimum wage.

The experience of Pakistan's lady health workers, in terms of pay, is far from unique. The care sector is characterized by relatively low earnings and exacts what is termed a "care penalty" in pay. The care penalty refers to the systematically lower wages that care workers receive compared with wages for non-care jobs that require similar levels of skill and education (Budig and Misra, 2010; England, Budig and Folbre, 2002). Comparing the salaries of primary teachers and nurses in more than 20 developing countries reveals that in 2009, many were near the poverty line (Chai, Ortiz and Sire, 2010). The terms and conditions of employment for care sector workers need to be better regulated and improved (Folbre, 2006). This requires effective regulation and monitoring by states, but also a critical role to be played by the organizations of care workers and of care-users, who need to build public confidence in such services and sustain their adequate financing.

Raising women's employment in service sector occupations, especially care related services, must include policies that address overall gender segregation in labour markets and the relatively low pay of such workers. The absence of such policies risks confining women to a few occupations and exacerbating occupational segregation. Therefore, public investment in the care sector needs to be accompanied by policies that reduce occupational and sectoral segregation and improve the pay and labour market conditions of such work so that women have an expanding range of options open to them. To be truly sustainable, an economic strategy that is responsive to care needs and to gender equality must also be concerned with making care work decent work. It falls on the state to lead the shift from a strategy that relies on market-based and "voluntary" provision of care that is of the most informal and exploitative kind, to one that nurtures professional forms of care with decent pay (UNRISD, 2010).

One important step towards this is the Domestic Workers Convention, 2011 (No. 189) of the International Labour Organization. The convention, which entered into force in September 2013, for the first time in history extends basic labour rights to an estimated 53 million domestic workers, 83 per cent of whom are women, many of them belonging to racial or ethnic minorities (ILO, 2013). To date, 14 countries have ratified the convention and it has entered into force in nine of those countries. While increasing ratifications is clearly a priority, it is important to acknowledge that other countries have also taken important steps to regulate domestic work and ensure decent pay and conditions for these vulnerable workers. In Namibia, unlike in many countries, domestic workers are covered by labour legislation and they have the same rights to employment protection, weekly rest and maternity leave (ILO, 2013). However, enforcement of these rights remains a challenge. In response to this and in order to move closer to ratification of the Convention, the Government of Namibia set up a Wages Commission in 2012 to recommend a new minimum wage for domestic workers and investigate other conditions of work (Hammerton, 2013).

There are some common elements between environmental services and care services. Both exist primarily outside of the traditional market sphere, but they are increasingly commodified and their market valuation is far from an accurate reflection of their social value. In a related sense, they are public goods with positive externalities that make the market mechanism an economically inefficient arbiter of their use. As a result of these market failures, both human and natural resources are in danger of being overexploited, given the incentives produced by the prevailing global economic system.

These parallels point to the need for state action, both in terms of regulating markets in ways that more equitably and accurately price the social value of ecosystem services and care, and as regards social provisioning of and

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investment in infrastructure and services that reflect their nature as public goods. Barring such intervention, market operations will result in shortages of ecological and care services, shortages that ultimately press into the realm of crisis.

E/ BROADENING THE GREEN ECONOMY AGENDA

The dominant development models present formidable challenges for social, environmental and even economic sustainability, as the multiple crises of recent years have made clear. Current economic models have been limited in reducing gender inequalities and enabling the realization of human rights. Policymakers need to steer their economies and societies along new pathways, within which sustainability and gender equality can reinforce each other. In order to do so, policies should be aimed at the creation of green jobs that offer decent pay and working conditions and provide social protection and prospects for advancement, within an enabling macroeconomic framework policy.

Current efforts to promote green jobs often overlook the potential, in the context of creating a green economy, of providing decent work and sustainable livelihoods for women. If green jobs schemes are to expand their scope and impact, they need to become more inclusive of women and more gender-responsive. This means ensuring that green growth policies increase access for women, particularly poor and marginalized women, into high quality jobs in sustainable and low-carbon industries. The potential of integrating the green and care economies remains largely untapped, but if properly resourced and supported, would constitute an important strategy for achieving economic, social and environmental sustainability.

If green jobs schemes are to expand their scope and impact, they need to become more inclusive of women and more gender-responsive

In order for this strategy to advance gender equality and human rights, the expansion of women's capabilities and the recognition, reduction and redistribution of care would have to become key criteria for policy success. Moving away from current patterns of consumption and production requires an emphasis on social investment, production and consumption through hybrid systems involving for-profit as well as a variety of non-profit institutions that can be responsive to people's needs and demands, irrespective of their income or wealth. A key priority would be investments in a variety of public goods, including health, education, food, water and sanitation and sustainable energy, as well as robust and gender-responsive care systems to ensure social sustainability.

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CHAPTER 4

FOOD SECURITY AND GENDER EQUALITY

A/ INTRODUCTION

Achieving food security is a central part of sustainable development, across the three dimensions. The ability of people to realize their right to food, to feed themselves, is essential today, but so is the capacity of future generations to be able to exercise their right to food. Ensuring an end to malnutrition and hunger requires a focus on agriculture and food production systems both in their relationship with natural resources on the one hand, and with global and national economic structures and policies, on the other. Achieving that goal also requires analysis of the context-specific social relations, including unequal gender power relations that constrain access to food by individuals and households.

The problems of hunger and malnutrition have recaptured the attention of world leaders since the food crisis of 2007 onwards, but the challenges have their roots in both long-term and short-term policy failures. This chapter is concerned with food security as an essential aspect of sustainable development, with gender equality at its core, because to be free from hunger is a human right, and to be adequately nourished is a basic capability without which many other opportunities for a fulfilling life cannot be seized. In particular, women's and girls' right to food and nutrition must be supported.

The right to food was first recognized in the Universal Declaration of Human Rights (General Assembly resolution 217 A (III)), adopted in 1948, and later elaborated in the International Covenant on Economic, Social and Cultural Rights (see General Assembly resolution 2200 A (XXI), annex). The International Covenant reaffirms the right to food and the important elements of availability, accessibility and utilization, as well as the fundamental right of everyone to be free from hunger. In its General Comment No. 12, the Committee on Economic, Social and Cultural Rights explained the normative content of the right to adequate food (article 11 of the Covenant). It underscored, among other elements, the importance of cultural appropriateness, nutritional adequacy and sustainability of access, and outlined the obligations of states and the international community in reinforcing the right to food (see E/2000/22 and Corr.1, annex V, General Comment No. 12).

The definition of food security that was adopted at the World Food Summit, in 1996,[10] reflects the need to prioritize access and asserts that food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The four components or pillars of food security include the availability of food; economic, physical and social access to food; food utilization; and the stability of these three dimensions over time. The outcome document of the United Nations Conference on Sustainable Development further reinforces the right to food (General Assembly resolution 66/288, annex, para. 108) and highlights "the necessity to promote, enhance and support more sustainable agriculture, including crops, livestock, forestry, fisheries and aquaculture, that improves food security, eradicates hunger and is economically viable, while conserving land, water, plant and animal genetic resources, biodiversity and ecosystems and enhancing resilience to climate change and natural disasters" (resolution 66/288, annex, para. 111).

Though substantial progress has been made in reducing the incidence of hunger and malnutrition over the past two decades, current trends in food consumption and production raise concerns about the prospects for achieving sustainable food security. Undernutrition and

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malnutrition persist in old forms, while new forms are also on the rise. Climate change and environmental degradation affect food production, especially for the most food-insecure households. While competition regarding land use for biofuels, along with new financial instruments, contribute to price volatility in global markets for cereals, increased demand for farmland from foreign investors risks disrupting the access of smallholders and pastoralists to land for sustaining their livelihoods.

Current debates about priority investments to combat hunger and malnutrition are framed as a problem of imbalances between production and population, or global shortages, rather than the inability of individuals to acquire food that is of adequate quantity and quality. A broad array of national and global policy actors and researchers have called for a 70 per cent increase in food production by 2050 in order to feed the estimated world population of 9 billion people. The focus is on global aggregates rather than the situation of countries and subnational groups. This approach dominates popular as well as academic and public policy debates and explains hunger as a problem of production shortages, attributable to such factors as overpopulation, war and drought, to which climate change and increasing biofuel production are adding new pressures (Tomlinson, 2013).

Food production is clearly an essential element of food security, but it is not the only one. As Amartya Sen pointed out more than three decades ago, hunger is about "people not having enough food to eat. It is not the characteristic of there not being enough food to eat" (Sen, 1982). Food security depends on access. In the context of climate change and environmental degradation, access to food for both food producers and food purchasers may become more constrained. A policy agenda on food security must be based on an analysis of the constraints to the acquisition of food of adequate quality and quantity. Food security must be considered a public good, the provision of which states must ensure in the context of an enabling international environment.

A policy agenda on food security must be based on an analysis of the constraints to the acquisition of food of adequate quality and quantity

Gender analysis is important for understanding the causes of hunger and malnutrition because women play critical roles in the food system, in the production, processing, preparation, consumption and distribution of food, as well as in its distribution (FAO, 2011). Yet women face discrimination and often have limited bargaining power in these roles, and the discrimination is reinforced when gender inequality intersects with other inequalities. Gender relations within the household and wider society shape the distribution of and access to food for consumption. Gender inequality shapes access to land and other resources needed to produce food, as well as the allocation of household incomes to food and other determinants of food security, such as health. Gender relations also shape the consequences of changing market conditions for both food production and distribution.

Approaching the food security challenge as a matter of imbalances between production and population obscures the complex gendered dynamics of local and global food markets, intra-household allocation of food and the production systems that are the root causes of hunger and malnutrition. Sustainable food security cannot be achieved without the agency and decision-making of women in the food system and without recognizing and overcoming the constraints that they face as producers and consumers. The policy challenge is to assess the productionist approach to food security and to reintroduce the human rights and gender perspective that privileges access, as an important component of sustainable

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development. To reintroduce that perspective, the chapter highlights the structural factors at multiple levels, from the household to the global, including gender power relations and the impact of climate change, that drive food insecurity. It draws attention to the policies that are needed to address these constraints as priorities for ending hunger.

B/ FOOD INSECURITY: RECENT TRENDS

1. Persistence of hunger and malnutrition

Goal 1 of the Millennium Development Goals, and specifically the target of halving the global incidence of hunger by 2015, has been considered relatively unambitious. Monitoring progress on this goal indicates a steady decline between 1990-1992 and 2011-2013, with the proportion of people who are undernourished declining from 18.9 per cent to 12 per cent. This leaves an estimated 842 million people, or 1 in 8, undernourished[28] (FAO, 2013c). However, this understates the severity of hunger and malnutrition. According to the United Nations Children's Fund (UNICEF), 26 per cent of children, or 1 in 4, are stunted, which is evidence of long-term undernutrition that compromises the mental and physical development of the child.[29] It is estimated that 2 billion people suffer from micronutrient deficiencies, such as deficiencies of vitamin A, zinc and iron (Von Grebmer and others, 2013). Anaemia, caused by poor nutrition and deficiencies of iron and other micronutrients, affects 42 per cent of all pregnant women in the world and contributes to maternal mortality and low birth weight (World Health Organization (WHO), 2008; UNICEF, 2008).

The aggregate data on caloric undernourishment reflect nutritional outcomes averaged out over a year, and they therefore miss the uneven progress across regions and countries, and particularly at the sub-national level. Survey data on food security assessments reveal a clearer picture of the difficulties households face in meeting their food needs. The surveys find significant levels of food insecurity worldwide, even in countries with relatively low levels of food insecurity as measured by aggregate food supply. For example, the 2012 household food security survey in the United States found that 14.5 per cent of all households (17.6 million households) reported being food insecure and experienced difficulty providing enough food for all their members, and 7 million of the 17.6 million households had very low food security (Coleman-Jensen, Nord and Singh, 2013). Households with children headed by a single woman accounted for 35.4 per cent of all food-insecure households, while households headed by a single man accounted for 23.6 per cent. Women of colour, in particular, were shown to be at an extreme disadvantage (Coleman-Jensen, Nord and Singh, 2013). In South Africa, the 2012 household survey found 22 per cent of households (26% of the population) were experiencing inadequate access to food (Statistics South Africa, 2013). This contrasts sharply with the indicator used by FAO regarding the prevalence of undernutrition, which showed a very small proportion of the South African

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population (under 5 per cent) to be in this category during the period 2010–2012 (FAO, 2013a).

Moreover, a new form of malnutrition has emerged as an urgent challenge affecting countries in all regions of the world: obesity. Obesity as a form of malnutrition often coexists with undernutrition and results from shifts from local and traditional diets to diets that are increasingly heavy in salts, sugars and fats, characteristic of processed foods. Obesity raises the risk of cardiovascular diseases and many cancers. The global prevalence of combined overweight and obesity has risen in all regions, with the prevalence among adults increasing from 24 per cent to 34 per cent for adults between 1980 and 2008. The prevalence of obesity among children has increased even faster, doubling from 6 per cent to 12 per cent over the same period (FAO, 2013b). Overweight can co-occur with underweight within the same household, and is on the rise in countries with a high level of undernutrition, such as India and the Philippines (FAO, 2006).

2. Identifying the food insecure

Food insecurity is concentrated in South Asia and sub-Saharan Africa. Together, the two regions account for some 60 per cent of the world's undernourished (FAO, 2013a) and three quarters of stunted children (UNICEF, 2013). While progress has been significant in South Asia, it has been slower in sub-Saharan Africa, where the total number of undernourished people has only recently begun to decline.

However, the countries where food insecurity is of serious concern are not limited to these regions. Several countries in Latin America and the Caribbean (e.g., Guatemala, Haiti), South-East Asia (e.g., Cambodia, Lao People's Democratic Republic, Timor-Leste), and Central Asia (e.g., Tajikistan) figure among the 56 countries classified as having "serious", "alarming" or "very alarming" situations in the 2013 Global Hunger Index (International Food Policy Research Institute, 2013), a composite measure that incorporates undernourishment, child underweight and child mortality. In Guatemala, the prevalence of undernourishment in the population nearly doubled from 16.2 per cent to 30.4 per cent between 1990–1992 and 2010–2012 (FAO, 2013a). In addition, the rate of malnutrition among indigenous children under 5 years old is almost double that among non-indigenous children (65.9% compared to 36.2%) (UNICEF and Central Institute for Fiscal Studies, 2011). While surveys in India show the proportion of undernourished children falling by a third, from 26 per cent to 17 per cent over the same period, more detailed data show the stubborn persistence of stunting and other forms of under-nutrition, underweight and anaemia among men and women, affecting between a quarter and over half of the population (FAO, 2013a). The limitations of national and global data sets mean that there is very little information on the gender dimensions of hunger (see box II).

The hungry are located predominantly in rural areas, where an estimated 80 per cent of the world's hungry live, among whom are smallholders (50%), landless labourers (20%) and those who depend on herding, fishing and forest resources (10%) (UNDP, 2005). The perversity of food producers and their children going hungry is captured in the case of women farm workers and their children in South Africa's commercial agricultural plantations, who experience widespread food insecurity. Faced with spiralling input prices, commercial farmers have tried "relentlessly to save on labour costs" by casualizing the labour force; this has produced devastating consequences for women farm workers both in terms of the availability of paid work and the low wages they receive.[30] Elsewhere, too, women are disproportionately affected by food insecurity. More than one third of adult women in Bangladesh, India and Pakistan are underweight (Von Grebmer and others, 2013). Hunger overlaps with other forms of vulnerability and exclusion. In India it is concentrated among women who are from low castes and scheduled tribes, from the bottom two wealth quintiles and among those who live in rural areas (Gillespie, Harris and Kadiyala, 2012; FAO, 2011).

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Box II

Data on food security: a key obstacle

Data gaps pose a major obstacle to gender analysis and for the monitoring of implementation of the right to food. In the most commonly used and collected international data series, for example, the proportion of undernourished or underweight children under 5 years old, there are virtually no data disaggregated by sex. Sex-disaggregated data are only collected at the national level on a limited number of internationally comparable indicators, such as body mass weight and certain micronutrient deficiencies.

The Food and Agriculture Organization of the United Nations (FAO) has developed an extensive indicator set covering multiple determinants of food security (availability, economic access, physical access, utilization, vulnerability) and outcomes (access, utilization) (FAO, 2013a). However, only 1 of the 40 indicators could be considered a gender indicator: anaemia among pregnant women. In order to assess women's realization of the right to food, it will be important to include the factors that determine their food security, disaggregated by sex, such as women's access to land and other resources, time-use and decision-making capacity.

In addition, economic data on food prices and markets are well developed for global aggregates: monthly prices on world markets for maize, rice, sugar and other commodities are monitored and published. This is valuable in understanding the overall market environment. However, more disaggregated information is needed in areas that are much less consistently monitored, but that are essential for monitoring people's access to food, including on prices at the national and local levels, and on the relationship between incomes and prices.

C/ STRUCTURAL CONSTRAINTS AND DETERMINANTS OF FOOD SECURITY

1. The paradox of plenty

For most of the twentieth century, hunger was seen as a problem of supply shortages at the national and global levels. For example, the World Food Conference, held in 1974, defined food security as: "Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (United Nations, 1975).

However, as hunger persisted, even as global production increased and food prices fell from the 1970s to the 1990s, this view of food security was challenged by many food security and

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policy experts (Hoddinott, 1999; Longhurst, 1988; Sen, 1982). Hunger thus came to be understood increasingly as a problem of distribution and access, and not only one of production and supply. The entitlement approach to hunger and famines developed by Amartya Sen (Sen, 1982; Drèze and Sen, 1991), and those yielded by international human rights norms, provided an intellectual and ethical foundation for the human-rights based approach to food security. Sen argued that famines occur even when there is plentiful supply, because individuals and households lose the means to acquire food (entitlements). Three means of access or entitlement were identified: wage exchange, own production, and social transfers, which would also apply in situations of endemic, or deeply-rooted and persistent, hunger and undernutrition (Drèze and Sen, 1991).

The capability to be well nourished depends not only on access to food and its utilization, but also on other capabilities such as being healthy, knowledgeable, having a say in household decision-making, and many others. Hunger and undernutrition depend on a host of economic, social and political factors that affect a person's ability to consume and utilize food that is adequate in quantity and quality. Stability of access is the other crucial component (Drèze and Sen, 1991).

Household incomes, national incomes and economic growth are important drivers of food security. Food comprises around half or more of household expenditures for low-income households under the poverty line. Abundant production drives down prices for both domestic and imported supplies. But these links are not automatic: in a paradox of plenty, hunger and malnutrition persist in contexts of plentiful and growing production and incomes. Three trends illustrate this paradox.

First, food production has more than kept pace with population growth in all regions[31] and food availability per person has improved across the world over the past two decades. At the country level, the adequacy of food supply is strongly correlated with the prevalence of undernourishment since the latter is an estimate modelled on caloric supply. However, supply is not related to other nutritional indicators, including stunting (FAO 2013c). Countries with adequate dietary energy supply can have high levels of stunting, such as Bangladesh, Ghana and Nepal. Such persistence of malnutrition is often attributed to the ineffective utilization of food that is consumed. But it could also reflect unequal distribution of available food within the country and within the household.

Second, hunger and malnutrition persist and the latter is on the rise, in the form of obesity, in rich countries such as the United States, as well as in upper-middle-income countries such as South Africa. The rise in malnutrition reveals gaps in households' ability to access food given the prevailing distribution of income, price levels, social transfers and the physical availability of nutritious food, the supply of which is increasingly driven by the global food industries and supermarket chains. Diets are changing as people rely increasingly on purchased processed foods in place of traditional diets richer in fibre, minerals and vitamins. Middle-income countries such as Ghana, Guatemala, Namibia and others have experienced some of the most serious problems of hunger. The situation has deteriorated in Guatemala for example, where the Global Hunger Index score is worse in 2013 than it was in 1990 (IFPRI, 2013).

Third, although in developing countries household incomes are a primary means of food access, the decline in undernourishment since 1990 (9 percentage points, from 24% to 15%) has not kept pace with the decline in the incidence of income poverty (23 percentage points, from 47% to 24%). Moreover, cross-country analyses show higher levels of poverty linked to higher prevalence of under-nourishment, but with wide variance. The disconnect between income levels and hunger is more marked when considering stunting and micronutrient deficiencies. For example, Ghana has made rapid progress in reducing the incidence of household income poverty and of caloric undernourishment.But malnutrition persists, with a prevalence of stunting that still affected nearly a quarter of children

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who were under 5 in 2011, though this was an improvement from one third of children under 5 being affected in 1994 (FAO, 2013c).

The persistence of malnutrition in spite of improvements in household incomes is often attributed to poor utilization of food, owing to underlying health status and environmental conditions, such as a lack of access to clean water and sanitation (FAO, 2013c). But a gender analysis of structural constraints might reveal other reasons as well, notably the mal-distribution of nutritionally adequate food within households (Drèze and Sen, 1991; Harriss, 1995).

2. Food security and gender equality

(a) Gender equality, rights and capabilities

Embedded in the right to food and the entitlement approach are the principles of agency and equality. Just as the entitlement approach focuses on hunger being caused by the loss of a person's means to acquire food, the right to food "is not a right to a minimum ration of calories ... or a right to be fed. It is about being guaranteed the right to feed oneself ..." (De Schutter, 2011). Inherent in the concept of human rights is the choice of the individual in meeting those nutritional needs, and their agency in doing so. A person's ability to acquire nutritious food is therefore closely related to other aspects of their capabilities and rights.

By allowing a focus on the individual, rather than on aggregates (e.g., nation, community, household), the human rights perspective accommodates a gender analysis of food security. It can open up enquiry into the intra-household dynamics of food allocation by gender and age, examining the role of women in household and community food production, in management and in decision-making.

The central role of women in food production and household food management and the important consequences of gender relations for food security have been amply documented (Agarwal, 2012). Evidence from studies over the decades clearly shows that women face unequal constraints as producers in being able to access productive assets such as land, common property resources, machinery and livestock, credit and other financial services and improved inputs (Agarwal, 2012; FAO, 2011). The "structures of constraint" (Folbre, 1994) and inequalities that hamper women's decision-making power and control over assets and earnings result in large part from social and economic institutions, in particular: discriminatory laws, social norms, values and practices that allocate rights and responsibilities and access to resources unequally; the gender division of labour that places unequal and heavy burdens for unpaid care work and unpaid family labour within agriculture on the shoulders of women and girls; gender discrimination in labour markets that limits women's access to decent work; and unequal power relations on the basis of gender that pervade both private and public spheres and constrain the decision-making power of women and girls. As explored below, in many instances, these constraints are intensifying in the context of environmental degradation and climate change.

These systemic disadvantages that women face intersect with other forms of inequality and exclusion on the basis of low income, group identity (ethnic, racial) and location. For example, indigenous women living in rural areas are likely to be particularly disadvantaged in terms of their access to land and housing (Hernández Castillo, 2002). Likewise, low-caste women are frequently confined to the least remunerative segments of the labour market (Harriss-White and Gooptu, 2001).

Inherent in the concept of human rights is the choice of the individual in meeting their nutritional needs, and their agency in doing so

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These intersecting and structural inequalities conspire to hamper women's access to adequate food, whether through own production, capacity to purchase food through earnings, or capacity to make an effective claim on social transfers (e.g., cash transfers or in-kind food provision). In addition to these three routes, the intra-household distribution of food can put girls and women in a disadvantageous position, receiving less and lower quality food than men and boys, which has been well documented for South Asia in particular (Harriss, 1995). Powerful social norms and implicit rules shape these intra-household transfers. But the problem is that when these norms and implicit rules are unfair, women are not able to claim their human rights because accountability mechanisms are not in place and there is often no redress (Elson, 2002).

(b) Rural livelihoods and gendered structures of constraint

Own production by smallholders is an important source of food security, and of livelihoods overall, in many parts of the world. Agriculture still accounts for 47 per cent of total employment in South Asia (2010-2012), and exceeds 50 per cent in most of the sub-Saharan African countries for which relevant labour force data are available, though the sector contributes much less to GDP (18% in South Asia and 14% in sub-Saharan Africa) (World Bank, 2014).

Unlike the classic transitions from agriculture to manufacturing (and from thereon to services) that took place in high-income industrialized countries, under current globalized conditions, the manufacturing sector in developing countries is unable to absorb the labour force that is being pushed out of agriculture (UNRISD, 2010; Li, 2011). At the same time, smallholder agriculture is increasingly under pressure as a viable livelihood, leading to high levels of rural poverty and outmigration. In the context of environmental degradation, it is often the men who migrate in times of difficulty and the women who are left to labour on increasingly unproductive land, while being responsible for household and family welfare (Skinner, 2011). Alongside environmental drivers, another factor in this process, as noted below, has been the shift in the policy environment, where liberalization policies have led to the withdrawal of public investment and support to agriculture.

Women farmers face both long-standing and new constraints in achieving food security. Many are systemic in nature and relate to the withdrawal of state support, in the 1980s and 1990s, for access to improved technology, credit, inputs and markets. Other constraints are anchored in social structures and power relations, including insecure rights to land, weak bargaining positions within the household and unequal access to resources and markets (FAO, International Fund for Agricultural Development and International Labour Office, 2010). In developing countries, most farmers operate or work on small farms, often in marginal environments, and/or as landless labourers. The historical institutionalized constraints to women's land ownership, through inheritance, purchase or in land reform programmes, are well documented and continue (Jacobs, 2010). While there are no global data sets to show gender inequalities in access to and ownership of land, available data show substantial gaps in diverse parts of the world: in Nepal, women own land in only 14 per cent of landowning rural households; in China, 70 per cent of farm operators without their own land are women; in Kenya, only 5 per cent of registered landowners are women; in Bangladesh and Pakistan, the land holdings of male-headed households are more than twice the size of the holdings of female-headed households (Agarwal, 2012).

Recent survey research from three diverse regional contexts provides asset data at the individual level for Ecuador, Ghana and Karnataka (India) to illustrate the scale of the problem of gender inequalities in land ownership. In Ecuador, women constitute 52 per cent of the landowners, at the national

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Climate change is having gender-differentiated impacts, and in many cases is intensifying the constraints that already place women who are reliant on agriculture for their livelihoods at a disadvantage

level; in Ghana, they represent 36 per cent of landowners; and in the state of Karnataka, India, they make up only 20 per cent (Doss and others, 2011). The differences across these contexts illustrate the strong impact of marital and inheritance regimes on women's land ownership. Ecuador has a "partial community property" marital regime, which means that all property, except for inheritances, acquired by either spouse during the marriage belongs to both of them jointly. Both Ghana and Karnataka, India, have "separation of property" marital regimes, where assets acquired during marriage belong solely to the person who purchased them. In Ecuador, children of both sexes inherit land, while there is a strong male bias in inheritance in both Ghana and India. Furthermore, survey evidence from the same three contexts suggests an association between women's land ownership and their degree of participation in agricultural decision-making (what to cultivate, how much to sell, inputs to use, etc.) (Deere and others, 2013). Women are thus likely to have greater control over what they produce and whether they use it to meet their households' food needs when they own the land.

The proportion of women in the agricultural workforce has been growing over recent decades in all regions, except in Europe, and has reached 43 per cent in Asia (which is most likely attributable to the fact that men, more than women, are exiting agriculture and seeking work in other sectors). Women rely on agriculture more than men; of the total workforce in 2008, 57 per cent of women in Asia and 63 per cent in Africa were in work related to agriculture (Agarwal, 2012). More specifically in terms of food production, time-use surveys for parts of sub-Saharan Africa, India and China suggest that women contribute a significant proportion of the labour required to bring food to the table, if the time spent on food production, processing and preparation is aggregated (Doss, 2011). Most women, however, engage in subsistence farming, and are "trapped in low productivity cycles" (Agarwal, 2014).

Women play an important role as agricultural producers, and their work has a positive impact on national agricultural productivity. The received notion that "women produce 60-80 per cent of the world's food" may resonate with many people, but it cannot be empirically verified (Doss, 2011). But perhaps the statistical claim "obscures the complex underlying reality which is that women's labour in agriculture cannot be neatly separated from their other time uses; neither can it be separated from men's labour; nor can women's labour in agriculture be understood properly without also understanding the differential access to land, capital, assets, human capital and other productive resources" (Doss, 2011). Better data are needed, not only to understand women farmers' contributions to food production, which by all accounts is significant, but also the myriad constraints that they face, in order to formulate policies to directly address such constraints.

Climate change is having gender-differentiated impacts, and in many cases is intensifying the constraints that already place women who are reliant on agriculture for their livelihoods at a disadvantage. Women's insecure tenure rights mean they are sometimes forced to work on less productive land and are excluded from agricultural training. Less predictable rainfall, more frequent floods and droughts and more crop failures mean that greater investments are needed in technology or fertilizers, resources

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to which women have less access than men. Agricultural extension services have become even more important for helping farmers adapt to climate change and develop more climate-resilient practices, but they have a poor track record of reaching women. As agricultural work becomes more labour-intensive, the burden of additional work falls to women, in many cases. Climate-related health risks further add to women's unpaid work, as the main carers for their families. This has an impact on women's health and well-being and reduces the time they are able to devote to other income-generating activities. With fewer assets to fall back on and limited access to alternative sources of income, the impacts of climate change on the most food-insecure populations, and on women in particular, are overwhelmingly negative, making it more difficult to escape the traps of low-productivity work, poverty and food insecurity (Skinner, 2011).

For both female members of farming households and landless labourers in rural, peri-urban and urban areas, the right to food is largely dependent on the adequacy of their wages, which Sen (1982) refers to as "exchange entitlements". Rural labour markets are strongly gender-segregated and women are more likely than men to be working in sectors that are low-paid and do not provide adequate social protection measures. Women's entry into paid work in such contexts is sometimes driven by distress associated with rising levels of debt or the loss of earnings by other household members (FAO, 2011). Even in relatively new sectors, such as horticultural production for export, in several countries, including Chile and Mexico in Latin America and Kenya and Uganda in sub-Saharan Africa, women make up a disproportionate share of the low-paid casual and temporary workers (Barrientos and Evers, 2014).

While women's earnings can make a critical difference in pulling their households out of poverty, the adverse conditions that characterize informal rural labour markets do not bode well for women's capacity to exchange their wages and earnings for a decent standard of living, including an adequate and sustainable supply of food. There are also gender-specific constraints on women's ability to control and decide how their earnings are spent (Kabeer, 2007). Efforts to regulate the wages and earnings of low-paid and informal workers are critical if this exchange entitlement is to function. This is not always easy, given the limited reach of local trade unions in rural areas. In Uganda, however, women flower workers have campaigned successfully, with the support of an international non-governmental organization, Women Working Worldwide, for higher overtime pay, better working hours and freedom of association, even if their real wages remained low as a result of high inflation rates in 2010-2011 (Barrientos and Evers, 2014).

A related issue from a gender perspective is the intra-household distribution of food. This may not be susceptible to policy influence, but easing pressures on food-insecure households, whether through general income support, food subsidies or school feeding programmes, can reduce the negative impact of intra-household gender bias in the distribution of food. Conversely, when households cannot access sufficient food, this bias is likely to be reinforced, with dire consequences for the health and nutritional status of women and girls. Hence, in the context of current food price hikes, cuts to food subsidies as part of austerity programmes undertaken in many developing countries are of serious concern (Hossain, King and Kelbert, 2013; UN-Women, 2014). A broader agenda for government and civil society is to promote the awareness of women's and girls' right to food and to empower them to claim that right by confronting gender bias and discrimination in the intra-household allocation of food.

The historically entrenched constraints outlined above, combined with new challenges driven by transformations of the food system and markets, as discussed in the next section, affect food-insecure people and households in a variety of contexts as consumers and producers. However, they have a particularly negative impact on smallholders who, as already noted, are also the largest group among food-insecure populations.

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D/ EMERGING CHALLENGES: THE GLOBAL FOOD SYSTEM

The food production and distribution systems of the twenty-first century are markedly different from those of the previous century and pose new threats to food security, particularly for poor households in poor countries, often with gendered consequences (High-level Panel of Experts on Food Security and Nutrition, 2011; von Braun, 2014).

The first reason for this change is that the global market has dramatically shifted. While the 1970s, 1980s and 1990s were characterized by abundant production and low international food prices, the current context is marked by rising and volatile world market prices and constraints to production. Development aid for agriculture plummeted during the 1980s and through the 1990s until the 2000s. Simultaneously, the governments of developing countries were advised by the international financial institutions to reduce the scope of state investment in agriculture and in agricultural research. This has been associated with low yields, especially in tropical agriculture, and the falling productivity of land. At the same time, greater trade openness and increasing market orientation of farmers have encouraged a shift away from food crops that were better suited to local ecological and social conditions, to cash crops, which require the purchase of inputs. With the cutback in public funding of agricultural inputs, farmers, especially women farmers, have been left at the mercy of large seed and fertilizer companies, marketing agents and moneylenders (Ghosh, 2010). These factors have contributed to the prolonged agrarian crisis in many developing countries.

After decades of low prices since the 1970s, world food prices began to rise from the early 2000s and peaked sharply over the period 2007-2008. Though domestic prices do not always mirror international price trends and levels, the 2007-2008 price hikes led to sharp rises in food prices in most developing countries (High-level Panel of Experts on Food Security and Nutrition, 2011). World market price increases therefore threaten food security for poor households. For example, the 2011 increase in the price of basic grains meant that, in many developing countries, the cost of a kilogram of wheat doubled from about $0.15 to $0.30, a critical difference for people who live on little more than a dollar a day (von Braun, 2014). Food represents a substantial portion of the expenditure of poor households in poor countries. For countries in Asia and Africa with available data, expenditure on food was generally over 50 per cent in the early 2000s, prior to the 2007-2008 crisis (e.g., 76% in Kenya, 75% in Pakistan, 63% in the Philippines) compared with a range of expenditure on food of between 10 per cent and 25 per cent in Western Europe and North America (e.g., 24% in France, 18% in the United States, 11% in the Netherlands) (FAO, 2013a).

While in theory, higher prices can increase incomes and stimulate production, in reality, when farmers lack the necessary inputs and resources, they are less able to respond to such price incentives. Moreover, higher prices do not neatly trickle down to the farm gate. Households adjust to such a decline in their capacity to purchase food in a variety of ways, including by shifting to less costly and less diverse diets, which are often deficient in the essential nutrients that are particularly important for pregnant women and young children. Studies of 11 countries with data available found that, in 8 of those countries, malnutrition increased or improvements in nutrition slowed during the period from 2007 to 2010 (von Braun, 2014). Women bear the brunt of

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coping with food insecurity, often by reducing their own consumption in favour of other members of the household and by spending more time on food preparation and processing, thereby adding to their unpaid care work (Quisumbing and others, 2008). FAO estimates that some 173 million individuals were added to the number of undernourished people between 2007 and 2009 (High-level Panel of Experts on Food Security and Nutrition, 2011).

The second factor to be taken into consideration is that climate change is likely to drive shifts in production potential throughout the world, thereby affecting productivity and prices. Studies consistently point to overwhelmingly negative consequences for farmers in the most vulnerable environments (Nelson and others, 2009). As the High-level Panel of Experts on Food Security and Nutrition (2012) noted, vulnerability to food insecurity arises both from biophysical and socioeconomic factors: "pre-existing conditions of vulnerability make poor people more exposed to the effects of climate change, as social, economic and agroenvironmental circumstances may become more severe with climate change". Since 1975, disasters have claimed the lives of more than 2.2 million people, with climate-related storms, floods, droughts, heat waves and other weather-related phenomena responsible for two thirds of the fatalities and economic losses resulting from disasters (United Nations, International Strategy for Disaster Reduction (secretariat), 2009).

Rising temperatures, changing precipitation patterns and extreme weather events will increase the likelihood of crop failures, reduce yields and encourage pests and weeds. Scenario studies by the International Food Policy Research Institute predict major yield and production losses for wheat, rice and maize in the most food-insecure regions: South Asia and sub-Saharan Africa (Nelson and others, 2009). Dryland agriculture in arid and semi-arid regions, where over 40 per cent of the world's population and more than 650 million of the poorest and most food-insecure people live, is especially vulnerable to the risks of climate change and variability, drought in particular. In some regions of the world, significant agricultural production takes place in low-lying coastal areas, where current population densities are high. In these regions, and particularly in small island States, a major threat of climate change is from saline intrusion, sea-level rise and increased flooding (High-level Panel of Experts on Food Security and Nutrition, 2012). Assuming no climate adaptation investments are made, child malnutrition could increase by 20 per cent by 2050, which would erase the gains made in previous decades (Nelson and others, 2009). The consequences are likely to be particularly severe for women smallholders, who are the least equipped to adapt to changing conditions, in large part because of the constraints they face in accessing such resources as credit, information and inputs that facilitate adaptive production strategies (Agarwal, 2012; Quisumbing and others, 2008).

The context of climate change and demands for mitigation of emissions in high-income countries has also led to the rise of the biofuel industry. Biofuel production has grown dramatically since the early 2000s. For example, between 2000-2002 and 2007-2009, ethanol production increased more than five-fold in the United

Women bear the brunt of coping with food insecurity, often by reducing their own consumption in favour of other members of the household and by spending more time on food preparation and processing, thereby adding to their unpaid care work

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States and in the European Union, and it more than doubled in Brazil. While the European Union, the United States, Brazil, China and India are the largest consumers of biofuels, production is dominated by the United States and Brazil, which together account for 75 per cent of the global ethanol supply, while the European Union produces almost 80 per cent of biodiesel generated from canola. The High-level Panel of Experts on Food Security and Nutrition (2011) explains that this development was "made possible only because of massive public support: subsidies, tax exemption and mandatory use in gasoline [which] in 2009 ... reached about 8 billion dollars in the European Union and the United States ... at the same time as they have reduced support for agricultural production, both at home and in their overseas assistance to poor countries".

A third factor in bringing about the change is that food as a globally traded commodity has become integrated into a more complex financial market, closely related not only to fuel but interlinked with other forces in the financial market. The price spikes of 2007-2008 were related to the fuel and financial crises of 2008. While they were not the sole factor driving prices, and shifts in demand and supply explain much of the upward pressure on world market prices, many argue that speculative activities are likely to have played a role in driving the spikes for some commodities (Ghosh, 2010; High-level Panel of Experts on Food Security and Nutrition, 2011).

A fourth aspect in this scenario concerns the domestic and international economic policy environments, which have shifted, but in unbalanced ways. Producers around the world benefited from domestic state support in the twentieth century through a variety of policy interventions, public investments and price support and stabilization measures, including the holding of reserve stocks (De Schutter, 2011). Most developing countries removed these interventions during the 1980s and 1990s, as a part of liberalization and structural adjustment measures. However, the shifts in agricultural policy were less radical in OECD countries, which maintained their support structures to farmers. Export subsidies and farm income support, which benefit farmers in the developed world, depress prices in world markets and create unfair competition for poor farmers and poor countries. The results of these market pressures can have particularly harsh consequences for food security.

The Agreement Establishing the World Trade Organization, of 1994, and a series of multilateral trade agreements, had major consequences for domestic agricultural support policies. Restrictions on trade-distorting domestic support measures in the Agreement on Agriculture have been controversial. Developing countries have consistently contested the provisions, arguing that the measures conflict with the objectives of food security and poverty reduction (De Schutter, 2011). The issue was highlighted once more at the Ninth Ministerial Conference of the World Trade Organization, held in Bali, Indonesia, in 2013, where 33 developing countries with significant smallholder populations tabled a proposal on reforming the provisions regarding the ability of governments to purchase food from domestic producers at reasonable prices for public stocks.

The fifth element that has brought about change, stimulated by increasing volatility and rising prices in world food markets, is investment in agricultural land, often referred to as "land grabs", which has been growing rapidly since the 2006-2008 food and commodity price boom (Borras and others, 2011; GRAIN, 2008). Investors include foreign financial entities, such as hedge funds and pension funds diversifying their portfolios, but also governments aiming to secure food supplies for their populations. Such investments have been an important factor behind the expansion of cultivated land, which has totalled about 5.5 million hectares per year in developing countries over the period from 1990 to 2007 (Deininger and Byerlee, 2011). They are making it difficult for poor and marginalized farmers, as well as pastoralists, to maintain their access to land, in many cases resulting in their

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dispossession. Such farmers, particularly women, tend to have insecure rights to land, which their families may have cultivated for generations, owing to lack of registration or ambiguities about the nature of land rights that are often interpreted as limited to usufruct (FAO, International Fund for Agricultural Development and International Labour Office, 2010). Large-scale investments in agricultural land might have positive benefits for aggregate GDP growth, national food production and employment creation. They could also open up new markets and technologies for the agricultural sector that would have spillover effects on smallholders (Deininger and Byerlee, 2011). Yet it is clear that their consequences for marginalized farmers who are dispossessed are likely to be negative. Furthermore, contemporary and historical experience provide consistent lessons regarding the negative impacts of dispossession on women: their lack of decision-making power on resettlement schemes; discriminatory compensation; exclusion from common property resources on which they are disproportionately dependent; and general deterioration in their well-being and status (see box III).

Box III

Gendered effects of "land grabs"

While States have long dispossessed rural peoples of their land for development purposes, so-called "land grabbing" is now attracting unprecedented attention. Land grabs at a global level are increasing, they are changing in character, and they are generating significant political opposition. Estimates indicate that between 50 million and 66 million people were displaced from their land in China between 1980 and 2002, and some 60 million people have been displaced in India since 1947, with the rate increasing in the past two decades, accounting for the majority of the world's dispossessed persons (if not the majority of dispossessed land area). In the twentieth century, most "development-induced displacement" was as a result of large public infrastructure and industrial projects, including public sector dams, mines and heavy industries. In many countries of Africa, Latin America and South-East Asia, international agribusiness, finance capital and foreign States are acquiring large areas of agricultural land.

A study of several cases of land grabbing and dispossession worldwide revealed that rare and limited gains were overwhelmed by a confluence of exclusions and gender inequalities. The negative consequences of land dispossession in the context of development projects recur with remarkable regularity, irrespective of project type and social context. First, in none of the cases examined did women have any decision-making power in the planning of projects or in negotiating the details of resettlement and rehabilitation. Second, discriminatory compensation and resettlement almost universally reproduced women's lack of land rights, or undermined them where they actually existed, by allocating compensation land or plots to male heads of households. In addition to land, states also directed other forms of compensation, whether cash or jobs, to men, thereby undermining women's influence over its allocation. Third, as women are the most dependent on common property resources for work and income in most agrarian contexts, they are the most affected by the enclosure of land, the destruction of commons and

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the resulting losses of livestock. Fourth, while the causal link between land dispossession and domestic violence and alcoholism remains underspecified, the increase of both has been observed by almost all studies of displaced populations. Fifth, since dispossession entails removing people from land against their will, states often resort to violence to push projects through, creating situations in which women's physical security becomes particularly at risk. The record of development-induced displacement is replete with examples of sexual violence and other human rights abuses perpetrated by the police, the army or hired thugs. Finally, in all cases, women widely recognized the threats dispossession posed or ultimately created for their well-being and played important roles in both overt and covert opposition to land grabs.

While it is important to recognize that the consequences were also typically poor for men, overall, whether women's labour was marginalized or increasingly exploited after dispossession, in none of the cases was women's well-being and social position improved by the development projects for which they gave their land. Indeed, the level of discrimination in the gender and social relations that structure women's work within and outside the household was arguably increased.

This points to the urgent need to maintain and defend democratically determined definitions of the public good, to limit the forcible acquisition of land to that needed for public projects with widespread benefits for the poor, especially poor women, and to make prior and informed consent a prerequisite for private projects that require land. It goes without saying that such consent must be obtained by all members of affected populations (including those without formal land rights) and not simply heads of household; this would also help to ensure that only those projects from which women can expect to benefit would move forward.

Source: Levien, 2014.

E/ NATIONAL EFFORTS TO SECURE THE RIGHT TO FOOD

While acknowledging that the global context has presented disabling conditions for the realization of the right to food, the governments of developing countries do have policy options. For national governments, giving priority to human rights can involve difficult choices when policies to promote food security potentially conflict with macroeconomic objectives and international trade rules (De Schutter, 2011). There is broad agreement among the food and nutrition policy community on a number of core policy priorities for promoting food security as a public good: (a) reversing the under-investment in agriculture and support to smallholders, for example, through research and development, investment in climate-resilient agriculture, access

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Extension services need to be overhauled in order to integrate the specific concerns of women farmers in the context of climate change and to facilitate the exchange of knowledge and good practices

to irrigation, affordable institutional credit and extension services and making sure that they reach women farmers; (b) removing gender discrimination in access to land and agricultural services; (c) robust social protection measures to increase the purchasing power of households; and (d) social investments to improve health and education, especially of women, and thereby improve nutrition. Measures that involve greater government intervention are increasingly being adopted by many developing countries, as outlined below.

There is now widespread agreement on the need for governments to invest in climate-resilient agriculture. The High-level Panel of Experts on Food Security and Nutrition makes the case that policies at the national level to increase general food system resilience are very likely to contribute to climate adaptation also, concluding that increases in expenditure on adaptation would be better directed at increasing overall expenditure on sustainable food security, with particular attention to the particular challenges posed by climate change. Such approaches will be very specific to particular locations and should draw on the knowledge of farmers, including women smallholders. As the High-level Panel of Experts (2011) has noted, "there will be no environmentally sustainable agriculture without the involvement and initiative of smallholders".

Extension services, which have often failed to effectively target women, need to be overhauled in order to integrate the specific concerns of women farmers in the context of climate change and to facilitate the exchange of knowledge and good practices. Governments should also seize the opportunity to address the barriers to women's access to financial services, such as credit and microinsurance, in order to enable them to make the changes to farming practices that are needed to secure their access to food, as the environmental context changes (High-level Panel of Experts on Food Security and Nutrition, 2012). Good practices at the community level include improved water management, such as building more efficient systems for irrigation

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This women farmer is part of a regional cassava initiative that supports vulnerable smallholders in eastern and central Africa

and water capture, storage and use; adopting practices to conserve soil moisture, organic matter and nutrients; and setting up community-based seed and grain banks. In Malawi, for example, women smallholders in several communities have developed strategies to overcome acute food shortages by using ecological cropping techniques that enable them to take advantage of changing rainfall periods in order to produce a second maize crop (Skinner, 2011).

Mobilizing women's agency and knowledge will be needed in attempts to foster sustainable and climate-resilient agricultural practices. Women Organizing for Change in Agriculture and Natural Resource Management, a global network of professionals and farmers across 83 countries, provides an important example of how this can be done. The network is dedicated to increasing women's access to and control of resources and integrating gender into agricultural policies. It works at the community level, but also works to make national policies, programmes and institutions more responsive to the needs and potential of rural women and to integrate them more effectively into the design, implementation

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and monitoring of policies. Forums of this nature are important, since research shows that any easy assumptions regarding the interests of women farmers aligning perfectly with policies on environmentally sustainable agriculture, at the local and national levels, can be misplaced (Agarwal, 2014). Women's participation in deliberating policy options is therefore critical.

Such measures as price supports and input subsidies for production and income stabilization, price controls on essential food items to limit household expenditures on food, and public food stocks to moderate price volatility, were commonly used in developing countries, but were discontinued under agricultural liberalization programmes since the 1980s. However, they have recently been reconsidered in a number of countries and redesigned as policy tools for reducing hunger and food insecurity. Many of these experiences have had positive results.

For example, input subsidies on fertilizers and seeds were largely dismantled during the 1980s as part of the structural adjustment reforms in developing countries. Critics of subsidies argue that they distort prices and often have perverse distributional effects, benefiting well-off producers and agribusinesses. However, newer debates have led to a reverse trend, starting in the late 1990s, to develop "smart" subsidies that are more targeted and could have broader social and economic benefits (Tiba, 2011). Ghana, Kenya, Malawi, Mali, Nigeria, Rwanda, Senegal and the United Republic of Tanzania, among other countries, have recently introduced new input subsidy programmes.

Another policy approach that is gaining ground is public procurement from smallholders. This addresses the institutional constraints they face, particularly rife in the case of women farmers, in accessing markets and obtaining fair prices, while providing a better quality of food products to social programmes, such as schools, hospitals and canteens, and helping to diversify diets with fresh produce. It is a key aspect of India's new food security policy, launched in 2013. Brazil has made extensive use of this approach as a major element of the country's comprehensive food security policy, *Fome Zero* (Zero Hunger), implemented since 2003, which has contributed to the sustained decline in hunger in rural areas, especially among female-headed households. The programme is being replicated in several countries in sub-Saharan Africa.

Public food reserves were one of the major food security policies throughout the twentieth century, but were largely dismantled in the 1980s in the context of structural adjustment reforms. Critics argue that they are inefficient and ineffective, expensive and complex to manage, and that they distort incentives for private storage that can more effectively offset supply fluctuations. However, it is also acknowledged that food stocks have been effective in stabilizing prices, as well as in stimulating agricultural growth (FAO, 2011; Crola, 2011). Many rice-producing countries in Asia have long used buffer stocks, as well as export and import monopolies and public procurement as complementary tools for price stabilization. More recently, Burkina Faso, Indonesia and Madagascar have implemented effective stock programmes (Crola, 2011). Moreover, proposals are being discussed for international food reserves as a mechanism to reduce the risks of price hikes in world food markets (Wright, 2012).

The other mechanism for guaranteeing the right to adequate food is through social transfers (e.g., in-kind transfers such as through direct public provision of subsidized food). Smallholders and landless agricultural labourers are particularly susceptible to the socioeconomic effects of climate change, especially if increased climate variability is not accompanied by improved social protection measures. Many governments provide subsidies on food to both rural and urban populations in order to enhance food security. The concern about food wastage and "leakage" of subsidies to the non-poor has led to a reconsideration of such programmes, and sometimes to arguments for replacing them with cash transfers. While cash transfers may be administratively easier to handle, the drawback is that the purchasing power of such

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cash transfers can be eroded in the context of food price rises. A further concern from a gender perspective is that cash transfers can be spent on other household priorities or needs and such items as alcohol and tobacco. In order to ensure the food security of girls and women in particular, the direct provision of affordable food may thus be the better option, a position that was strongly endorsed in a survey with women slum dwellers in New Delhi (Ghosh, 2011).

The experience of Brazil is instructive in this regard. The policy instruments discussed, including public procurement, food stocks and price supports, are elements of *Fome Zero* that bolster each of the entitlements (production, exchange and transfers) through which households can acquire food. The programme also supports access to credit, inputs and other resources for smallholders, cash transfers (*Bolsa Familia*, a programme which is largely directed at women), public procurement from family farms, increases in social investments and a minimum wage that has more than doubled since 2003. Food security is a consistent priority across different social and economic policies, including Brazil's trade policies and positions in multilateral policy forums.

The Agreement on Agriculture addresses national support measures for agriculture and sets minimum allowable levels of trade-distorting measures, evaluated by a complex set of criteria. Overall, these provisions leave much broader policy scope for developed countries than for developing countries. The level of support to agriculture in developed countries remains very high, based on a wide range of government subsidies that are not considered trade-distorting and are therefore permitted (Demeke and others, 2012). For developing countries, there are more constraints in the formulation of a robust set of food security policies, in part because the Agreement on Agriculture was designed in the 1980s and 1990s, when developing countries were being encouraged to liberalize the sector in order to stimulate production. Food security in poor countries and households was not the major concern. Many of the support measures fall into a "grey zone" and countries face uncertainty as to the trade consequences of adopting them and being exposed to potential litigation (De Schutter, 2011).

Apart from the overall negative effect of these measures on producers in developing countries, there are clear inconsistencies between these trade measures and the objective of ending the unacceptably high level of hunger and malnutrition. Supporting the productivity of smallholders in developing countries, notably in sub-Saharan Africa and South Asia, would help to facilitate the achievement of that objective (De Schutter, 2011). A second important point is the inequity in these global trade rules, where income support to farmers in the European Union and the United States does not face the same restrictions as subsidies to consumers in India. Trade rules accommodate measures that emerged in developed countries to suppress production in an era of depressed prices and abundant production. They need to be changed to meet the needs of the twenty-first century and the challenge of high prices and potential new pressures on production from climate change, polluting technology and competition for fuel (De Schutter, 2011).

The right to food remains an unfulfilled human right and an urgent global challenge. Food security policies should address the structural causes constraining people's access to food at the local, national and global levels. A supply-driven framework does not adequately address the structural inequalities that constrain women's and girls' access to adequate food, whether through own production, earnings/food exchange, intra-household distribution or social transfers. A new agenda for food security in the context of sustainable development needs to refocus attention on people's capabilities and rights, on public goods and on the key issues that determine access. If sustainable development is to include gender equality at its centre, then issues of access and rights, and the structural forces that constrain access and rights from the micro to the macro level, need to be tackled head-on. If this process is to be successful, the agency, leadership and decision-making power of women will be critical.

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CHAPTER 5

POPULATION, SUSTAINABLE DEVELOPMENT AND GENDER EQUALITY

A/ INTRODUCTION

Population is a crucial aspect of sustainable development across its three dimensions. Population growth and decline, urban/rural location, migration, composition in terms of sex and age and a host of other factors all have an impact on economic growth and labour markets, health, the environment and the prospects for present and future generations. Population dynamics can significantly influence the possibilities for achieving a socially just and gender-responsive approach to sustainable development. The topic of population elicits debates about the relationships between humans and nature, men and women, old and young, rich and poor. Population policies often centre on women's health, reproduction and sexuality. Population paradigms frequently attribute poverty to overpopulation; see the causes of environmental degradation and natural resource scarcity in population growth or mismanagement by poor people; and link reducing women's fertility to mitigating climate change or preventing environmental destruction (UNDP, 2011).

In an era of climate change, financial instability and growing inequalities, concerns about overpopulation play an important role. Population growth has an impact on the natural environment, human society and prospects for sustainable development. However, the dominant focus on population growth shifts attention away from unsustainable patterns and levels of production and consumption, particularly regarding the stark differences in resource distribution and levels of consumption both between and within countries, which pose significant challenges for sustainability. The relationship between population and sustainability is context-specific and mediated by a host of other factors, economic, political, social and cultural.

Critically, focusing on overpopulation as a root cause of these problems often leads to problematic policy responses, particularly from a gender perspective. Population policies that are coercive in their approach to reducing fertility rates compromise human well-being, dignity, individual bodily integrity and autonomy and are inconsistent with international norms and standards. Since 1994, the global policy and normative framework has made a significant shift in recognizing women's sexual and reproductive health and reproductive rights as the cornerstone of population and development policies. Both the Programme of Action of the International Conference on Population and Development and the Beijing Declaration and Platform for Action, and the subsequent outcomes of their review conferences, have reaffirmed the centrality of sexual and reproductive health and reproductive rights to sustainable development. The recent 20-year review process concerning the implementation of the Programme of Action of the International Conference on Population and Development highlighted the need for sustainable development policies to be grounded in human

Population policies that are coercive in their approach to reducing fertility rates compromise human well-being, dignity, individual bodily integrity and autonomy and are inconsistent with international norms and standards

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rights, non-discrimination, gender equality and sexual and reproductive health and rights (see A/69/62).

The achievement of sexual and reproductive health and rights for all people will necessitate a new social contract, where governments meet their obligations as duty bearers and individuals claim their rights. Sexual and reproductive health and rights include rights to access essential information, education and services for all on issues such as sexuality, relationships, pregnancies and safe childbirth. This includes recognition of the basic right of all couples and individuals to decide freely and responsibly on the number, spacing and timing of their children and to have the information and means to do so. The human rights of women include their right to have control over and decide freely and responsibly on matters related to their sexuality, including sexual and reproductive health, free of coercion, discrimination and violence. The enjoyment of sexual and reproductive health and rights includes the right of access to sexual and reproductive health-care services of high quality across the life cycle, including safe and effective family planning methods and emergency obstetric care, recognizing the right of women and men to be informed and to have access to safe, effective, affordable and acceptable methods of family planning of their choice.[32] Among the obstacles to advancing this agenda are narratives linking population growth to environmental degradation, which pervade popular media, environmental education and policy debates and decisions in the health, conservation and climate arenas. These narratives have influenced the way current demographic dynamics are related to gender and sustainability and the design of policies.

This chapter explores the debates on overpopulation, gender equality and sustainable development and serves as a prompt to policymakers to go beyond the limits of overpopulation paradigms in order to better understand the complex interplay of contributors to global problems. This means responding to the most significant drivers of environmental challenges, including patterns and levels of unsustainable production and consumption, and firmly anchoring sustainable development policies in human rights, including sexual and reproductive health and rights.

B/ DEMOGRAPHIC DYNAMICS

1. Current population picture

Present demographic realities are very different from what they were even 50 years ago. Over the course of the twentieth century, world population almost quadrupled, from 1.65 billion in 1900 to around 6.1 billion in 2000 (United Nations, 1999; 2001). However, what was termed a "population explosion" is now slowing down. World population growth rates have been declining since the late 1960s, with birth rates declining more rapidly than anticipated. Smaller households are becoming the global norm.

At present, the average number of children per woman, measured as the total fertility rate,[33] is estimated to be 2.53 for the period from 2005 to 2010, according to the *World Population Prospects: The 2012 Revision* (United Nations,

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World population growth rates have been declining since the late 1960s, with birth rates declining more rapidly than anticipated

2013c). That figure masks differences between countries. Sub-Saharan Africa has 39 countries with a total fertility rate above 4, and among these, 10 countries: Angola, Burkina Faso, Burundi, Chad, the Democratic Republic of the Congo, Mali, the Niger, Nigeria, Somalia and Uganda, have total fertility rates above 6.[34] Nevertheless, fertility rates are declining in most of these countries, especially in urban areas. In other countries, mainly in East Asia and Eastern Europe, fertility rates have fallen well below replacement-level fertility of roughly 2 children per woman. However, the population is not yet declining in most of those countries, owing to population momentum, except in countries such as Japan that are most advanced in the demographic transition (Fischer, 2014). During the period from 2005 to 2010, the 75 countries with below-replacement fertility made up 48 per cent of the world's population (United Nations, 2013c).

The result is heterogeneity of demographic experiences around the world: "The demographic transition associated with declining fertility and mortality levels, together with the urban transition that has shifted the locus of human activity from rural to urban areas, have caused unprecedented changes in population size, age structures and spatial distribution" (A/69/62, para. 760).

The *World Population Prospects*: The *2012 Revision* estimates that the present world population of about 7.2 billion in 2014 will reach 8.1 billion in 2025, 9.6 billion in 2050 and 10.9 billion by 2100. These calculations are based on the medium-variant projection, the one most widely used. The projected global population total is higher than in the 2010 revision, which estimated a population of 10.1 billion in 2100. This is mainly because projected fertility levels have been adjusted upward in a number of countries, particularly in sub-Saharan Africa (United Nations, 2013c).

Age structure matters. A large cohort of people of reproductive age in a population generates demographic momentum, as there are more people having children than in an ageing population. Today, in developed countries as a whole, 23 per cent of the population is already aged 60 or older, surpassing the percentage of children aged 15 and under (United Nations, 2013c). While most developing countries have more youthful populations, and hence more demographic momentum, declining fertility rates mean that they too will increasingly face the phenomenon of population ageing.

The projection that the world population may grow to almost 11 billion people is being met with a call for greater investments in family planning in order to reduce population growth (United Nations, 2013c). However, a narrow focus on contraception and family planning overlooks the complex interplay of social, economic and cultural factors in demographic transitions to lower birth rates. Family planning policies should be situated within a broader sexual and reproductive health and rights and gender equality framework, rather than solely focusing on fertility reduction.

2. Population dynamics

Youthful and ageing populations are population dynamics which generate significant policy debate. Children and young people are the majority of the population in the global South, with 1.7 billion children under the age of 15 and 1.1 billion young people aged 15-24, the largest global cohort of young people in history. Youthful populations predominate in countries that are considered to be the least developed, including Mali, the Niger and Somalia, which also have the highest population growth rates (United Nations, 2013c).

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The youthful population boom in the global South is expected to generate substantial social change on an international scale (A/69/62). Two theories, namely, the demographic dividend and the youth bulge, dominate scholarly and policy discussions about how youth will influence economics, politics and international security. The demographic dividend concept suggests that large youthful populations can create economic growth and development under the right conditions, including increased access to education for young people and economic policies that support open trade. Population policy would be a key tool for achieving dividends because it influences fertility rates and creates a large proportion of working age adults to dependent seniors and children.

In contrast, the youth bulge theory predicts that large youth populations are prone to violence and unrest at a variety of levels and intensities. Urdal (2012) suggests that youth bulge violence is not inevitable, but is attributable to a combination of population stress and lack of employment, resources and education for young people. As such, states can mitigate or harness the impact of youth bulges through providing increased educational and employment opportunities.

This binary understanding of youth populations as either a dividend or a bulge leads to policy responses that treat youth as a homogeneous group, without the recognition of diversity. Recognizing and respecting the variety of experiences and aspirations among young people is necessary to design policies that enable the realization of human rights and capabilities.

It is equally important to recognize the diversity of ageing populations. Population ageing, when the number of older people in the population increases and the number of young people decreases, is occurring throughout the world. It is most concentrated in the developed countries, including in Italy, Japan and the Russian Federation, where the number of older people exceeds the number of those under 15 years of age. The *World Population Prospects: The 2012 Revision* reports that by 2050 there will be close to double the number of older people than children in developed countries (United Nations, 2013c). The diminishing birth rates in developed countries, coupled with the longevity of ageing populations, are causing fears of economic stagnation on the basis of assumptions about the lack of working age adults and rising health-care costs. Ageing populations are often seen as economic drains on national economies.

The popular linkage of large "greying" populations with economic decline ignores the multiple roles older people play as paid and unpaid workers, including in the care economy, and as consumers and investors. The notion that ageing populations act as a drain on national economies, coupled with alarm over their size and longevity and fears of pension scarcity, have been used as a rationale for pension privatization in developed countries. Pension privatization, however, is largely driven by opportunities to open up new markets and increase the flow of capital. As Minns and Sexton (2006) conclude, "if there is a crisis of too many old people, it is one of too many people in poverty in their old age, both now and in the future. Problems of pension financing derive less from demographic changes than

Recognizing and respecting the variety of experiences and aspirations among young people is necessary to design policies that enable the realization of human rights and capabilities.

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from unemployment, low wages, and a shift in income distribution away from wages towards profits".

Population ageing also raises urgent questions about the adequacy of existing care systems (both paid and unpaid), especially in the case of those whose meagre savings and pensions do not allow them to access market-based care services. Women are disproportionately represented among this group, given their generally higher life expectancy, their smaller savings and limited access to contributory pensions, and the fact that they are more likely to marry, or cohabit, with men who are older than they are; this means that women are more likely to provide care for their spouses but less likely to receive care from them in their old age (Abe, 2010; Arza, 2014). In the context of changes in household structures (the increasing proportion of one-person households and households that include only elderly persons, in some contexts) and, to some degree, changes in the labour market (the increase in female labour force participation), policymakers need to put in place adequate care systems, such as Japan's long-term care insurance, which has made a small but significant impact in reducing the long hours of unpaid care provided by family members, especially female spouses and daughters (Abe, 2010).

3. Demographic transitions and family planning

Demographic transition is a process whereby reductions in mortality are followed by reductions in fertility. Together, these reductions eventually lead to smaller proportions of children and larger proportionate shares of older people in the population (United Nations, 2013d). The process of demographic transition leads populations to experience a period of population growth owing to natural increase, along with the processes of urbanization and population ageing (Dyson, 2010).

While initially demographers posited that industrialization would bring about declines in mortality and fertility in developing countries, by the 1960s they began to identify rapid population growth in poor countries as a serious brake on economic development; hence, a decline in fertility came to be seen as a prerequisite for, and not a consequence of, successful industrialization (Hodgson, 1983; Szreter, 1993). As such, policy responses based on the idea that family planning could induce demographic transition emerged from the 1960s to 1990s.

The assumed link between family planning and demographic transition yielded a number of rationales for population control, including the view that investments in family planning were much more cost-effective than other development strategies (Connelly, 2008). Family planning programmes and contraception play a role as one among many proximate factors that influence the timing and speed of fertility decline. However, broader and contextual factors, including economic, social and cultural differences between countries, even in the same region, influence the shape and timing of declines in mortality and fertility, rather than family planning alone.

Mortality decline also needs to be viewed from a gender perspective. Women and girls are more likely to die than men and boys in many low- and middle-income countries than they are in rich countries, resulting in some 3.9 million excess deaths of girls and women under the age of 60.[36] Of these 3.9 million excess deaths, one fifth of girls die in infancy, two fifths of girls and women die in their reproductive years, and around two fifths are accounted for by sex-selective abortion of female foetuses (the "missing girls"), and the numbers are growing in sub-Saharan Africa and in the countries most affected by HIV/AIDS (World Bank, 2012).

The causes of maternal mortality are complex and vary by region. Between 2003 and 2009, 73 per cent of all maternal deaths were the result of direct obstetric causes (e.g., haemorrhage, hypertensive disorders, sepsis, embolism), including 8 per cent caused by

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complications related to unsafe abortions, and the 27 per cent were the result of indirect causes (e.g., HIV-related, pre-existing medical conditions) (Say and others, 2014). Therefore, while family planning represents one aspect of the response needed to reduce maternal mortality, a broader sexual and reproductive health and rights agenda, including access to quality sexual and reproductive health services, is necessary.

C/ POPULATION AND THE ENVIRONMENT: POLICIES AND CONSEQUENCES

Concerns about overpopulation play a central role in the main discourses about sustainable development and policy responses. These concerns draw on older theories and models about the relationship between population, resources and the environment that have proved remarkably resilient. Among these notions are "carrying capacity", which is related to planetary boundaries, as discussed in chapter I, "the tragedy of the commons", which is concerned with the management of common resources, and degradation narratives that refer to environmental destruction by the poor.

There are a number of reasons for the resilience of concerns about overpopulation. First, even though these notions may have been disproven by historical evidence (Ostrom, 2000; Boyce, Narain and Stanton, 2007), overpopulation paradigms project population-induced scarcities into the future. Because sustainable development takes a long-term and future-oriented view, such projections are appealing: they seem to provide insight into what lies ahead for humanity.

Second, overpopulation paradigms make hunger, poverty, environmental degradation and even war seem like the inevitable consequence of too many people pressing up against too few resources. By avoiding the political negotiation of resource use and control, competition and conflict, these paradigms can shift responsibilities away from powerful elites and vested interests onto the shoulders of the poor.

Third, these paradigms draw on and reinforce dominant and stereotyped views of women and men. Women matter only to the extent that they reproduce the population problem. In some cases, women's agency is recognized, but only in a limited fashion as enlightened managers of their own fertility and local environments. Gender power relations, as well as differences between women on the basis of other factors, tend to be overlooked.

Demographic dynamics are indeed complex. The problem with the paradigms presented below is that they ignore this complexity and reduce demographic dynamics to the operation of abstract laws that can justify coercive measures and narrow policy responses. Analysing population paradigms is a necessary first step

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in rethinking the relationships between gender, population dynamics and the environment in order to make more effective policies.

1. Perspectives on population, sustainability and gender equality

Narratives linking population, poverty and environmental degradation gained increasing traction in policy debates in the latter part of the twentieth century and have had a very significant impact on the field of sustainable development. A major consequence of these overpopulation paradigms were policies to reduce women's fertility, including in some cases through coercive population control measures. While the global policy framework now recognizes that population policies must be anchored in sexual and reproductive health and reproductive rights, the persistence of concerns regarding overpopulation continue to shape population policies that are narrowly focused on reducing women's fertility.

The basic premise of degradation narratives is that in rural parts of developing countries, population pressure coupled with poverty is the main cause of land degradation. In other words, the poor are primarily responsible for destroying their own environments (Fairhead, 2001; Hartmann, 2010). These narratives have their roots in colonial policies that justified land expropriation by blaming native agricultural practices and population pressures for soil erosion, deforestation and desertification (Fairhead and Leach, 1996; Adams, 2004). Later they were used to justify external interventions such as the top-down implementation of rural development projects and population control programmes (Williams, 1995; Roe, 1995).

Degradation narratives have expanded to include a negative view of migration. In this perspective, after poor people deplete their immediate environments, many migrate to other marginal lands, setting in motion the same vicious downward spiral. From the 1990s onwards, this perspective included the poor who flock to already overcrowded cities and, most recently, so-called climate refugees — the new environmental refugees (Doyle and Chaturvedi, 2011).

The concept of carrying capacity is central to the view of population growth exceeding the planet's capacity to produce food and thus degrading the environment and causing wars, and has also been deployed in order to influence policy efforts to limit population growth in developing countries (Sayre, 2008; Vogt, 1948). Similarly, the idea of the S-curve, where animal, plant and human populations grow exponentially until they meet environmental resistance and then decline, has also reinforced the concept of saturation point as the upper level at which no further population increase can occur (Odum, 1953).

The tragedy of the commons approach, based on concerns for the planet's carrying capacity, has advocated for population control and private property rights and has had an enduring impact on policy responses and debates (Hardin, 1968). Yet people have been managing common resources cooperatively for centuries and are able to negotiate successfully the tensions between private gain and the public, and environmental, good. For example, work on common pool resources has documented many cases where individuals create stable institutions of self-government that make and enforce rules which protect natural resources and provide mutual protection against risk (Ostrom, 2000).

Gender relations are often critical in processes of managing common pool resources. As Ostrom explained: "it is certainly the case that when women are active participants in making rules and affecting the way a commons operates that the long-term impacts are likely to be better and the equity of outcomes is likely to be much better ... In those settings where gender inequity decreases, there is certainly a much broader consideration of future generations and less concern about immediate monetary payoff" (Ostrom, in May and Summerfield, 2012).

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The ideas and narratives of overpopulation have had a far-reaching impact on policy responses in relation to population, health, development, environment and migration, often with significant consequences for the enjoyment of human rights and gender equality. While sustainable development advocates have acknowledged the role of inequality and other factors, some continue to see population pressure as the most important cause of both poverty and environmental degradation (Myers and Kent, 1995).

Against this background, the efforts of gender equality advocates and women's movements led to a significant change in the approach to population at the International Conference on Population and Development, held in Cairo in 1994. The Conference represented a major international policy shift from population control to women's empowerment and a broader sexual and reproductive health and reproductive rights agenda. The Programme of Action adopted at the Conference, or "Cairo consensus", was endorsed by most of the world's governments and condemned the use of coercion, including incentives and disincentives in family planning provision. Instead, it promoted voluntary family planning as a part of reproductive health, including maternal care, sexuality education and prevention of sexually transmitted infections.

The Programme of Action of the International Conference on Population and Development maintained that rapid population growth was a major cause of poverty and environmental degradation, and that reduced fertility rates were necessary for sustainable development. At the same time, it advocated for a positive agenda of women's empowerment and broader reproductive health programmes as solutions to high birth rates, instead of the top-down, target-driven family planning programmes of the past.

Despite the pledges adopted at the International Conference on Population and Development, commitments on sexual and reproductive health and reproductive rights were not subsequently fully reflected in the Millennium Development Goals. Initially, the Goals did not include a specific target for advancing reproductive health and rights, and instead included target 5 (now 5A), which called for reducing maternal mortality. Target 5B was added in 2005, at the 5-year review point, to promote universal access to reproductive health care. Yet Goal 5, with both targets A and B, narrows the Programme of Action of the International Conference on Population and Development from a broad sexual and reproductive health and reproductive rights agenda to an emphasis on reproduction. As sexual and reproductive health and rights are important for preventing maternal mortality and morbidity, this narrow agenda has stymied even the achievement of the limited aims of Goal 5 (see E/CN.6/2014/3). By only focusing narrowly on maternal health, the role of women shifted from "agents of social change, and the subjects of rights", as envisaged in the Programme of Action, to "child-bearers and caretakers" who are "limited to their pregnancy status" (Yamin and Boulanger, 2013). Following the emphasis on pregnancy, international funding streams, which were already scarce, have been channelled largely towards maternal and child

The ideas and narratives of overpopulation have had a far-reaching impact on policy responses in relation to population, health, development, environment and migration, often with significant consequences for the enjoyment of human rights and gender equality

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health provision, while other aspects of sexual and reproductive health and rights, including contraception, experienced a decrease in funding (Yamin and Boulanger, 2013).

2. Patterns of consumption and production

For proponents of overpopulation paradigms, scarcity is a foregone conclusion and driving down population growth rates is the only solution. Technology and market enthusiasts are more optimistic. In the case of food, for example, they put their faith in the expansion of agricultural trade and production (see chap. IV, on food security). Between these two poles, however, are a range of issues that merit consideration for policy development.

Acknowledging the problems with the narratives concerning population and the environment does not deny the very real pressures population growth can put on the availability of vital resources, namely, food, water, sanitation, energy, housing, jobs, social services, especially in an era of rapid urbanization and climate change. Projecting population growth and greenhouse gas emissions to the year 2100 in one integrated model showed that slowing population growth would reduce future emissions: "by the end of the century, the effect of slower population growth would be ... significant, reducing total emissions from fossil fuel use by 37-41 per cent" (O'Neill and others, 2010). However, the problem here is equating larger populations to greater emissions, without paying attention to the more significant issue of consumption levels or the distribution of consumption.

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While carbon legacies, the projected carbon emissions of descendants, deriving from the fertility of individual women, can be significant when juxtaposed with projected greenhouse gas emissions, there is generally an inverse relationship between individual childbearing and per capita greenhouse gas emissions. In other words, countries where women bear the fewest children are most often those with the higher rates of per capita greenhouse gas emissions and the highest carbon legacies (Murtaugh and Schlax, 2009).

Instead, focusing on consumption shows that "it is not the growth in (urban or rural) populations that drives the growth in greenhouse gas (GHG) emissions but rather, the growth in consumers and in their levels of consumption" (Satterthwaite, 2009). In developing countries with rapid population growth, those in higher income classes are most able to consume resources, such as fossil fuels for vehicles and household electricity, making high levels of greenhouse gas emissions per capita primarily the domain of the affluent. In the case of high-income developed countries as well, richer households emit far more carbon than lower income ones (Boyce and Riddle, 2007).

Developing economies, which represent 80 per cent of the world's population, accounted for 73 per cent of the growth in global emissions in 2004. But they accounted for only 41 per cent of global emissions in that year, and only 23 per cent of global cumulative emissions since the start of the industrial revolution (Raupach and others, 2007). These perspectives underscore the need to evaluate the links between population growth and climate change in the context of patterns of consumption and production and global equity. Beyond sheer numbers of people, population policies and responses to climate change must take a long-term perspective on emissions and focus on changing patterns of production and consumption. Indeed, the principle of common but differentiated responsibilities concerns the joint responsibility of all countries to protect the environment, while recognizing the need to

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A counsellor from a reproductive health NGO, Pakistan, talks to a village mother

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take into account the different circumstances, particularly the contribution of developed and developing countries to environmental degradation and the different abilities of countries to address the problem.

3. Reducing fertility rates and "missing women"

From the late 1960s to the 1990s, reducing fertility in poor countries was a major component of bilateral and multilateral agency policies and programmes, and was also vigorously pursued by national population planning in developing countries.[37] The urgency of limiting birth rates led to coercive practices, such as forced sterilization and pressuring or bribing women to use higher-risk contraceptives without adequate informed consent or medical support. This meant that family planning became an instrument to control population growth rather than to protect and promote "the basic right of all couples and individuals to decide freely and responsibly the number, spacing and timing of their children and to have the information and means to do so, and the right to attain the highest standard of sexual and reproductive health".[9]

Framing the population issue in relation to resource and environmental pressures was a fundamental factor in building public consensus for population control interventions (Connelly, 2008; Hartmann, 1995). The constitution of China mandates that the government support family planning and that individual couples practice it. The one-child policy, introduced in the late 1970s, has been implemented through a system of economic and social incentives and disincentives, along with free contraceptive services (United Nations, 2002). The application of the policy varies by province and between rural and urban areas, as the decisions regarding implementation are made at the provincial level. For example, outside of cities, two children are generally permitted and three children are permitted for some minority ethnic groups (Hesketh, Lu, and Wei Xing, 2005). Decades after the introduction of the policy, at the fifteenth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Copenhagen in 2009, the Vice-Minister of the National Population and Family Planning Commission of China, Zhao Baige, noted that the country's family planning policy had prevented the birth of 400 million Chinese people and thereby reduced carbon dioxide emissions by 18 million tons per year (Xing, 2009; Feng, Cai and Gu, 2013). In Viet Nam, limiting families to two children became obligatory in the 1980s. Incentives for the use of contraception, as well as penalties for family planning violations, were introduced in an effort to promote implementation of the population policy (United Nations, 2002).

In countries with marked son preference, one-child and similar population policies have led to distorted sex ratios. Population data show a sex ratio at birth of 117 males per 100 females for China, 110 males per 100 females for Viet Nam and 111 males per 100 females for India (United Nations, 2013c). The biologically normal sex ratio at birth ranges from 102 to 106 males per 100 females (World Health Organization, 2011). Such policies have given rise to the widespread practice of sex-selective abortion, as well as the abandonment, hiding and neglect of female children. The World Bank estimates that in 2008 alone, there were an estimated 1 million fewer girls in China and 250,000 fewer girls in India than expected as a result of such practices (World Bank, 2012, p. 78). The one-child policy has also had negative gender outcomes for men, especially poor men in rural areas who cannot find spouses and who are stigmatized as "bare branches" (Greenhalgh, 2005).

Other contributing factors to this positive association between women's empowerment and fertility decline include women's access to gainful employment outside the home and the opportunity to earn an independent income. There is ample statistical evidence, based on comparisons between countries and regions, that link women's education to the lowering of fertility (Sen, 1999). Recent work by Chinese demographers indicates that most of China's fertility transition was accomplished in the decade of the 1970s, before the implementation of the one-child policy. The country's total fertility rate

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In many low- and middle-income countries, sustained growth coupled with better services and economic opportunities for women over the past decades has been linked with declines in the total fertility rate, improvements in education for girls and women and greater labour force participation

dropped from 5.8 in 1970 to 2.8 in 1979, and would likely have continued to decline even in the absence of the one-child policy, as a result of mortality decline, increases in education and rapid social and economic changes (Feng, Cai and Gu, 2013). What such analysis suggests is that "economic development may be far from 'the best contraceptive', but social development — especially women's employment and education — can be very effective indeed" (Sen, 1999). In southern Indian states such as Kerala and Tamil Nadu, fertility rates dropped dramatically between 1979 and 1991 (from 3.0 to 1.8, and from 3.5 to 2.2, respectively), thanks to their remarkable achievements in terms of women's literacy rates, high levels of female labour force participation and relatively low infant mortality, as well as an active, but non-coercive family planning programme (Sen, 1999). This contrasts with the record of other Indian states and also other countries, which despite heavy-handed family planning methods, failed to achieve similar outcomes. "The regional contrasts within India strongly argue for voluntarism (based inter alia, on the active and educated participation of women), as opposed to coercion" (Sen, 1999).

These findings are corroborated by more recent assessments from other countries and regions, which show notable declines in fertility linked to women's education and paid employment. In many low- and middle-income countries, sustained growth coupled with better services and economic opportunities for women over the past decades has been linked with declines in the total fertility rate, improvements in education for girls and women and greater labour force participation. In Bangladesh, the economy has almost tripled in size since 1980; the total fertility rate declined from 6.9 children in 1971 to 2.3 in 2009; the number of girls in school increased from 33 per cent to 56 per cent of total enrolment between 1991 and 2005; and the labour force participation of young women between the ages of 20 and 24 increased almost two and half times between 1995 and 2000. In Colombia, the economy has grown one and a half times since 1980; the total fertility rate declined from 3.2 children in 1986 to 2.4 in 2005; women now have higher completion rates than men for primary, secondary and tertiary education; and from 1980 to 2004, the labour force participation of women in the 13 largest cities went from being the second lowest in the region to the second highest. In the Islamic Republic of Iran, the economy has almost doubled since 1980; from 1979 to 2009, there was the fastest decline in total fertility rate in the world, from 6.9 children to 1.8 (below-replacement level); 1.2 girls are enrolled in primary school for every boy, the number of women in secondary school has doubled, and women make up more than 50 per cent of total university students and 68 per cent of those in science; and at present, women represent 30 per cent of the labour force (World Bank, 2012).

These diverse country examples indicate the importance of a comprehensive approach to gender equality and the realization of women's human rights and capabilities, including the provision of quality education, health services and access to decent work, along with the availability of accessible family planning services, as effective means of fertility reduction.

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D/ BROADENING THE POPULATION AGENDA

This chapter has identified many of the challenges posed by the enduring legacy of population paradigms and models that are deeply rooted in development thinking and practice. They focus on women's fertility as both the cause of and the solution to serious global problems, from environmental destruction and climate change to economic instability and political conflict. The narrow focus on overpopulation as a driver of environmental challenges distracts from unsustainable patterns and levels of production and consumption and inequities between and within countries.

Population policies must be broadened from fertility reduction to the realization of women's and girls' human rights and capabilities. Sustainable development cannot be achieved unless all women and girls enjoy universal access to sexual and reproductive health and rights over the life cycle, enabling them to make free and informed decisions about sex and reproduction. This requires the development of policies and legal frameworks and the strengthening of health systems to provide universally accessible quality sexual and reproductive health services, information and education across the life cycle, including on safe and effective methods of modern contraception, safe abortion, comprehensive sexuality education and maternal health care.

For the full realization of sexual and reproductive health and rights, governments have a responsibility to ensure that along with other essential services, health services are available, accessible, acceptable and of appropriate quality for all. This requires targeted measures to address the structural inequalities, stigma and discrimination that limit access to health services for women and girls. Ensuring access to quality education at all levels and access to decent work is also essential for broadening the population agenda.

Sustainable development cannot be achieved unless all women and girls enjoy universal access to sexual and reproductive health and rights over the life cycle, enabling them to make free and informed decisions about sex and reproduction

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CHAPTER 6

INVESTMENTS FOR GENDER-RESPONSIVE SUSTAINABLE DEVELOPMENT

A/ INTRODUCTION

This chapter develops an agenda for sustainable development, with particular emphasis on local priorities, poverty eradication and gender equality. It extends the argument of the previous chapters that sustainable development should enhance the capabilities of women and girls, so they are able "to lead the lives they value — and have reason to value" (Sen, 1999). Capability is akin to freedom, meaning the freedom to lead a particular life as opposed to another. Because the capabilities framework emphasizes choice in addition to outcomes of well-being (Nussbaum, 2000), it is only indirectly linked to specific bundles of goods and services. Yet in order to deliver tangible improvements for women and girls, investments must be directed towards sectors from which they can benefit the most. The term "investment" is used to denote financial, social and institutional efforts aimed at creating future benefits for humans and their environments. This chapter highlights four domains with a particularly strong potential to transform the lives of women and girls: domestic water, safe sanitation, clean(er) cookstoves and domestic electricity services. Expanding access to these goods and services can improve gender equality directly and specifically, because women suffer disproportionately from their absence (Antonopoulos and Hirway, 2010; Anenberg and others, 2013). There is ample evidence, for example, that the physical burden of food, fuel and water collection reduces women's capabilities relative to their own potential and relative to those of men (e.g., Cecelski, 1984; Ray, 2007).

Access to water, sanitation, clean cookstoves and electricity are the backbone of a decent quality of life and the basis on which a range of other life choices can or cannot be made. And yet there is significant underinvestment in these areas, relative to the global need. The four domains are directly connected to environmental sustainability. For example, high rates of open defecation, which contribute to water pollution and health hazards, are directly linked to inadequate sanitation facilities. Greater investments in these areas are therefore needed, for both social and environmental sustainability. However, not all investments in these sectors are sustainable and gender-responsive. The chapter proposes two dimensions for assessing investments in these areas from the perspective of gender equality and sustainable development:

(a) The risks and benefits of technologies, innovations and societal investments, including the gendered distribution of those risks and benefits;

(b) The extent to which the human rights and capabilities of women, especially those of poor women and girls, can be (or have been) advanced as a result of such investments.

Measuring the extent to which women's and girls' capabilities are enhanced through specific investments is not an easy task. Improvements in under-five female mortality and gender parity in secondary education are useful indicators for assessing and evaluating transformative investments in water, sanitation, cookstoves and electricity: they are particularly relevant for low-income communities or countries; they are a prerequisite to many other capabilities; and they are routinely measured in a large number of countries. In addition, investments should be assessed based on their potential and performance with regards to reducing unpaid care work for women and girls. While this indicator is not routinely calculated, time-use data for many countries exist, and could be used to measure progress. If investment outcomes are measured in terms of capabilities, so should the decision-making processes that bring them about. Most importantly, sustainable

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Strong public action by civil society and the state is required in order to expand the capabilities of all and protect environmental resources

development investments (local or national) should ensure that those who bear the risks of the intervention also hold the right to shape it.

While the past decades have brought significant improvements in the technological possibilities at the core of these services, including more efficient, lower-carbon and lower-cost options, they cannot go to scale on the basis of technological interventions alone. Nor is there a guarantee that improved technologies for use by women will automatically improve women's lives. The vast literature on access to basic services for the poor strongly suggests that universal and gender-responsive access cannot be ensured by voluntary mechanisms alone (i.e., through the market or the non-governmental sector). Strong public action by civil society and the state is required in order to expand the capabilities of all and protect environmental resources.

The chapter explores four concepts. Section B turns to the question of how to assess (ex ante) or evaluate (ex post) a sustainable development intervention through the lens of gender equality. Drawing on the literatures on risk and risk perceptions, and on the operationalization of capabilities and well-being, some assessment criteria for socially transformative investments are suggested. Each of the four investment domains is in section C, along with technological and social approaches towards providing basic levels of service. There are considerable political and institutional barriers to providing services to low-income populations at scale, and in particular for ensuring gender equality or environmental integrity in their provision. Section D focuses on the institutional contexts that may enable sustainable development pathways. It highlights the relevance of civil society alliances that are needed to support social investments at the necessary scales. Section E covers ways and means of financing such investments.

B/ ASSESSING TRANSFORMATIVE INVESTMENTS FOR GENDER EQUALITY

1. Assessing the risks of investments

Innovative technologies and the programmes that implement them always have risks. For every category of development investment, therefore, it is important to ask what kinds of risks are being taken and who will assume the potential costs. The rights and risks approach of the World Commission on Dams (2000) is useful in this regard. It has been valuable in laying out a framework for responsible public investments for dam-building, and can be usefully applied to other sectors. The World Commission clearly distinguished risk bearers from rights bearers, arguing that those who have risks imposed on them (risk bearers) often do not have rights

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with respect to investment decisions that are commensurate with their risks.

The members of the World Commission on Dams argued that the differential risk profiles and perceptions within and across communities call for transparent discussions with all the affected and interested parties, recognizing that the two may not be the same, and acknowledging that unforeseen consequences are always possible. The broader risk literature on technology and social acceptance has indeed shown that risk cannot be understood simply as a probability distribution of outcomes. People bring to their risk assessments not only the attributes of a technology, but also their cultural and political frames of reference and their social uncertainties and fears. These subjective and situated perspectives are not merely a matter of better communication of technical risks; they require analysis of the multiple criteria by which the risks are perceived (Stirling, 1998). For sustainable development, the rights and risks framework, with its emphasis on risk perception, risk distribution and the voluntary or involuntary nature of the risks, is especially important for large-scale and irreversible investments. In the case of large dams, for instance, on which the report of the World Commission was based, it was shown that affected and displaced communities often bore the risks of dam-building, but rarely enjoyed the right to shape decisions or benefit from new employment opportunities. Women and others without legal title to land were not allocated land in compensation for submerged holdings. This relatively unfavourable gender outcome, the World Commission argued, could apply to many investments other than dams (such as roads), when the risk bearers were not the rights holders.

2.Assessing the outcomes of investments

It is important to be able to assess potential investments in terms of their impact on gender equality and the local priorities and needs of the poorest people. If investment X is going to be promoted over investment Y, there must be clear criteria for estimating the impact before investing, or evaluating the impact after the investment has been made. As a core criterion, investments in the name of sustainable development should be assessed against their ability to enhance the capabilities of women and girls. No development pathway can be considered "sustainable" if it reduces women's capabilities. Thus if an investment in a low-carbon and energy-efficient option intended for the poor inadvertently increases unpaid care work for women, then it is not on a sustainable development pathway. This is not to deny the clear and urgent need for decarbonizing the global economy, but rather to argue, as outlined in chapter 2, that an emissions-centric or planetary-boundaries view of sustainability is inadequate from a local development or gender equality perspective. A capabilities approach to assessing investments requires a shift from the income-plus-environmental-footprint yardstick through which sustainable development is most often measured. Several measures have been put forth in order to assess capability enhancement.

One possibility for measuring women's capability enhancement, while keeping the measure practical and selective, is to choose among the indicators that already form part of the Human Development Index of the United Nations Development Programme, such as life expectancy and gender bias.[38] The Human Development Index is derived from Sen's influential capabilities and functionings approach (Sen, 1985) and can be seen as a way to operationalize capabilities. The Index as a whole is somewhat generic and large-scale; clearly, specific socioeconomic circumstances and priorities should dictate which indicators of capability are most relevant. For instance, for community-based investments in sanitation, an education indicator (such as secondary school enrolment for girls) might be the metric of evaluation. For investments in clean domestic energy for the very poor, female and infant mortality may be a more suitable metric. The indicators of interest should be measured for the overall population, but should also be measured for the lowest quintiles. They can be measured at multiple scales, for the state as a whole or for a single local intervention.

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Greater efforts are needed from Member States to prioritize the systematic collection, reporting and analysis of data on the minimum set of gender indicators adopted by the United Nations Statistical Commission

As a means of illustrating the approach, the female under-five mortality rate and the ratio of female to male enrolment in secondary education could be considered potentially useful capability measures in the context of the four priority areas analysed in this chapter (Saith and Harriss-White, 1999; Unterhalter, 2013). Such indicators are relevant for low-income communities or countries. Along with anthropometric indicators of nutrition, under-five mortality ratios and secondary school enrolment correspond to intrinsically important capabilities and are the precondition to the realization of many other human rights and capabilities. They are also realistic indicators given that child mortality and school enrolment data, imperfect though they may be, are routinely measured in a large number of countries. Other indicators could serve the purpose as well.

The enrolment measure is the female-to-male ratio as this is a direct indicator of parity; however, the simple rate of female participation in secondary education is also a plausible capability metric. Secondary school enrolment is emphasized over primary schooling: the literature has convincingly shown that more years in school are associated with girls being able to articulate their rights and better protect themselves and their families against illness (Unterhalter, 2013).

Two criteria may be a small number for the purpose of measuring gender equality across multiple domains. However, these are proposed as illustrative and important, rather than as sufficient, constituents of a sustainable pathway; their selection is entirely context-specific. It is expected that actual investments will be assessed through additional environmental and economic criteria. But selectivity and simplicity are essential for indicators to gain policy traction. Indeed, just one indicator may be a good assessment criterion for specific contexts, depending on the pre-investment baseline conditions.

An indicator for gender-responsive development that is indeed crucial is the reduction of unpaid care work. Every economy is dependent on the unpaid care economy (Razavi, 2007), comprising cooking, cleaning, elder care, childcare and community-based volunteering. In low-income economies, care work also includes fetching water and fuel, often over long distances. Unpaid work is heavily feminized, and the burden of unpaid work may increase or decrease as a result of ostensibly sustainable interventions. They may even be deemed sustainable because they rely on uncounted unpaid work; much-lauded interventions such as rainwater harvesting and community-based resource management have been critiqued on this ground (Jackson, 1993; Kabeer, 2005). Reduction of unpaid care work, particularly in low-income households, is essential if women and girls are to develop the full range of their capabilities. This indicator is not routinely calculated in the Human Development Index. Although countries are increasingly collecting time-use data, the lack of data in several areas such as women's experiences of poverty, unpaid care work, women's participation in decision-making at all levels and women's access to, ownership of and control of assets and productive resources, limits the assessment of gender equality and women's capabilities. Greater efforts are needed from Member States to prioritize the systematic collection, reporting and analysis of data on the minimum set of gender indicators adopted by the United Nations Statistical Commission.[39]

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C/ CATEGORIES OF INVESTMENT FOR GENDER-RESPONSIVE SUSTAINABLE DEVELOPMENT

Reliable domestic water supplies, clean and dignified sanitation, cleaner cookstoves and domestic electricity services are all basic categories. Every person, regardless of their age, gender or class, needs to drink water, breathe, eat cooked food, urinate and defecate, and see in the dark. Investments in these areas affect everyone every day, and therefore contribute to the fulfilment of capabilities and of human rights. They are the determinants of health and livelihood for all and the backbone of what has been called the "environmentalism of the poor" (Martínez-Alier, 2002). They are particularly critical for poor women given their social responsibilities in meeting the needs of other household members as well as their own. They should therefore be at the centre of policy efforts to achieve sustainable development.

All four categories of investment have spillover effects that benefit users as well as non-users (e.g., access to safe sanitation for women increases overall community health and efficient cookstoves improve household health as well as household budgets). Unsafe water, unsafe sanitation and indoor air pollution from solid fuels, account for some 11 per cent of deaths in low-income countries (WHO, 2009). All four investments have a technological core, but investing in technology alone cannot ensure that innovations are taken to a transformative scale. All four have significant positive externalities, meaning that the social benefits from their provision tend to exceed private benefits. Therefore markets are likely to underdeliver these goods and services, making them candidates for investments in the public domain. This does not preclude private sector participation but calls for coordinated efforts to direct private investments towards broader social goals, through context-specific subsidies and regulations. Investment in all four categories can either be channelled along unsustainable pathways that may not promote gender equality, or along more sustainable and equitable innovation pathways, through which capabilities may be improved. Focusing on these categories, therefore, does not imply that these will inevitably lead to gender equality, nor that these are the only worthwhile investments for sustainable development. Many investments can be transformative for poverty eradication and for gender equality, such as good infrastructure, mobile technologies for development, or financial inclusion for the unbanked. The emphasis is on investment categories that are likely to improve gender equality directly and specifically, especially for poorer women, because they are

The emphasis is on investment categories that are likely to improve gender equality directly and specifically, especially for poorer women, because they are disproportionately burdened with poor health and unpaid care work in the absence of such investment

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disproportionately burdened with poor health and unpaid care work in the absence of such investment (Antonopoulos and Hirway, 2010).

Sanitation investments in urban South Asia or Africa that provide a low toilet-to-user ratio often preclude women from using them, because they cannot stand in long queues in the morning or walk to facilities at night. On the other hand, many community-led total sanitation initiatives from Africa, such as from Kenya and Sierra Leone, have shown that women readily assume leadership roles in encouraging latrine construction and in the community mobilization activities that community-led total sanitation needs (Hickling and Bevan, 2010). Several improved cookstove interventions, in China, India and Kenya, have simultaneously improved household air pollution and potentially improved women's respiratory health, though the latter has been challenging to measure. An especially successful programme is China's national improved stoves programme to replace coal-burning stoves (Sinton and others, 2004), discussed in more detail below.

1. Water

Some 748 million people worldwide are without access to improved water sources (WHO/UNICEF, 2014), defined by WHO as water from a protected well, protected spring, collected rainwater, boreholes or tap. Diarrhoea from microbial contamination (even in "improved" water) claims the lives of 1.6 million children under five every years (WHO/UNICEF, 2006). Many innovative approaches are being developed and disseminated towards improving water quality. This section focuses on reliable access to adequate and improved quantities of water for domestic use. Especially for women in developing countries, basic access comes first.

Social expectations dictate that women and girls are the primary water carriers for their families; in over 70 per cent of households where water has to be fetched, women and girls do the fetching (WHO/UNICEF, 2012). Where rural water sources are distant, women walk up to two hours to fetch water. Where urban water is from shared standpipes they may wait in line for over an hour (see Ray, 2007). Survey data for 25 sub-Saharan countries indicate that women spend a total of 16 million hours a day collecting water (WHO/UNICEF, 2012); the more distant the source of water, the less water the household uses. Case studies from around the world show that water-related time poverty translates to lost income for women and lost schooling for girls (UNDP, 2006). In addition, high levels of mental stress result when water rights are insecure. All this fetching and carrying causes cumulative wear-and-tear to the neck, spine, back and knees; in effect, a woman's body becomes part of the water-delivery infrastructure, doing the work of pipes.

In many developing countries, urban access to improved water is higher than rural access, and access at the top quintile is significantly higher than at the bottom quintile. These trends are commensurate with the Human Development Report of 2006, which stated unequivocally that lack of access to water stemmed from inequality and lack of rights and not from some generalized notion of scarcity (UNDP, 2006), echoing the analysis in chapter 4 on the right to food.

Even in urban areas, where the access percentages are usually higher, the reliability, quality and affordability of access for the lowest quintiles are all insecure. Continuous piped water has the greatest health benefits and lowest drudgery costs, but is technologically and financially viable only for densely populated communities. Piped water with a sewer connection for developing countries would have required $136 billion a year from 2000 to 2015 in order to meet the target of the Millennium Development Goals; meeting the target using cheaper supply technologies, including borewells, low-cost pipes and roof-water capture, and without adding point-of-use treatments to improve water quality, has been estimated at under $2 billion

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annually (Hutton, Haller and Bartram, 2007). According to the WHO/UNICEF Joint Monitoring Programme on Water Supply and Sanitation,[40] the global water access target for the Goals was met by 2013, but this target falls short of universal access; falls short of water safe to drink; has been achieved largely through urban rather than rural access; and is quite compatible with continued time poverty for women, high costs of access and other indicators of water poverty (e.g., highly variable water quality, low reliability of water access source, physical burden of collecting and hauling).

In rural areas, modest quantities of water are needed not just for consumption but for livelihoods. Zwarteveen (1997) argues that an exclusive focus on the domestic water sector when discussing women's water needs overlooks the increasing number of woman-headed small farm households, and emphasizes the role of women as mothers rather than as producers as well. Rural systems that are "multiple use", meaning that they provide water for drinking and for small plots and a few cattle or goats, are more likely to respond to the range of basic needs that rural women must meet. They have a higher potential for cost recovery as they help to generate income, especially if credit is available. A drinking-water focused intervention, by contrast, such as a borehole with a pump, could have a life cycle per person per year cost of $20 to $60, with little chance of cost recovery from its low-income user base. From a pragmatic rather than human rights perspective, donors and governments are, in today's global economy, more ready to invest in schemes with partial cost recovery potential as opposed to none.

In addition to large storage-based multipurpose water projects, decentralized water-augmenting technologies exist, and have collectively reached many millions. Many of these would count as "multiple use" in today's terminology. Several of these are "modernized" traditional approaches, often community-based. The best-known example is rainwater harvesting, which is being taken to scale by communities in partnership with governments and non-governmental organizations. Another is the treadle pump, which is a foot-powered pump that extracts shallow water for domestic purposes, as well as for small farms and kitchen plots. The revival and modernization of these techniques are owed partly to recurrent droughts, and partly to efforts to counter the narrative that large dams were the only channel to water security. But a lack of funding and policy interest has prevented these approaches from reaching truly transformative scales (see Sovacool, 2012).

Everywhere, water is another word for life; access to water for poor women is one of the highest priorities of sustainable development. In this sense, the history of failed water projects in rural and urban areas is instructive. A frequently cited reason for failure is that women's voices and views were ignored before and during these efforts; and that women are the water users and therefore the ones with knowledge and stakes. Women's agency, voice and leadership are thus essential to sustainable and gender-responsive water access and must go beyond "tokenistic" participation. While it would be naïve to argue that women's leadership is either necessary or sufficient for sustainable community-level water projects, numerous case studies from Ethiopia, India, Kenya, Nepal, Pakistan, South Africa and the United Republic of Tanzania, among others, have argued that placing women at the centre of water and sanitation decisions has led to more cost-

Women's agency, voice and leadership are essential to sustainable and gender-responsive water access and must go beyond "tokenistic" participation

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effective delivery, more households with access to water and less corruption in water financing (Fisher, 2006; Chattopadhyay and Duflo, 2004).

2. Sanitation

Sanitation is a basic need, and yet access to improved facilities is denied to billions of people worldwide. It is important to understand that for social as well as biological reasons, women and men face different risks and have different needs with regard to sanitation. For example, girls and women may be exposed to sexual violence when accessing shared and off-site facilities, and the lack of adequate facilities in schools may keep girls away, particularly during menstruation.

"Improved" sanitation facilities, according to WHO and UNICEF, include pour flush or flush toilets into a sewer, ventilated improved pits and composting toilets, through the use of which pathogenic waste is likely to be removed from human contact. Many different toilet designs, from the simple pit with slab, to more complex but locally producible dry (ecological) toilets, exist for low-income households (Nelson and Murray, 2008). But over 2.5 billion people still have no access to an improved latrine; of these, 761 million use shared facilities, which the Joint Monitoring Programme for Water Supply and Sanitation of WHO and UNICEF does not consider "improved". Open defecation rates have gone down in all developing countries (WHO/UNICEF, 2013), but it remains the norm for over 1 billion people, 90 per cent of whom are rural residents.

Open defecation is a severe public health risk as well as an environmental hazard, causing widespread diarrhoeal disease and water pollution. Sanitation programmes are gaining increasing attention, relative to the previous neglect of such programmes in comparison with drinking water programmes, and are promoted vigorously by health researchers, by governments in concert with local communities and by international non-governmental organizations. It is still the case that for every $4 spent on water and sanitation programmes, sanitation receives about $1 (WHO, 2012). But a sea change has occurred in recent years with respect to recognizing sanitation as indispensable for health and development.

Basic sanitation that is clean, affordable to construct and to maintain, and safe to access, is a particularly transformative investment for women's and girls' capabilities. Women need more privacy than men when they use the facilities because of social norms, need more time in the toilet than men do (because they must sit or squat), need physical safety when they access toilets outside of the dwelling, and may need multiple daily visits during their menstrual period. For these reasons, access to sanitation access is as germane to gender equality and dignity as access to water. As with water access, sanitation access in low-income countries is highly unequal; as with water, urban coverage rates for sanitation are significantly higher than rural coverage rates (WHO/UNICEF, 2013). Even within rural regions, access is lowest for communities far away from main roads. Overall, it is estimated that children in the poorest quintiles of low-income countries (in South Asia and sub-Saharan Africa) suffer up to 20 times the health burden of inadequate sanitation as children in the top quintiles within those same countries.

New directions in sanitation research and promotion have largely been focused on extending access through developing new technologies, encouraging toilet uptake, improving markets for sanitation products, encouraging a larger role for non-state actors and discouraging open defecation (Black and Fawcett, 2008; water.org;[41] Bill and Melinda Gates Foundation). Several donor efforts (e.g., the Gates Foundation's "Reinvent the Toilet" initiative) and government-community partnership efforts (e.g., community-led total sanitation campaigns) are focused on sustainable sanitation for the poor. Community-led total sanitation emphasizes rural sanitation, as this reflects both the origins of the concept in rural areas (Kar and Chambers, 2008) as well as where open defecation mostly occurs. It is a subsidy-free approach to community

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mobilization for sanitation that encourages people to build their own toilets/latrines with local resources to stop open defecation. Community-led total sanitation encourages women to take leadership roles, but also builds on traditional notions of women as the keepers of cleanliness and order in the family and can add to women's existing labour (Mehta and Movik, 2011). But there are also city-based examples of urban sanitation with community leadership at their centre, using sanitation as a community-building as well as toilet-building exercise, from South Asia, Central America and Southern Africa. These methods, which were once pilot projects but are now becoming mainstream, represent a major change from previous supply-driven and facilities-driven approaches. It is still unclear if these demand-driven means can be sustained over time in multiple settings, or if they can adapt to the political economies of different countries well enough to go to scale (e.g., Harris, Kooy and Jones, 2011, on Viet Nam).

The definition of improved (or reinvented) latrines in all these efforts remains hardware-oriented, saying little about wastewater treatment before disposal or sludge removal if the toilet is a dry toilet. Untreated sewage and faecal sludge from overflowing pits are highly polluting and unsustainable. If improved sanitation required sewage to be treated before its discharge into the environment, 4.1 billion rather than 2.6 billion people would be counted as unserved (Baum, Luh and Bartram, 2013). Sustainable toilet designs therefore have to include not only the reduction of open defecation, but also the disposal and reuse of pathogenic waste (Nelson and Murray, 2008). Financing sanitation at the required scale remains an unmet global challenge, with great uncertainty in existing cost estimates and almost no estimates of spending by private households. Hutton and Bartram (2008) estimate that about $36 billion (2008 US dollars) annually will need to be invested for 10 years to meet (and maintain) the Millennium Development Goals target of reducing by half the population without access to improved sanitation. If primary treatment of toilet waste and long-term maintenance costs are added, the cost of "sustainable sanitation" can be 5 to 20 times the cost of building the latrine alone. Innovative social enterprises that safely convert human waste into reusable sludge or renewable energy are being piloted at the scale of urban slums (e.g., Sanergy),[42] exploiting the possibilities for cost recovery from productive reuse, but these efforts are still at the pilot stages.

Menstrual hygiene has often been neglected in national and international sanitation promotions; it is only now being acknowledged as the critical programmatic gap for the post-2015 development targets

The emphasis on eliminating open defecation is absolutely critical. But it is not enough for sustainable or gender-responsive sanitation. Clean and secure sanitation can enable girls' education, women's mobility and women's and girls' physical and sexual security. However, gender equality means that toilet programmes have to go beyond addressing defecation and disease management and take equally seriously the requirements of privacy, safety and menstrual hygiene management. Menstrual hygiene has often been neglected in national and international sanitation promotions; it is only now being acknowledged as the critical programmatic gap for the post-2015 development targets (WHO/UNICEF, 2013). Sanitation facilities and products that are safe and private enable girls to stay in school and reduce their discomfort and potential shame during menstruation. Evidence from India, Nepal, Nigeria and the United Republic of Tanzania indicates that a lack of sanitary facilities and clean cloths during menstruation keeps girls from school, and that clean safe toilets, as well as menstrual hygiene education, keep girls in school. Other studies from India

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and Kenya show that poor menstrual hygiene and changing facilities embarrass girls, keep them from physical activity during recess, keep them home and that improved and affordable sanitary products and privacy improve the experience of the school year and also quality of life overall (House, Mahon and Cavill, 2012; McMahon and others, 2011; Shah and others, 2013). In short, men and women have very different sanitation needs, for biological and social reasons. Investments in this area have to be designed and implemented with these bodily needs and the social norms that surround them as a central concern, and this means sanitation uptake programmes cannot be focused on the prevention of open defecation alone.

3. Cookstoves

It is still the norm for women to do the daily cooking for their families. It is a central part of the unpaid care economy. Women and their children, especially younger ones who are with them all the time, therefore suffer disproportionately from exposure to harmful smoke emitted from biomass-burning cookstoves. The time spent collecting fuelwood or charcoal, also a job mainly delegated to women in developing countries, is onerous and sometimes dangerous, for the women and also for the children who often accompany them. In addition, rural households are highly labour-constrained during peak agricultural seasons, and the time to collect fuelwood has high opportunity costs.

Women spend many hours per day searching for fuel and cooking over open flames that emit harmful smoke. They are therefore disproportionately affected by dirty and inefficient cooking practices and reliance on biomass fuels (Global Alliance for Clean Cookstoves, 2013). Globally, almost 3 billion people rely on solid fuels for cooking and heating; 78 per cent of this population is rural, according to Sustainable Energy for All (see www.se4all.org). Biomass-burning traditional cookstoves (i.e., stoves using wood, charcoal, animal manure or crop residues), especially when used indoors, are the primary contributor to household air pollution. Globally, such pollution is responsible for over 4 million deaths, and household air pollution and ambient air pollution, jointly, are now the leading global environmental health risk. In South Asia and China, solid-fuel cookstoves, which are biomass-based in India but significantly coal-based in China, are the single largest contributor to household air pollution. The cumulative burdens from diseases, from black carbon and inhaled particulate matter, are manifest in respiratory infections, lung inflammation, low birthweight and cardiac events (Fullerton, Bruce and Gordon, 2008).

The health and income benefits and time savings if households can switch to cleaner-burning and more efficient cookstoves are important to communities overall. As is the case with water and sanitation, this gives them positive externalities well beyond the benefits for individual women. In South Asia and sub-Saharan Africa, for example, a large share of ambient (not just indoor) particulate matter is attributed to cooking with solid fuels.

Investing at scale in efficient solid-fuel stoves, especially in rural and peri urban regions, is simultaneously a gender-responsive and a sustainable-pathway investment. For health reasons and to prevent indoor air pollution, it would be better to switch away from cookstoves altogether and into cleaner fuels such as liquefied petroleum gas or natural gas, but this is a more ambitious proposition.

Relative to data on water and sanitation, the data by country and by quintile on access to efficient cookstoves are sparse (see Anenberg and others, 2013). In part this is because clean cookstoves are only just becoming a significant focus of public spending or routinely collected public data. National energy policies and poverty reduction strategy papers very often focus on electrification and do not adequately reflect the importance of cooking energy. The exception thus far was China's massive and organized national improved

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stoves programme, which has since been discontinued, but which introduced 180 million improved stoves (Sinton and others, 2004) while it lasted.

Despite growing policy attention, public investment in cleaner cookstoves remains inadequate. The first factor affecting support for cleaner cookstoves is that the effects of cookstove interventions in the field have been widely varied, some being assessed as having had no effect, others having contributed to modest health improvements, which are difficult to quantify, or to lower than anticipated improvements in indoor air pollution (see Anenberg and others, 2013). The designs and combustion efficiencies of "clean" cookstoves themselves vary widely, from those that include a chimney so that the smoke is pushed outdoors to those that simply use less fuel but retain particulate pollution indoors. The income effects of efficient stoves are more likely to be consistently positive, as many improved stoves burn between 30 per cent and 60 per cent less fuel than their unimproved counterparts; this can be a significant saving for rural households that spend nearly 10 per cent of their monthly income on energy (Miah and others, 2010).

The second consideration is that producing cookstoves that women want to use and marketing these to low-income families has been a challenge. Most cookstove interventions, even when they report satisfaction with the stoves and use of the stoves, also report the continued use of the traditional stove for staple foods (whose taste apparently changes with improved stoves). In addition, there is anecdotal evidence that women are unwilling to give up the convenience of two stoves, despite the benefits of consistently using the efficient one. This form of device "stacking" makes it harder to see health impacts and also harder to sell new stoves. In the cooking arena especially, men and women may value different aspects of clean stoves. It has been hypothesized that women value stove aesthetics and smoke-free environments more than men, who are concerned about timely meals and the traditional taste of food. Such views are not necessarily in conflict, but they present marketing challenges. It is estimated that 166 million households now use relatively inexpensive improved stoves, with 116 million in China and 22 million in South Asia. Though at-scale change remains elusive, encouraging results in stove uptake have been reported by many non-governmental organizations, such as Practical Action, Groupe énergies renouvelables, environnement et solidarités (Group for the Environment, Renewable Energy and Solidarity (GERES)) Cambodia and Potential Energy, working in Asia and Africa, and with women centrally involved in stove design, testing and social and conventional marketing (see Global Alliance for Clean Cookstoves, 2013).

The cookstove arena is now firmly enmeshed in the climate mitigation debate. It is routinely asserted that cleaner cookstoves can empower women, improve human health and mitigate global warming, and therefore that there is a win-win nexus of climate, energy and poverty. Reduced solid fuel use reduces harmful emissions, even though all stoves in total produce a very small fraction of total emissions (about 1 to 3 tons of carbon dioxide per year, per stove) (Lee and others, 2013). More critical than the emissions of carbon dioxide may be those of black carbon (soot), an air pollutant, a forcing agent for global warming and a regional climate disruptor, which biomass- and coal-burning stoves produce, and which generates a significant amount of warming in the short-term. In South Asia it is estimated that half of the total emitted black carbon is from biomass-burning stoves, and that it disrupts the monsoons and therefore potentially threatens water availability. It should be noted, however, that detailed research on black carbon sources shows that residential biofuel cooking overall may or may not result in a small warming effect from short-lived pollutants, but the size of the effect, if any, is extremely uncertain. Residential coal burning has a slightly higher short-term warming effect, but again, "with low certainty" (Bond and others, 2013).

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The apparent climate impacts have made it possible to finance and market stove programmes through public-private partnerships, the Clean Development Mechanism, the Clean Cooking Loan Fund and other new forms of creative carbon financing.[43] But the data provide little assurance that reducing the burning of biofuel will mitigate near-term climate change in a meaningful way. The so-called co-benefits of climate mitigation from clean stoves, such as better health for, in particular, women, and lower costs for fuel, in terms of the time spent collecting fuel and/or the financial cost, overwhelm the climate benefits. The benefits in terms of women's and children's health and the reduction in their unpaid workloads alone should provide a strong enough rationale for investing in clean cookstoves as part of a sustainable development agenda.

almost pure black carbon with little organic carbon (Lam and others, 2012). Not having basic electricity automatically puts a household in the category of "poor" and, by this metric, over 1.3 billion people remain poor.

Though the Millennium Development Goals did not have an electricity (or energy) goal or target, access to basic electricity services is a prerequisite for gender equality and not just for overall development alone (Cabraal, Barnes and Agarwal, 2005). The primary target of Goal 3, on promoting gender equality, was the elimination of gender disparity in education, and access to electricity has allowed more women to read and watch television across all income classes (Pereira and others, 2011, and Energy Sector Management Assistance Program, 2004, cited therein). Small enterprises, often run by women, also need electricity. Access to electricity improves health-

The benefits in terms of women's and children's health and the reduction in their unpaid workloads alone should provide a strong enough rationale for investing in clean cookstoves as part of a sustainable development agenda

4. Electricity

The final example of a transformative investment is electricity. Reliable, safe and affordable lighting transforms lives. Electricity means that men and women can work longer or more flexible hours if needed, that children or adults can study in the evenings with good lighting, and that cell phones, which have become an essential means of communication for the working poor, can be charged. Electric lighting is safer by far than open flame kerosene lamps or candles. Wick-based lighting, such as candles and kerosene lamps, also generates high levels of black carbon, but unlike biomass-burning cookstoves, kerosene lamps emit

care infrastructure in general because clinics can function after sunset, vaccines can be kept cold and childbirth need not take place in the dark. The maternal mortality ratio in particular is strongly correlated with access to electricity (Sovacool, 2012). Women aged 15 to 34 die in disproportionately high numbers on account of maternal mortality (United Nations, 2013a), and deliveries without light are known to be a significant cause of infections and death. Basic access to electricity is therefore essential for the expansion of women's capabilities.

The cost estimates for bringing modern electricity services to the 1.3 billion people who are currently unserved range widely, but the

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Basic access to electricity is essential for the expansion of women's capabilities

World Energy Outlook estimates a need for $49 billion per year until 2030 (International Energy Agency, 2012). The range depends on how capital costs are estimated, but also on what is assumed about fuel prices and appliance efficiencies. Ongoing maintenance costs are usually included for assessing grid electricity costs, but often left out of calculations for smaller home-based or community-based systems. Centralized grid extension remains most efficient for densely populated middle-income urban areas such as in China or South Africa. But capital cost considerations and low prospects for revenue recovery have prevented private sector utilities from entering low-income, sparsely populated, rural markets (Bazilian and others, 2012) even as many developing countries have been pushed, for reasons of efficiency but also of ideology, in the direction of privatizing their energy services.

It is important to consider the current tension between bringing electricity to the unconnected and increasing greenhouse gas emissions, because the conventional model of provision is a centralized grid based on fossil-fuel energy. Overall, the majority of those in the dark are rural residents, and their low capacity to pay, high level of need and global climate change considerations have combined to make decentralized systems based on renewables a leading policy recommendation for sustainable energy, according to Sustainable Energy for All. There are several options within the category of decentralized or microgrid systems using renewable energy. These include extremely small systems averaging around 10W ("pico"), supporting simply a couple of lights and cell-phone charging; or solar home systems, supporting fans, four to five efficient lights and a television, averaging about 30-40W for commonly sold units; or mini-grid systems which offer several community-scale services, require higher upfront investments, but generate electricity at a lower cost than home systems, as reported by Sustainable Energy for All. Microgrid systems may be faster to scale up and replicate than a centralized grid in low-resource communities, but case studies show that costs and capacity for ongoing maintenance cannot be an afterthought in the cost-benefit analyses. Hybrid renewable-conventional systems are also possible, at the community or multi-community scale, combining photovoltaics with wind, or even with diesel, providing grid-like reliability and a range of productive applications beyond just residential use (Guruswamy, 2011).

Basic electricity access is currently defined as having a connection in the home. Providing a minimal level of electricity to the 1.3 billion people who are currently without access, in order to power basic lighting, a fan and a radio or television, would add up to a tiny fraction of current global electricity consumption, while having potentially transformative effects. Therefore the climate is not in immediate danger from the provision of basic electricity for the poor, even if their entire consumption were to be powered by fossil fuels. But integrating renewables into the grid and expanding decentralized options by using clean power sources that minimize the impact on local health and the level of particulate pollution, are important steps for preventing the lock-down of new fossil-fuel based infrastructures. The provision of basic services is only a start. Poverty eradication will require moving beyond that (Sovacool, 2012). As with the cookstove arena, sustainability in relation to electricity services should reflect the relative effects on climate and on capabilities of both centralized and decentralized, and conventional and renewable, options.

As with all interventions, decentralized rural electrification programmes have succeeded in some areas but failed for financial, political and social reasons in others. And while

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basic electricity services remain essential for sustainable development, no technology, regardless of its cost, climate resilience, or mode of dissemination can ensure that the electricity generated and used will in fact improve gender equality. Studies on women and electricity have reported that, once there are electric lights, women have more time to be with their children, perform their chores faster and can read more. But for extremely small and limited systems, cooking, studying and television compete for the limited electricity (Jacobson, 2007); intra-household allocation and power will determine who uses the watts and for which purposes (see Agarwal, 1997). It may be that, higher costs notwithstanding, systems with a higher capacity than "pico" will be needed in order for electricity services to actively promote gender equality. Based on the capability enhancement criteria suggested in this chapter, therefore, small, but not pico, systems may turn out to be on the more sustainable path.

D/ INSTITUTIONAL CONTEXT OF INVESTMENTS

The institutional context of investing in sustainability and capabilities is undeniably crucial. Each of the four priority sectors identified depends on innovative and/or affordable technologies, and technologies can easily be seen as the central ingredient for making investments in water, sanitation, cookstoves and electricity a success. But technology is only a part of any investment story, as technologies are disseminated in an institutional and financial context, to users with their own values and views, and within specific political economies. The institutional context significantly determines who has access and on what terms. Many projects in water, sanitation and energy now engage women at every level, from design to marketing to finance. This is particularly true for the more market-based interventions, such as clean cookstoves or off-grid efficient lighting; it is also increasingly the case for water or sanitation systems. But the institutional demands of going to scale for the 1.3 billion people without electricity or the 2.5 billion people without sanitation are truly daunting.

Water, sanitation and electricity have historically gone to scale through public sector investments, as networked utilities have traditionally been monopolies. Since the 1980s, these services in developing countries have opened up to the private sector. Private sector participation increased because the public sector did not provide services to the low-income public and because the global political economy became more market-friendly and more sceptical of the state (see e.g., World Bank, 2003). Over the same period, civil society actors and decentralization became mainstream in these service sectors. The cookstove sector was never fully in the public domain. Stoves have mainly been seen as stand-alone consumer items, despite long-standing (and now increasing) national and donor programmes for improved stoves and biogas-based energy.

The resulting public-private partnerships in the centralized or semi-centralized utilities for developing countries have had mixed results (Bazilian and others, 2011). The literature in

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support of public-private partnerships has often argued that such partnerships are the only way forward, as the state sector has neither the funds nor the capacity and credibility to expand provision. However, a recent comprehensive study of water and sanitation financing in 17 countries, conducted by the United Nations Inter-agency Mechanism on All Freshwater Related Issues Including Sanitation (UN-Water) and WHO, shows that 80 per cent of the (non-household) funds for this sector continue to come from central, regional and local governments (WHO, 2012). The arguments against public-private partnerships suggest that privatization is reducing the state to a mere upholder of private property and guarantor of private contracts, but overlooks the failure of many states to provide for poor people, and the implications of that failure. The evidence on whether public-private partnerships benefit low-income women, by providing a reliable and efficient service and thus reducing coping costs and uncertainty, or whether they harm women, by requiring monetary contributions and user fees which women may not have, is still mixed.

Though the limitations of government-run programmes have been emphasized in recent decades, and though states are often poorly governed, the evidence suggests that they remain pivotal to social investments at scale. A well-known example is China's rural clean cookstove project; the programme transformed over 100 million households through improved stoves, with a coordinated effort by multiple national ministries, multiple county- and village-level officials, rural energy companies and local energy service enterprises (Sinton and others, 2004). An example of nationally led rural electricity access is the post-apartheid national electrification programme in South Africa. The far-reaching programme was successful in that access to electricity more than doubled within a short time, with selected private sector concessionaires working towards a largely public sector goal.

The nature of private sector engagement in water, sanitation and energy is rapidly changing, especially for providers working with people in the lowest income quintiles

Such at-scale examples are rare without the state playing a central role. Private enterprise, demand-driven services and finances, bottom-up pressure from non-governmental organizations and the demonstration effects of pilot projects, are all critical. But much of the literature on the importance and innovation of private actors in essential services concludes that the state needs to set and enforce an enabling policy framework, provide direct assistance to the poorest, and direct the flow and targeting of collective goods, if water and energy services are to be universally provided. Different reasons have been suggested for the failure of promising interventions to scale up, such as insufficient state subsidies, weak infrastructure, weak governance and poor regulation (Zhang and Smith, 2007; Bailis and others, 2009; Pereira and others, 2011; Harris, Kooy and Jones, 2011; Sovacool, 2012). Private actors cannot capture spillover benefits, or provide services to an extremely poor user base, or guarantee either basic needs or environmental integrity. This is not their mandate.

At the same time, the nature of private sector engagement in water, sanitation and energy is rapidly changing, especially for providers working with people in the lowest income quintiles. Rather than large corporate entities, they are small-scale, semi-formal entities sometimes purely commercial, at other times social as well as commercial, and mostly agile and entrepreneurial. It is critical that the public sector engages with the private sector(s) in sustainable development efforts, and regulates it while taking advantage of its service-creation and market-creation potential. Yet regulation and oversight is a capacity that smaller states may lack, especially relative to the well-financed corporations with which they sometimes have to negotiate. Regulation and oversight of the

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private and public sectors, therefore, are also the business of civil society and social movement representatives. These entities, heterogeneous though they may be, are often effective pressure groups and/or watchdogs on behalf of unserved or marginalized communities.

In this complex institutional environment, where different providers are operating side by side, investments for sustainable development can only go to scale with alliances among all the players in the development arena. Contemporary efforts show that such alliances are indeed possible in the water, sanitation and energy sectors. Grameen Shakti is one of the primary private (but non-profit) sector actors in off-grid electricity in Bangladesh and has installed over 1 million home solar systems. It uses financing provided by the International Finance Corporation and the Government of Bangladesh to extend generous microcredit terms to its buyers (Pachauri and others, 2012). The extensive networks of rainwater harvesting systems in India, pioneered by groups such as Tarun Bharat Sangh and Gravis, are now going to scale with government support, in some cases government mandates, after hundreds of successful demonstrations (India, Ministry of Water Resources, 2012). Community-led total sanitation, a subsidy-free participatory approach to latrine building and use, is expanding rapidly in sub-Saharan Africa with the support of international agencies and national governments (e.g., Rukuni, 2010). Cookstove projects with women's groups, community groups, social enterprises and for-profit stove makers are working with millions of customers in Africa, Central America and South and South-East Asia. These examples are proof that transformative alliances can and do exist, and that new forms of state-business-society ties can enable gender-responsive sustainable development.

Despite the shortcoming of many state-run efforts, the historical evidence points to the need for states to enter into contracts with their people, and to honour those contracts, at least in part. It is akin to what has been called the "developmental state", in which the state, in concert with other social actors, is ultimately accountable to all women and men (Evans, 1995). It is compatible with the call for countries to realize their commitments to human rights, which include gender equality and an adequate standard of living. Sustainable and capability-expanding development, at scale, needs an active and accountable state.

E/ FINANCING INVESTMENTS FOR SUSTAINABLE DEVELOPMENT

Financing pro-poor gender-responsive investment in sustainable water, sanitation and energy services is a formidable proposition, especially for countries with low per-capita GDP. The difficulty of financing such investments to scale must be acknowledged and budgetary competition with other sectors, including health, defence, education, debt repayment and agriculture, must also be faced. Financing investments for the lowest

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quintiles requires an enabling environment in developed and developing countries alike. The following list is by no means exhaustive, but serves to show that both traditional and non-traditional sources of financing for water, sanitation and energy services exist and can be usefully harnessed and redirected towards sustainability and gender equality:

(a) Central government domestic resource mobilization (e.g., progressive taxation on income, including the corporate sector) is central to any new social contract that is pro-poor and responsive to gender equality;

(b) Local and municipal government financing;

(c) Public financing of infrastructure, with central or local government oversight and monitoring, but with the provision or supply either contracted out, or provided through market forces;

(d) Redirecting international development lending away from a large-infrastructure bias;

(e) Bond and portfolio equity financing (increasingly common for large infrastructure, allowing for funds to be raised nationally or internationally);

(f) Community-driven development financing or social funds (these may be of limited scalability);

(g) Developed countries meeting the target of 0.7 per cent of their gross national product being apportioned for official development assistance to developing countries (and ring-fencing priority sectors such as water and sanitation within that 0.7 per cent);

(h) Mobilize resources through a tax on global financial transactions;

(i) Reducing the many existing, and often legal, avenues of tax evasion;

(j) Removal of fossil fuel subsidies in the Group of 20 (G20) and in the newly industrializing countries;

(k) Redirecting military budgets;

(l) Reducing trade-distorting agricultural subsidies and exports in developed countries, which make it difficult for farmers in poor countries to compete, as pointed out in chapter IV;

(m) Climate financing in accordance with the obligations of the United Nations Framework Convention on Climate Change, to be channelled in part through the Green Climate Fund;

(n) Other smaller but potentially pivotal funding categories, such as adaptation and mitigation financing including the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries and related processes (REDD and REDD+), green microfinance and possibly future carbon taxes (bearing in mind that such instruments are important but imperfect, and may be no more pro-poor or gender-responsive than traditional government financing).

Both traditional and non-traditional sources of financing for water, sanitation and energy services exist and can be usefully harnessed and redirected towards sustainability and gender equality.

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Multiple actors have a role in implementing and monitoring such financing regimes, including governments, multilateral lenders, regional development banks, United Nations entities, traditional development assistance institutions and the private sector. With the growth of public-private partnerships and increasing involvement of the private sector in development, stronger accountability frameworks are needed to ensure compliance with human rights standards, particularly as public money is often used to draw in (or "top up") private investments. It is important to highlight the role of grants versus the role of loans for community-based water, sanitation and clean energy, and for adaptation measures more broadly. Lending requires poor countries and possibly poor communities to repay the loans. When these repayments result in shrinking social sector spending, more unpaid work for women may ensue. The criteria laid out in this chapter indicate that such financing is not appropriate for sustainable development.

In sum, for sustainable development to be compatible with internationally accepted human rights norms, gender equality is a necessary component of any chosen pathway(s). Investments towards socially transformative development should consider women's capability enhancement, especially at the lowest quintile, as a non-negotiable goal. This means that sustainable development efforts, globally or regionally, must be directed towards key sectors from which poor women are the main beneficiaries. Against this backdrop, water, sanitation, cookstoves and electricity were identified as priority areas for investments that can promote gender-responsive sustainable development. Each of these sectors could be transformative for women's and girls' health and dignity, especially for those from poorer households. For this to happen, investments cannot be designed in a gender-neutral way but need to take the specific needs of women and girls into account, including the circumstances under which they study, work and live.

Investments in the four selected domains are, in effect, investments in the determinants of health and opportunity. It is crucial to choose practical, selective and relevant indicators, such as the reduction of unpaid care work, in order to assess the impact of these specific investments on the capabilities of women and girls. Additional metrics of assessment may also be chosen, such as water quality or carbon emissions or pro-poor income growth, or similar measures relevant to a specific societal investment. However, the approach for such investments does question a carbon-first-and-foremost approach to water, sanitation and

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Taking turns at the tap in Maane Dobhaan, Nepal, 2013

energy for the poor without due attention to other dimensions of sustainable development.

It is important to recognize that effective investments at scale are difficult and uncertain and depend on gender-sensitive and context-sensitive design as well as financing (Schalatek, 2012). Moreover, such investments call for transformative alliances between policymakers, donors, the state and the private and civil sectors. Investments at scale (whether sustainable or otherwise) need the reach and organizing power of the state; and the state needs the mobilizing power and vigilance of collective action and social movements to ensure it honour its contracts. Sustainable development can be pioneered, demonstrated and encouraged, but ultimately not spearheaded, by non-governmental organizations, donors and the private sector. Basic but transformative investing needs much more than innovative technologies and innovative financing to be sustainable. Moreover, it must be underpinned by the agency and leadership of women and girls taking the decisions that are so critical for their lives, livelihoods and communities in the pursuit of sustainable development.

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CHAPTER 7

CONCLUSIONS AND POLICY RECOMMENDATIONS

The present *World Survey* has examined the important links between gender equality and sustainability. The survey is published at a crucial moment, at a time when the international community has recognized that dominant patterns of development and growth are unsustainable in economic, social and environmental terms and is defining the future sustainable development agenda. The Open Working Group of the General Assembly on Sustainable Development Goals, the establishment of which was mandated in the outcome document of the United Nations Conference on Sustainable Development, has since worked on a proposal for future sustainable development goals. The vital importance of gender equality and the empowerment of women as a core part of the post-2015 development agenda has been a strong and recurring theme in the discussions of the Open Working Group.

Current trends in relation to growth, employment, food, population, water and sanitation, and energy provide examples of how unsustainable development and gender inequality reinforce each other. Economic growth trajectories continue to perpetuate gender inequalities, confining women to low-paid jobs and relying on women's unpaid care work, while at the same time exploiting natural resources and damaging ecosystems and biodiversity. The focus of food policy on aggregate production has not only neglected pressing challenges posed by climate change, but also issues of access to and the right to food for all, along with the complex gendered dynamics of local and global food markets, intra-household allocation of food and production systems that drive hunger and malnutrition. Narrowly focused population policies may prescribe coercive measures to achieve fertility reduction that can have significant implications for women's enjoyment of human rights. Further, the dominant population paradigm shifts attention away from patterns of consumption and production, which play a more significant role than population in environmental degradation. The lack of universal access to water, sanitation and energy that are environmentally sustainable and of good quality bears significant consequences for women's and girls' human rights and capabilities.

Power imbalances in gender relations, in the exercise of rights, access to and control of resources, and participation in decision-making, persist as a significant obstacle to women's full and equal contribution to and opportunity to benefit from sustainable development. Looking forward to the post-2015 development agenda, efforts to achieve gender equality and sustainable development should be grounded in human rights and underpinned by principles of equality and justice for present and future generations. As such, sustainable development is economic, social and environmental development that ensures human well-being and dignity, ecological integrity, gender equality and social justice, now and in the future.

All sustainable development policies and frameworks, at the global, regional, national and local levels, must include an explicit commitment to gender equality and the realization of women's and girls' human rights and capabilities. This requires redressing gender inequality, discrimination and disadvantage and addressing their intersection with other inequalities. Women's collective action and full and equal participation in all aspects of decision-making related to policy development and monitoring must be supported and are central for achieving results.

Addressing sustainable development and gender equality together is vital for harnessing the synergies between both objectives. Gender equality can have a catalytic effect on achieving sustainable development. Acknowledging women's knowledge, agency and collective action offers the potential to improve resource productivity and efficiency; to enhance ecosystem conservation and sustainable use; and to build more sustainable, low-carbon and climate-resilient food, energy, water and sanitation, and health systems. Women have been and must continue to be central

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actors in promoting sustainability and green transformations. However, approaches that draw on women's knowledge and time without conferring upon women the rights and the benefits of sustainable development can further reinforce gender stereotypes and entrench gender inequalities.

Achieving sustainable development means reconciling economic, social and environmental concerns and objectives. There are always tensions and trade-offs to negotiate and harmonize. Some pathways promote environmental sustainability without taking sufficiently into account gender equality, and others promote gender equality and neglect key dimensions of sustainability. Any development pathway will only be sustainable if it enhances women's capabilities, respects and protects their rights and reduces and redistributes their unpaid care work.

The negotiation of policy dilemmas to achieve sustainable development and gender equality requires inclusive learning and deliberation processes and ways to monitor exclusions, trade-offs and unexpected opportunities. The active participation, leadership and creativity of women, civil society and women's organizations, communities and all concerned individuals in such processes are critical.

Renewed social contracts between states and all people are needed, where states fulfil their obligations as the duty bearers and rights holders claim and enjoy rights. States play central roles in delivering on commitments to gender equality, setting standards and regulations for resource use and providing public services and investments for sustainable development. Public investment is necessary for scaling-up key innovations for gender-responsive public goods, such as the provision of water supplies, appropriate sanitation facilities and modern energy services. Alliances between the state, private sector and civil society actors that advance gender equality and sustainable development also have a vital role to play. In particular, voices and movements from the margins that offer powerful alternatives for transformed, more sustainable futures grounded in gender equality and human rights should be sought, heard and acted upon.

States play central roles in delivering on commitments to gender equality, setting standards and regulations for resource use and providing public services and investments for sustainable development

The *World Survey* proposes three criteria to assess whether sustainable development is in line with gender equality and women's human rights: first, compliance with human rights standards and the realization of women's capabilities; second, attention to the unpaid care work of women and girls, especially those in poor and marginalized households and communities; and third, full and equal participation by women and girls in all aspects of sustainable development.

In order to ensure that efforts to achieve sustainable development meet the criteria, Member States should fully implement the commitment to gender equality and the empowerment of women contained in the Beijing Platform for Action and the outcome of the twenty-third special session of the General Assembly. States parties to the Convention on the Elimination of All Forms of Discrimination against Women should fully implement their obligations under the Convention.

To that end, States, international organizations, including the United Nations, and human rights mechanisms, the private sector, non-governmental organizations, trade unions and other stakeholders may wish to take the following actions:

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(a) On sustainable development and gender equality overall:

(i) Develop and implement policies on the economic, social and environmental dimensions of sustainable development in line with international norms and standards on gender equality, non-discrimination and human rights;

(ii) Promote transitions to sustainable low-carbon, climate-resilient consumption and production patterns while ensuring gender equality;

(iii) Ensure women's right to an adequate standard of living, through increasing access to decent work and providing gender-responsive, universally accessible and high quality services, social protection measures and infrastructure, including education, health, water and sanitation, and energy;

(iv) Promote a renewed social contract between states and people that ensures the financing and implementation of sustainable development, with universal access to public goods and services and common pool resources, particularly for the poorest groups of women and girls;

(v) Recognize, reduce and redistribute unpaid care work between women and men within households, and between households and the state by expanding basic services and infrastructure that are accessible to all;

(vi) Respect, protect and promote sexual and reproductive health and rights for all, particularly women and girls, across the life cycle;

(vii) Protect the commons and prevent the appropriation and exploitation of natural resources by private and public interests, through state oversight and multi-stakeholder regulation;

(viii) Ensure the full and equal participation of women and girls in sustainable development policies and initiatives as actors, leaders and decision makers;

(b) Green economy, gender equality and care:

(ix) Ensure that macroeconomic policies are geared towards creating decent work and sustainable livelihoods and reducing inequalities based on gender, age, income, geographical location and other context-specific characteristics;

(x) Prioritize the development of gender-responsive policies aimed at generating decent work, with a focus on labour market segregation, gender wage gaps and the unequal distribution of unpaid care work within households, and between households and the state;

(xi) Ensure that green growth strategies are gender-responsive and socially, economically and environmentally sustainable;

(xii) Ensure that green growth policies increase access for women, particularly for poor and marginalized women, to high quality jobs in sustainable and low-carbon industries;

(xiii) Invest in women's skills development and education to increase their access to green jobs, including targeted measures to increased women's education, employment and leadership in science, technology, engineering and mathematics;

(xiv) Transform service and informal sector work, including paid care work, into sources of sustainable livelihoods and decent employment through specific policies and regulations that are aligned with decent work standards;

(xv) Promote and protect the rights of domestic workers by ratifying the Domestic Workers Convention, 2011 (No. 189) of the International Labour Organization and by developing and implementing labour market and employment policies to guarantee decent pay and conditions for domestic work;

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(c) Food security:

(xvi) Develop and advance global standards and norms to support food security and women and men smallholder farmers in areas such as equitable trade rules, regulation of commodity markets and large-scale land investments, including for biofuels;

(xvii) Design and implement comprehensive gender-responsive and human rights-based policies that ensure equitable and sustainable access to adequate, safe, affordable and nutritious food for all, addressing the specific constraints individuals and households face in acquiring food through own production, wage exchange and social transfers;

(xviii) Guarantee food security for all by provisioning of high quality through public food reserves, food subsidies and/or school feeding programmes, among others, to ease the pressure on food-insecure households and reduce gender bias in the intra-household allocation of food;

(xix) Work to eradicate discriminatory attitudes and behaviours, especially with regard to women's and girls' right to food and the intra-household distribution of food through concrete and long-term measures;

(xx) Increase agricultural and food system resilience to climate change, drawing on the knowledge of farmers, particularly women smallholders, and facilitating the exchange of knowledge and good practices in crop and land management to mitigate and adapt to climate and environmental stresses;

(xxi) Address the institutional constraints that women smallholder farmers face, such as removing gender discrimination in laws, policies and practice in access to land, common property resources, credit, inputs, machinery and livestock, financial and extension services, with specific attention to marginalized groups of women, by providing price supports and prioritizing public procurement from women smallholder farmers;

(xxii) Promote decent work and adequate wages for agricultural and informal workers, especially women, through labour market regulation and employment policies that guarantee decent employment conditions for all and prevent discrimination against women;

(d) Population:

(xxiii) Ground sustainable population policies in sexual and reproductive health and rights, including the provision of universally accessible quality sexual and reproductive health services, information and education across the life cycle, including safe and effective methods of modern contraception, maternal health care, comprehensive sexuality education and safe abortion;

(xxiv) Ensure that health services are available, accessible, acceptable and of appropriate quality for all women and girls;

(xxv) Design and implement population policies to address the full range of measures related to women's fertility, including measures to increase access to high quality education and access to decent work;

(xxvi) Ensure women's participation and voice in decision-making at all levels regarding population and sustainable development;

(e) Investments that accelerate the realization of gender equality:

(xxvii) Assess investments in services and infrastructure in terms of the gender-specific costs, benefits and risks they present for the realization of women's and girls' rights and capabilities, with particular focus on the poorest groups;

(xxviii) Prioritize investments to ensure universal access to water, with specific attention to distance, quality, affordability and the ways in which women use water, with a view to reducing unpaid care work;

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(xxix)Ensure access to clean, private and safe sanitation for all women and girls that is responsive to gender-specific needs such as menstrual hygiene and addressing the risk of violence in accessing sanitation facilities;

(xxx) Invest at scale in efficient solid-fuel stoves or cooking technologies that use cleaner fuels, especially in rural and peri-urban areas, and encourage stove uptake by involving women in stove design, testing and social marketing;

(xxxi) Invest at scale in initiatives to provide basic and affordable electricity access to unserved and underserved populations, particularly rural populations, with a view to enabling health-care facilities to function; supporting income generation and educational attainment; and reducing women's unpaid care work, enabling them to enjoy leisure time;

(xxxii) Ensure women's full and equal participation and leadership in decision-making processes at all levels to determine investment in and usage of water, sanitation and energy technologies at the household, local, national, regional and global levels;

(xxxiii) Develop public-private-civil sector alliances that enable investments at scale to guarantee universal access to essential services and infrastructure, while ensuring compliance with human rights standards;

(f) Financing measures:

(xxxiv) Increase financial resources for sustainable development and gender equality through: developed countries meeting target of 0.7 per cent of their gross national product apportioned for official development assistance to developing countries; introducing a tax on financial transactions; reducing existing avenues of tax evasion; members of the Group of 20 and newly industrializing countries removing fossil fuel subsidies; and reducing trade-distorting agricultural subsidies and exports in developed countries;

(xxxv) Mobilize domestic resources for sustainable development and gender equality through progressive taxation on income and corporate sector profits, addressing tax evasion and illicit financial flows, and redirecting military budgets;

(xxxvi) Create an enabling environment in developed and developing countries for financing green, pro-poor and gender-responsive investments at the national and international levels;

(g) Data and statistics:

(xxxvii) Improve the systematic collection, dissemination and analysis of gender statistics and of data and information disaggregated by sex and age, through financial and technical support and capacity-building, on the participation of women in household decision-making, the role of women in food production and management, women's access to land and other resources, and time-use and unpaid care work;

(xxxviii) Ensure the collection, analysis and use of accurate and complete data disaggregated by sex and age at the individual and household levels on food and nutrition security, including hunger and malnutrition, and on resilience and adaptation to climate change;

(xxxix) Collect and disseminate statistics regularly and report on the minimum set of gender indicators agreed by the Statistical Commission;

(xl) Develop international standards and methodologies to improve data on unpaid care work, women's participation at all levels of decision-making and women's ownership and control of assets and productive resources.

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ENDNOTES

1. Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex I.
2. Report of the Fourth World Conference on Women, Beijing, 4-15 September 1995 (United Nations publication, Sales No. E.96.IV.13), chap. I, resolution 1, annexes I and II.
3. See http://huairou.org/south-asian-network-grassroots-womens-leaders-community-resilience-formally-launched-kathmandu-nepal (accessed 26 June 2014).
4. Public goods are recognized as having benefits that cannot be easily confined to a single "buyer" or user of that good; the benefits of a public good spill over to others. They are goods which people consume together rather than separately, such as a malaria-free environment, clean air, education, sanitation, and so on.
5. United Nations, Treaty Series, vol. 1249, No. 20378.
6. United Nations, Treaty Series, vol. 1771, No. 30822.
7. United Nations, Treaty Series, vol. 1760, No. 30619.
8. United Nations, Treaty Series, vol. 1954, No. 33480.
9. Report of the International Conference on Population and Development, Cairo, 5-13 September 1994 (United Nations publication, Sales No. E.95.XIII.18), chap. I, resolution 1, annex.
10. Report of the World Food Summit, 13-17 November 1996 (WFS 96/REP), part one, appendix.
11. See also World Survey on the Role of Women in Development: Globalization, Gender and Work (United Nations publication, Sales No. E.99.IV.8).
12. "States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command." See principle 7, Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex I.
13. See, for example, http://nupge.ca/content/%5Bnid%5D/economy-or-environment-its-false-choice.
14. For more information, see http://viacampesina.org/en/index.php/main-issues-mainmenu-27/ women-mainmenu-39/1549-chile-women-farmers-to-teach-the-region-agroecology (accessed 26 June 2014).
15. Employment that is not covered or insufficiently covered by formal arrangements, including lack of protection in the event of non-payment of wages, compulsory overtime or extra shifts, lay-offs without notice or compensation, unsafe working conditions and the absence of social benefits such as pensions, pay for sick leave and health insurance.
16. See also World Survey on the Role of Women in Development: Women's Control over Economic Resources and Access to Financial Resources, including Microfinance (United Nations publication, Sales No. E.09.IV.7).
17. Macroeconomic policy refers to interventions by governments and central banks that affect conditions throughout the entire economy through their impact on aggregate income, total expenditure, investment, credit, interest rates, exchange rates and capital flows, among other factors. Macroeconomic policies are usually divided into fiscal policies (government spending and taxation) and monetary policies which influence the money supply and the availability of credit. Other policy areas, such as trade and financial market policies, can also have economy-wide effects.
18. Financialization goes beyond the proliferation of financial markets and the corresponding speculative activity, to refer to the extension of those markets to an ever-expanding range of activities and sectors, such as pensions, health care, housing and so forth (Fine, 2012).
19. Global imbalances refer to the distribution of large current account deficits and surpluses across a number of countries.
20. Decent work includes high quality employment generation; workers' rights, including freedom from discrimination; access to social protection; and ongoing social dialogue among a variety of economic and civil society organizations (ILO, 2012).
21. See www.ilo.org/global/research/global-reports/global-employment-trends/WCMS_195447/lang--en/index.htm.
22. See Waste Pickers, 2014, Women in Informal Employment: Globalizing and Organizing, information available from http://wiego.org/informal-economy/occupational-groups/waste-pickers (accessed 24 January 2014).
23. Definitions and usage of social security and social protection vary widely, across both disciplines and international organizations. The World Survey draws on the approach of ILO (2014) to use both terms

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interchangeably as referring to measures that secure protection against, inter alia: lack of work-related income (or insufficient income) caused by sickness, disability, maternity, employment injury, unemployment, old age, or death of a family member; lack of access or unaffordable access to health care; insufficient family support, particularly for children and adult dependants; general poverty and social exclusion.

24. The phrase appears to have originated from the report of the Special Rapporteur on the right to food (E/CN.4/Sub.2/1987/23).

25. See E/2000/22 and Corr.1, annex I, General Comment No. 13; E/2001/22, annex IV, General Comment No. 14; E/2003/22, annex IV, General Comment No. 15; E/2006/22, annex C, General Comment No. 18; and E/2008/22, annex VII, General Comment No. 19.

26. Paid care work includes occupations in which workers are supposed to provide a face-to-face service that develops the human capabilities of the recipient. "Human capabilities" refer to health, skills or proclivities that are useful to oneself or others. These include physical and mental health, physical skills, cognitive skills and emotional skills, such as self-discipline, empathy and care. Examples of caring labour include the work of teachers, nurses, childcare workers and therapists (England, Budig and Folbre 2002).

27. Two important exceptions are the models presented in Braunstein, van Staveren and Tavani (2011) and Seguino (2010).

28. Defined as the proportion of the population that does not meet a minimum level of dietary energy consumption. This indicator measures food insecurity at the national level and is defined by the Food and Agriculture Organization of the United Nations.

29. See United Nations Children's Fund (UNICEF) Childinfo, available from http://data.unicef.org/nutrition/malnutrition (accessed 8 May 2014).

30. See, for example, Fatima Shabodien, "Women farm workers dying for food", Oxfam online discussion essay series on making the food system work for women (2012), available from http://blogs.oxfam.org/en/blogs/women-farm-workers-dying-food (accessed on 18 July 2014).

31. The food production index set at 100 for 2004-2006 was 118.0 in 2012, against 75.3 in 1994.

32. Report of the Fourth World Conference on Women, Beijing, 4-15 September 1995 (United Nations publication, Sales No. E.96.IV.13), chap. IV, resolution 1, annex II, paras. 96 and 97.

33. The average number of children a hypothetical cohort of women would have at the end of their reproductive period if they were subject during their whole lives to the fertility rates of a given period and if they were not subject to mortality. It is expressed as children per woman (United Nations, 2013c).

34. See United Nations, Department of Economic and Social Affairs, Population Division, Population Estimates and Projections Section, http://esa.un.org/unpd/wpp/Excel-Data/ fertility.htm (accessed 16 June 2014).

35. "The lack of balance between birth and death rates is particularly pronounced in many developing countries experiencing population momentum. This phenomenon occurs when a large proportion of a country's population is of childbearing age. Even if the fertility rate of people in developing countries reaches replacement level, that is if couples have only enough children to replace themselves when they die, for several decades the absolute numbers of people being born still will exceed the numbers of people dying", see www.worldbank.org/ depweb/english/modules/social/pgr/index02.html (accessed 22 June 2014).

36. "Excess female deaths in a given year represent women who would not have died in the previous year if they had lived in a high-income country, after accounting for the overall health environment of the country they live in" (World Bank, 2012).

37. See the essay by Sen (1990). Missing women refers to the excess mortality of girls and women in a given country compared to areas of the world where women/girls and men/boys receive the same level of care.

38. United Nations Development Programme, Human Development Report, Human Development Index, http://hdr.undp.org/en/statistics/hdi (accessed on 27 June 2014).

39. The minimum set of gender indicators adopted by the Statistical Commission in 2013 provides a guide for the national production and international compilation of gender statistics. See Department of Economic and Social Affairs, Statistics Division, Gender Statistics, available from http://unstats.un.org/unsd/gender/default.html (accessed 16 July 2014).

40. The Joint Monitoring Programme on Water Supply and Sanitation of the World Health Organization (WHO) and UNICEF is the United Nations mechanism for monitoring regional and national progress in access to water and sanitation. It uses globally and nationally supported household surveys as its primary data source, and is considered the most comprehensive data set tracking water and sanitation globally.

41. More information available from http://water.org/.

42. More information available from http://saner.gy/.

43. More information available from the website of the Global Alliance for Clean Cookstoves, http://carbonfinanceforcookstoves.org.

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*Symbols of United Nations documents are composed of capital letters combined with figures.

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UN WOMEN

UN Women is the UN organization dedicated to gender equality and the empowerment of women. A global champion for women and girls, UN Women was established to accelerate progress on meeting their needs worldwide.

UN women supports UN Member States as they set global standards for achieving gender equality, and works with governments and civil society to design laws, policies, programmes and services needed to implement these standards. It stands behind women's equal participation in all aspects of life, focusing on five priority areas: increasing women's leadership and participation; ending violence against women; engaging women in all aspects of peace and security processes; enhancing women's economic empowerment; and making gender equality central to national development planning and budgeting. UN women also coordinates and promotes the UN system's work in advancing gender equality.

220 East 42nd Street
New York, NY 10017, USA
Tel: +1-646-781-4400
Fax: +1-646-781-4444

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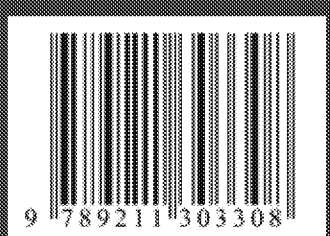

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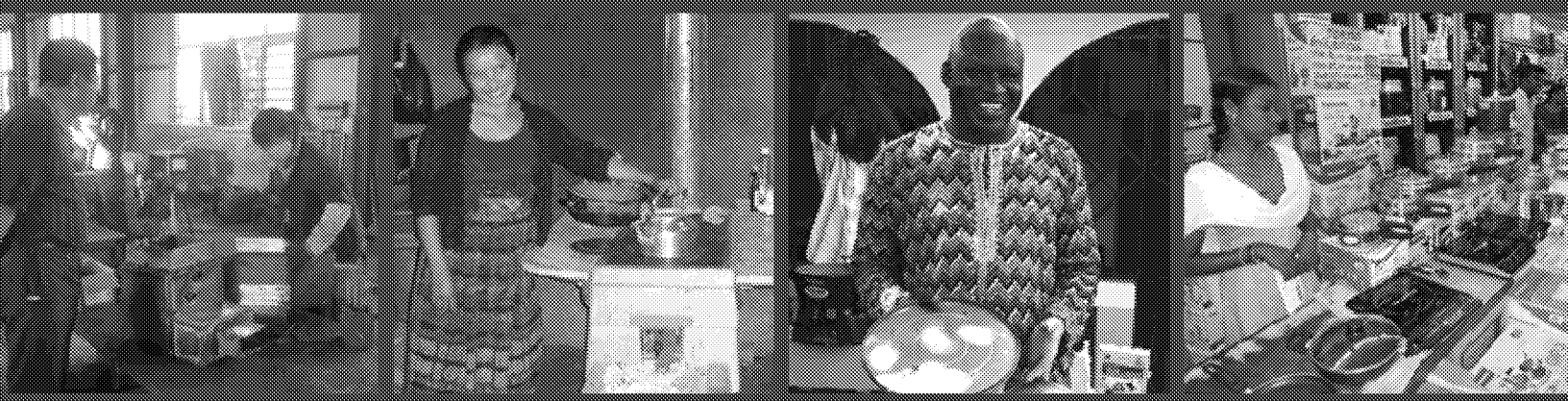

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

FUELING MARKETS | CATALYZING ACTION | CHANGING LIVES

PHASE 1 | 2010-2014

ED_005941_00000099-00001

THE PROBLEM

Every day **3 billion** people cook food and heat their homes using solid fuels in traditional cookstoves or over open fires.

THE IMPACT

4.3 million premature deaths annually are caused by exposure to smoke from open fires and traditional cookstoves.

Women and girls in particular face health, safety and economic risks.

FORESTS ARE DEPLETED AND THE ENVIRONMENT IS DEGRADED.

21% of global black carbon emissions are attributed to cookstove smoke.

THE SOLUTION

Cleaner and more efficient cookstoves and fuels can reduce fuel consumption and exposure to household air pollution.

The Global Alliance for Clean Cookstoves has brought together more than **1,000 PARTNERS** from the public, private and nonprofit sectors to accelerate the market for clean cooking solutions.

THE GOAL

The Alliance's 100 by '20 goal calls for **100 million** households to adopt cleaner and more efficient cookstoves and fuels by 2020.*

Working together we can save lives, improve livelihoods, empower women and protect the environment.

*and the good news is we are already ahead of schedule!

COVER PHOTO FAR LEFT: MINISTRY OF AGRICULTURE, P.R. CHINA

A MESSAGE FROM RADHA MUTHIAH

EXECUTIVE DIRECTOR OF THE GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

THERE ARE AT LEAST 20 MILLION CLEANER AND MORE EFFICIENT COOKSTOVES IN OPERATION.

Dear Friends,

Four years ago, when Hillary Rodham Clinton announced the launch of the Global Alliance for Clean Cookstoves, I remember thinking, "This is it. This is the issue and the approach that will galvanize women and girls around the world." She spoke movingly of the fact that, for 3 billion people who depend on open fires, the simple act of boiling a pot of water, making a meal or trying to heat a home carries a lethal health risk. The Alliance would bring together women's groups and entrepreneurs, governments and corporations, foundations and investors in a global effort to save lives, empower women and protect the environment by creating a thriving market for clean cookstoves and fuels. The goal was ambitious and the vision of a public-private partnership to create the change was pioneering.

Four years later, as the Executive Director of the Global Alliance for Clean Cookstoves, I can report that this optimism proved prescient. In just four years, the Alliance has mobilized a thousand partners who are working together to address this silent killer. It has championed policy decisions that will enable and accelerate the clean cookstoves and fuels market. It is working with the International Organization for Standardization to create a set of standards that will help us deliver quality, effective, and independently tested products. It has driven $50 million in grant funding and $50 million in private investment into the sector. Most important of all, the Alliance is raising the awareness of millions of men and women who, in their very purchasing decisions, have the ability to solve the problem of household air pollution. With the desire, access, and means to own a wide variety of cleaner cooking technologies and fuels, our target audiences are becoming informed customers, not hapless victims.

I'm proud of the amazing progress the Alliance has made, and as Phase 1 of our Strategic Business Plan comes to a close, I am thrilled to report that today there are at least 20 million households using cleaner and more efficient cookstoves and fuels. This growth reflects the commitment of our partners, our organization's focus, our donors' generosity, our investors' faith and of course burgeoning consumer demand. As we move into Phase 2 of our strategic plan, we will build on that momentum. The Alliance's goal is to enable 60 million households to adopt clean cooking solutions by 2017. Toward this achievable goal, the sector will need $500 million in grants and investment over the next three years and I am confident that we can meet this milestone!

Speed, flexibility and smart strategies are essential if we are to combat this global killer. We encourage you to deepen your commitment to the sector in 2015 and redouble your efforts to accelerate the market for cleaner cookstoves and fuels. Working together we will improve public health, empower women and girls, and protect our environment. It's an investment that promises lifesaving returns and it will pay dividends for decades to come.

Radha

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REAL CHANGE, REAL GROWTH, REAL MARKETS

Highlights of Alliance Achievements 2010-2014

In 2011, the Alliance released a comprehensive sector strategy in its groundbreaking report *Igniting Change: A Strategy for Universal Adoption of Clean Cookstoves and Fuels*. The subsequent Alliance strategic business plan, structured in three phases, provides a clear roadmap for the creation of a dynamic market for clean cooking solutions. As Phase 1 of the plan draws to a close, the Alliance has made tremendous progress and, thanks to the energy and commitment of its partners, it has surpassed many of its original goals. Here, in brief, are just a few of the Alliance's major achievements to date.

ALLIANCE ACHIEVEMENT

RECRUITING PARTNERS AND EXPANDING THE SECTOR

The Alliance has grown from 19 to 1000 partners over the past four years and today it works with 46 national governments, 12 UN agencies, hundreds of NGOs and scores of foundations across six continents. Its multisector appeal and its now proven market-driven approach have also brought a wealth of new private sector players to the table. The Alliance has welcomed global corporations, investors, financial institutions and hundreds of entrepreneurs and enterprises looking to build capacity, scale up production, and improve their products. Researchers across several disciplines, including climate, gender, public health, and public policy are incorporating cookstoves and fuels elements into their studies. The Alliance has also benefited from the growth of several dynamic national and regional alliances that are essential to its critical mission.

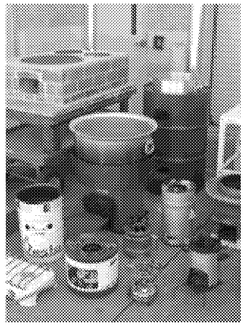
ALLIANCE ACHIEVEMENT

PROMOTING CLEAN FUELS

To save lives and mitigate the environmental impacts of black carbon and deforestation, the Alliance cannot focus solely on stove distribution and manufacturing. It must factor the role of cleaner and more renewable fuels into the equation. Beyond looking at biomass, improving access to—and availability and affordability of—electricity, LPG, ethanol, methanol, biogas and solar is central to its work. In Phase 1, the Alliance has commissioned research to identify barriers across the clean fuel supply chain, supported capacity building of clean fuel enterprises, increased the number of investors and resources to support scale and adoption in priority markets, and developed mechanisms to share best practices.

ALLIANCE ACHIEVEMENT

MOBILIZING INVESTORS



At Alliance exhibitions, potential investors can view clean and efficient cookstoves and fuels and learn more about new technologies.

The Alliance and its global partners have driven $50 million in grant funding for Secretariat activities and another $50 million in investment for the sector at large. The Alliance has also partnered with Social Capital Markets (SOCAP) to give scholarships for clean cooking entrepreneurs to attend its annual conference. In addition, it works with SOCAP to offer networking and matchmaking opportunities for all attendees.

ALLIANCE ACHIEVEMENT

FOCUSING ON WOMEN AND GENDER ISSUES

The Alliance recognizes that women will ultimately determine the use and adoption of clean cooking solutions. It is building evidence on the impact women can have on adoption when they are engaged as entrepreneurs in the value chain. Working with its partners, the Alliance is testing the most effective gender-informed business models for scaling adoption. In addition, the Women's Empowerment Fund provides finance for partners to test ways to empower women and it funds innovative approaches to gender integration. The Alliance also provides targeted capacity building, training and other tools to help partners address gender issues and continue to integrate women in the clean cooking sector.

ALLIANCE ACHIEVEMENT

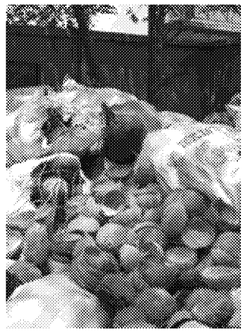
TAKING ACTION AND SHARING KNOWLEDGE

The 2014 China Cookstoves and Fuels International Conference in Beijing attracted 250 participants.

The Alliance is gathering tremendous momentum in its focus countries of Bangladesh, China, Ghana, Guatemala, India, Kenya, Nigeria and Uganda. Government leaders have built clean cooking solutions into their health, energy and environmental policies, and stakeholders have worked closely with the Alliance to develop and execute comprehensive Country Action Plans. The Alliance has helped enhance local distribution channels and strengthened the capacity of entrepreneurs to produce higher quality stoves and fuels in greater quantities. As each country works to address its unique challenges and opportunities, the Alliance has also expanded and enriched its base of knowledge on the sector and has shared it with a wider audience. The Alliance's 6th Biennial Clean Cooking Forum in Phnom Penh, Cambodia in 2013 convened 500 participants from 60 countries and was the largest gathering to date of sector stakeholders.

ALLIANCE ACHIEVEMENT

DRIVING INNOVATION AND BUILDING ENTERPRISE CAPACITY

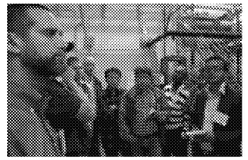


In Cambodia, one innovative company makes briquettes out of recycled char-ash and coconut husks.

The Alliance established the Spark Fund, Women's Empowerment Fund, and the Pilot Innovation Fund in order to support the development of commercially viable enterprises and encourage innovations in design, manufacturing and distribution of clean cookstoves and fuels. Using these grants and other forms of soft and patient capital, the Alliance is preparing a pipeline of opportunities for investment and is mobilizing much larger investor interest in the sector. The Alliance also continues to create revenue streams for clean cooking enterprises by enhancing the demand for and access to carbon credits through its Carbon Finance Platform for clean cooking.

ALLIANCE ACHIEVEMENT

DEVELOPING GLOBAL STANDARDS AND TESTING



The Alliance held a training workshop for 40 staff members from 16 countries at the U.S. Environmental Protection Agency's Cookstoves Testing Facility.

The Alliance, in collaboration with national standards committees and relevant organizations from 23 countries, has supported International Organization of Standardization Technical Committee 285 (ISO TC285), the first standards for cleaner and more efficient cookstoves and clean cooking solutions. The Alliance is also increasing local capacity in design innovation and testing by supporting 13 Regional Testing and Knowledge Centers (RTKCs) across Africa, Asia, and Latin America, and coordinating knowledge training and staff development within a broader network of RTKCs.

ALLIANCE ACHIEVEMENT

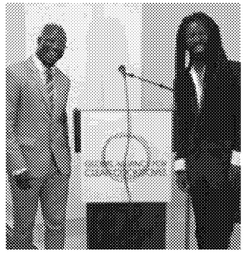
BUILDING THE EVIDENCE BASE BY GALVANIZING AND COORDINATING THE RESEARCH COMMUNITY

Researchers in Gujarat, India evaluate the moisture in wood in order to monitor fuel use.

To date the Alliance has invested almost $5 million in competitive research grants to support a total of 39 studies across 23 countries. It has formed a Research Advisory Committee of leading experts across different disciplines and helped build the evidence base for clean cookstoves and fuels by supporting studies on child survival, climate change, fuels, gender impacts, and market research. In addition, the Alliance has worked to share that knowledge with a broader network of advocates and stakeholders by hosting webinars and creating partner country toolkits that outline best practices and strategies. The global Research Platform also works to convene researchers, commission research, and communicate results.

ALLIANCE ACHIEVEMENT

RAISING AWARENESS OF THIS SILENT KILLER AND ADVOCATING FOR CHANGE



Ghanaian football legend Stephen Appiah and musician Rocky Dawuni are influential Alliance champions.

The Alliance has been featured in more than 100 global, national and local media outlets and has mobilized hundreds of experts, authorities, and influencers to help address this issue. The Alliance's ambassadors, champions, and Leadership and Advisory Council members are a diverse group of world leaders, celebrities, executives, and experts who are actively involved in advocacy and strategic guidance, fundraising, and media campaigns for the Alliance.

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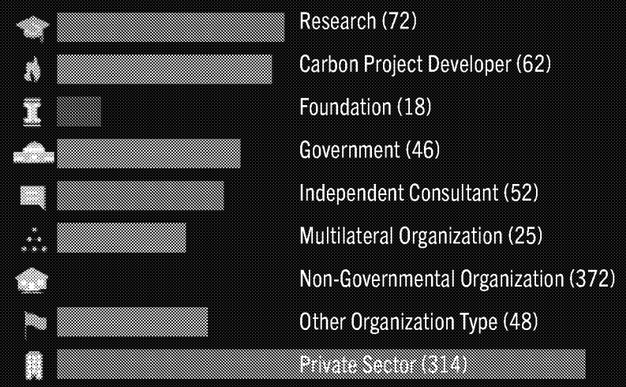
1,000 PARTNERS STRONG

Launched with just 19 members in 2010, the Global Alliance for Clean Cookstoves now includes more than 1,000 active partners. Together they represent a network that can provide all the resources necessary to create a thriving global market for clean cookstoves and fuels. To date, the broad reach and depth of the Alliance has helped spur the adoption of more than 20 million cleaner and more efficient cookstoves and fuels, which represents huge progress in the goal to deploy clean cooking solutions in 100 million households by 2020. The Alliance is proud of the incredible progress made by its global suite of partners and is thrilled to celebrate their incredible success.

The Department for International Development (DFID), the Alliance Secretariat's largest bilateral donor, won "Best Initiative by a Government Body" at the 2014 Climate Week Awards. DFID was recognized for its efforts to support innovation, market development, and research in the clean cooking sector. DFID funding has been instrumental in the Alliance's research, gender, and humanitarian programming.

PARTNERS BY CATEGORY



The Swiss Tropical Institute of Public Health

and Cayetano University in Peru are working with the Alliance to identify the key attributes that influence the acceptance and adoption of cleaner, more efficient and safer cooking products in rural Andean populations of Peru. The study will examine cooking-related practices and preferences, showcase risk perceptions, and highlight how household decisions are made. The study will also map existing improved cookstove (ICS) interventions along with national and regional policies associated with ICS promotion.

ENVIROFIT

Envirofit International, a cookstove manufacturer, and EVAK, a community development and training institution, are working in partnership with Johns Hopkins Bloomberg School of Public Health as it conducts gender research in Kenya. The research will examine the impact that women entrepreneurs can have on the adoption and sustained use of clean cooking solutions.

Eco-Fuel Africa

CEO Sanga Moses was named one of *National Geographic*'s 2014 Emerging Explorers. The Explorers were recognized for making discoveries, making a difference, and inspiring people to care about the planet.

The World Health Organization

and the Alliance are working together to develop and accelerate the release of new indoor air quality guidelines for household air pollution. The guidelines, which cover cooking, heating, and lighting, will allow government officials and others involved in policy development to better understand the relationship between levels of exposure to household air pollution and their devastating health outcomes. The guidelines can be used by governments and ministries both to promote clean cookstoves and fuels programs and as a scientific basis for legally enforceable standards.

Project Gaia,

a U.S.-based NGO working to create a thriving market for alcohol-based fuels and stoves, has scaled up its operations in Ethiopian refugee camps, installed the first microdistillery for ethanol cooking fuel in Addis Ababa, collaborated on maternal health research in Nigeria and conducted mini-pilot studies in Asia and Central America. They are currently working on launching a new innovative stove model with Dometic and commercializing programs in Ethiopia, Nigeria, and Haiti. The Alliance continues to champion its partners in the liquid fuels space and to recognize their growth and innovation.

climatecare

ClimateCare, a leader in both the climate and development sectors, has unlocked private sector finance to distribute clean cookstoves to more than 750,000 families throughout the developing world.

THE UNITED STATES GOVERNMENT

is one of the largest bilateral contributors to the sector. Eleven of its government agencies, more than any other country, are lending their expertise on research, testing, and market development to ensure the Alliance meets its goals.

Calvert Foundation™

Calvert Foundation is launching the next round of their Women Investing in Women fund, WIN–WIN 2.0, with the Alliance. The focus of the $20 million fund will be to empower women by scaling access to clean energy products, including clean cookstoves and fuels.

Professor Tami Bond,

one of the world's leading experts in the study of the environmental and health impacts of black carbon emissions from traditional cookstoves and open fires, has won a 2014 MacArthur Fellowship, commonly known as a "genius grant." Bond, a professor of civil and environmental engineering at the University of Illinois at Urbana-Champaign, studies particles released into the air from burning many types of fuels including biomass. One of the practical low-cost interventions she recommends is training researchers in developing countries to measure and evaluate cookstoves and fuel emissions.

Shell was a finalist for the Ethical Corporation's Responsible Business Award in the category Best Business/NGO Partnership. To date, Shell has pledged $12 million in funding and in-kind support to the Alliance and is providing staff support to attract investors to the sector and improve access to carbon finance for clean cooking enterprises. With financial and technical support from Shell and others, the Alliance has launched the Spark Fund, developed global standards for clean cookstoves, provided equipment and capacity building for regional testing centers, and funded market assessments in Alliance focus countries. Shell's support builds on the work of the Shell Foundation, an independent charity that has been a pioneer of the clean cookstoves sector for over ten years, and whose work was instrumental in creating the Alliance in 2010.

Deutsche Bank

The Alliance and Deutsche Bank hosted an Investor Roundtable in New York. Representatives from major banks, financial institutions, and impact investment funds discussed the capital needs of the sector, as well as methods for scaling and structuring investment in clean cooking solutions.

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SNV Netherlands Development Organisation, a founding partner of the Alliance, has implemented biogas projects in 20 countries, and clean cookstove and fuel projects in 16 countries across Asia, Africa, and Latin America. It is also leading research studies in concert with the Alliance, to better understand and document innovative distribution models for clean cooking solutions.

1.5 million improved cookstoves were sold by distributors and manufacturers that receive support through Alliance Partner Deutsche Gesellschaft Für Internationale Zusammenarbeit (GIZ) GMBH in 2013.

Philips recently announced the establishment of an Africa Innovation Hub in Nairobi, Kenya. The Hub will conduct studies that facilitate innovation and ways of bringing new products such as the Philips smokeless cookstove to market.

The Xunda Science & Technology Group Co. Ltd, a leading Chinese manufacturer and exporter of gas and biomass stoves, attributes the popularity of its products to the company's investment in technology and innovation. The company reports that it owns more than 200 patents and in 2013, it sold 80,000 improved stoves in China, Guatemala, India, Fiji, Yemen, Bangladesh and several other countries.

Solar Cookers International held a three-day conference in Sacramento, CA in July 2014. The conference brought together project directors, promoters, designers and researchers from 16 countries to discuss recent advancements in solar cooking, obstacles to adoption, solar cooker testing standards, and a number of other critical topics.

THE CHARCOAL PROJECT

is a nonprofit that promotes biomass fuel alternatives and clean combustion technologies. It is collaborating with the Massachusetts Institute of Technology's D-Lab on The Harvest Fuel Initiative. The Initiative's technical team is currently performing comprehensive evaluations of green briquettes, wood-derived charcoal, and firewood at Lawrence Berkeley National Lab to help enterprises understand how fuel quality influences customer satisfaction.

The Alliance's health research-portfolio is enriched by productive partnerships with the National Institutes of Health and with the US Centers for Disease Control and Prevention. Their input and guidance have enabled the Alliance to leverage resources, share expertise, and maintain the highest standards of policy-relevant investigation as we work to demonstrate the many benefits of clean cooking solutions.

Jita Bangladesh, a joint venture of CARE Enterprise Inc. and Danone Communities, is dedicated to empowering women and underserved communities by improving their access to products that promote good health. CEO Rashid Shaikh Saif Al, who was recently named one of the Schwab Foundation's Social Entrepreneurs of the Year, reports that Jita is currently reaching 2 million consumers with its unique "last mile" sales and distribution model and hopes to increase that reach to 7 million consumers in the near future. Jita saleswomen are known as Aparajita, or women "who never accept defeat."

Support from Norway, a founding partner of the Alliance, has been instrumental in the formation of country level alliances and the development of country action plans in focus countries. Leveraging their longstanding support for global efforts to improve energy access, Norway has been a leader in driving innovation in programs and policies to reach and include the base of the pyramid.

Greenway Appliances, a Pilot Innovation Fund and Spark Fund grantee, has created an innovative partnership with ESAF Retail and ESAF Micro Finance and Investments to distribute clean biomass stoves. ESAF has access to 434,000 members through its 150 branches and its loan officers have agreed to demonstrate Greenway stoves and take customers' orders. The results have been promising. In three months, Greenway sold a record 50,000 stoves to members of local women's financial self-help groups.

The Alliance granted Nokooda Solution Systems the Innovation in Clean Cooking Award at the Sankalp Unconvention Summit in 2014. Nokooda processes biomass waste from public parks and turns it into pellet fuels, which are sold in Delhi, India. In addition to diverting tons of waste from landfills in India, the company creates 'enviropreneurs' who earn an income from waste processing or from selling the pellets. Nokooda will use the $15,000 prize to help develop an innovative cookstove with continuous refueling capabilities.

GERES, a French NGO that applies engineering solutions and technical expertise to environmental challenges, is working with the Alliance to accelerate and expand its successful StovePlus program in Asia and Africa. In Cambodia, where more than 3 million stoves have been disseminated to date, GERES' focus is on strengthening the association of producers and distributors of improved cookstoves, as well as launching a new model of rocket stove designed for the local market.

THE UNITED NATIONS HIGH COMMISSIONER FOR REFUGEES is working closely with the Alliance to ensure that millions of displaced people will have regular and reliable access to fuel and energy without threat to their lives or personal safety. With an initial focus on energy needs for cooking and lighting in refugee camps, SAFE (Safe Access to Fuel and Energy) is a cross-sectoral issue that must be addressed in order to reduce the many risks associated with the collection and use of firewood for cooking.

2013 Pilot Innovation Fund winner UpEnergy, a company that helps market and distribute efficient stoves in Uganda, was recognized by *Fast Company* magazine as one of the Top 10 Most Innovative Companies in Africa!

The Alliance is proud to partner with the following initiatives

- Global Bioenergy Partnership
- Every Woman Every Child
- Climate and Clean Air Coalition
- Roundtable on Sustainable Biomaterials
- Sustainable Energy for All
- Cooking for Life
- Energy for All
- Safe Access to Fuel and Energy
- Global LPG Partnership

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GETTING TO KNOW OUR 3 BILLION CONSUMERS

Through a combination of 19 market assessments, three major customer segmentation studies, over 100 site visits, and extensive data analysis, we understand more about the clean cookstove and fuels customer than ever before.

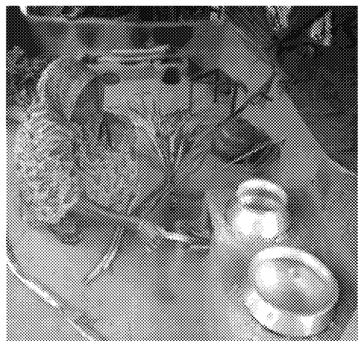
Every smart business enterprise knows that consumer needs and desires drive purchasing decisions, and the customer is at the heart of the Alliance's work. Its consumer-centric sensibility is the starting point from which everything else follows. It is not enough that the Alliance helps stimulate the supply of clean cooking solutions. To forge a thriving global market, the Alliance and its enterprise partners must work together to produce cookstoves and fuels that offer real benefits, are used consistently, and are affordable and available to the 500 million households worldwide that still use solid fuels for cooking.

Research is critical to the success of this mission and in the last three years the Alliance has conducted market assessments in 19 countries. Information gleaned from this data, combined with research from Alliance partners, is readily available on the website *cleancookstoves.org*. The assessments provide partners with essential insights into preferences, price points, and usage patterns and also offer a snapshot of a customer's access to new technologies and financing. The customer segmentation research provides even richer detail. It supports researchers who make home visits and watch women prepare their daily meals, noting the types of pots and ingredients used. In Bangladesh, for example, women will often make one huge pot of rice which will be used for every meal. It is no surprise then that a recent WASHplus study found that consumers want stoves that are powerful enough to boil water quickly and big enough to hold large pots. In West Africa, where women pound cassava, yams or plantains into dough, cookstoves have to be durable and stable. In Guatemala, baking tortillas requires a larger Plancha-style cookstove. This stove is more expensive than other technologies, thus consumer-financing options are essential to the success of this market.

In regions where consumer awareness of the risks of household air pollution is low, marketers cannot just tout health benefits to drive sales. The promise of savings, however, is a huge draw and the cost of charcoal or firewood in a given location will influence purchase intent. If the price of biomass fuels is high, there's a compelling financial motive to choose a more efficient technology or fuel. Some consumers see clean cookstoves and fuels as a status symbol. In Bangladesh researchers found that many women are interested in adopting new products because it increases their social standing.

The Alliance partners include several prestigious research institutes and their studies have revealed some common precepts that cross cultural and geographic boundaries. We know that a cookstove's size, ease of use, durability, and portability are critical attributes. Stoves which are too small to cook traditional dishes, or do not offer the same or improved functionality over traditional stoves and three-stone fires, stand little chance of being adopted. If it takes longer to cook on an improved or efficient stove, a user will quickly return to their familiar cooking practices or use an improved cookstove along with a traditional cookstove, a concept known as stove stacking. Indeed in Kenya almost 70 percent of the population report that they sometimes use an alternative fuel for cooking. In rural households the most common combination is wood and charcoal; in urban areas, it is kerosene and LPG. Overall LPG is considered the most convenient and prestigious fuel, but due to the fact that it is not always available, LPG stoves are used sparingly. This clearly demonstrates the impact that supply chains have on cooking practices and it is one of a myriad of factors that influence consumer behavior.

Electric inductions stoves, which can boil water faster than electric radiant or gas stoves, are making inroads in India.



In Bangladesh, women in rural areas can spend up to a third of their day in the kitchen.

Stoves must be stable, durable and designed to accomodate big pots.

FAST FACT In Ghana the quality of materials is one of the strongest drivers of consumer satisfaction. Consumers are attracted to high-quality metals such as stainless steel or cast iron.

FAST FACT One cookstove marketed in Nigeria was renamed the Fast Fire because consumers like products that cook food quickly.

FAST FACT Stove ownership in China varies greatly by region. Households in colder areas own up to 6 stoves.

PHOTOGRAPH OF SUSAN KAMAU: BARBARA MINISHI

Meet The Chef Corps

One of the ways the Alliance is raising awareness of the risks of indoor air pollution is through its Chef Corps. Meet four chefs who are using their fame to promote clean cooking solutions.

JOSÉ ANDRÉS

Spanish-American chef José Andrés is an internationally-recognized culinary innovator, passionate advocate for economic and social empowerment and founder of World Central Kitchen, a nonprofit which seeks to find sustainable solutions to food insecurity and malnutrition.

SUSAN KAMAU

Kenya's most celebrated chef, Susan Kamau, is the founder of *Kenyan Kitchen*, a magazine, website and TV show. Her passion for home-cooked food and ability to connect with citizens from every demographic make Susan a powerful spokeswoman for the Alliance.

SANJEEV KAPOOR

Indian restaurateur Sanjeev Kapoor runs a successful TV Channel, has won many culinary awards, and is the author of several bestselling cookbooks. He believes that the act of cooking can help empower women.

LUU MENG

Luu Meng is Cambodia's most recognizable chef. He is the president of the Cambodia Hotel Association, sits on the board of the Cambodia Restaurant Association and is co-author of the book *Cambodia's Top Tables*.

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ALLIANCE FOCUS COUNTRIES AT A GLANCE

65% of annual deaths attributed to household air pollution occur in these eight countries.

NIGERIA

75%
OF POPULATION RELIES ON SOLID FUELS

127 million
people affected by household air pollution

70,000
DEATHS PER YEAR

UGANDA

97%
OF POPULATION RELIES ON SOLID FUELS

35 million
people affected by household air pollution

13,400
DEATHS PER YEAR

BANGLADESH

89%
OF POPULATION RELIES ON SOLID FUELS

138 million
people affected by household air pollution

78,000
DEATHS PER YEAR

CHINA

45%
OF POPULATION RELIES ON SOLID FUELS

608 million
people affected by household air pollution

1.04 million
DEATHS PER YEAR

GUATEMALA

70%
OF POPULATION RELIES ON SOLID FUELS

9.6 million
people affected by household air pollution

5,200
DEATHS PER YEAR

GHANA

84%
OF POPULATION RELIES ON SOLID FUELS

21 million
people affected by household air pollution

13,400
DEATHS PER YEAR

KENYA

84%
OF POPULATION RELIES ON SOLID FUELS

36 million
people affected by household air pollution

14,300
DEATHS PER YEAR

INDIA

63%
OF POPULATION RELIES ON SOLID FUELS

780 million
people affected by household air pollution

1.02 million
DEATHS PER YEAR

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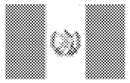
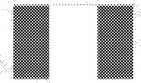
FOCUS COUNTRY GOALS AND STRATEGIES



GUATEMALA

Seventy percent of households in Guatemala use firewood and reducing the fuelwood deficit is imperative. **Cleaner and more efficient cookstoves and fuels play a major role in forest preservation.** President Otto Pérez Molina, a member of the Alliance's Leadership Council, has made the issue a priority across ministries. The Alliance is supporting the clean cooking sector in Guatemala through customer research, access to finance, public awareness, and by mobilizing international initiatives around household air pollution. In November 2013, the Inter-institutional Wood and Energy Roundtable, which represents 14 government agencies, released a National Strategy for Sustainable Use of Wood. The Ministries of Energy, Agriculture, and Environment are working towards the Strategy's **goal of disseminating 650,000 cookstoves over the next 10 years.** The Guatemalan Cluster for Improved Cookstoves and Clean Fuels, an active and collaborative industry association, was also established in 2013. It has helped unite the diverse enterprises in Guatemala around common interests in the clean cooking sector. Guatemalan stakeholders worked with the Alliance on a Country Action Plan (CAP), which was released in May 2014. Over 100 national and international partners contributed to the CAP, thus ensuring the strategy fully represents the needs and priorities of the sector.



NIGERIA

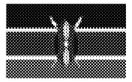
Working with the Federal Ministry of Environment and the Nigerian Infrastructure Advisory Facility, the Alliance and its local partner continue to mobilize sector stakeholders. The Nigerian Alliance, a public-private partnership of government agencies, corporations, and donors, helped to develop a comprehensive National Clean Cookstove Program Plan of Action with **a target of 17.5 million households by 2020.** The National Alliance is now executing pilot programs in three states—Ebonyi, Jigawa, and Niger—and will focus on ways to enhance demand, raise public awareness, and maximize rural networks to market clean cookstoves and fuels. In addition, the Standards Organization of Nigeria is participating in the ISO process and to facilitate its work, the Alliance has helped establish a Clean Cookstoves Development Centre in Ebonyi State and a National Clean Cookstoves Testing Laboratory at the University of Nigeria, Nsukka. **Local production is critical to improving access to clean cooking technologies,** and in 2014 the Alliance awarded a Spark Fund grant to SMEFunds, a company that has developed a new type of clean cookstove. It also awarded a 2013 Pilot Fund grant to Solar Sister to support its work to empower women entrepreneurs in Nigeria. The Alliance is also in the process of facilitating a Country Catalytic Grant fund.

GHANA

In 2012, Ghana became the first country to launch a National Action Plan for achieving the objectives under the UN's Sustainable Energy for All initiative. This early adoption, combined with the leadership of the Ghana Alliance for Clean Cookstoves (GHACCO), has spurred **considerable progress in the cookstoves and fuels market.** Foreign Minister Hanna Tetteh has prioritized the issue of clean cooking and the Energy Commission stated that the country can meet its goals by 2020. The Alliance has supported those goals by conducting a comprehensive market assessment in Ghana. It is also working with the government to develop a national LPG policy. Ghana is aligned with the ISO TC285 standards process and is working with the Alliance to bolster its Regional Knowledge and Testing Center at the Council for Scientific and Industrial Research. **There are 900,000 improved and clean stoves in circulation** and that number is expected to grow once the Alliance launches its national consumer awareness campaign. Two clean cooking ambassadors, Reggae star Rocky Dawani and soccer legend Stephen Appiah, will champion that effort. The Alliance has established a Country Catalytic Grant fund in Ghana and the GHACCO team is continuing to identify promising local enterprises and helping them become "investor ready."

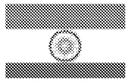
UGANDA

The Alliance is working closely with the Uganda National Alliance on Clean Cooking (UNACC) and the Ministry of Energy to increase the use of clean cooking products and fuels in Uganda. The Alliance completed a market assessment in 2011, and this informed the Country Action Plan developed by government representatives, national stakeholders and international organizations. **To date, 1.2 million improved stoves have been distributed in Uganda.** To bolster that number, the Alliance is working with the World Bank and UNACC to provide a range of capacity building products to enterprises along the clean cookstoves and fuels value chain. The Alliance has awarded $1 million in support over the last two years through its Spark Fund, Pilot Innovation Fund, and Women's Empowerment Fund. **It has also supported two Regional Testing and Knowledge Centers (RTKCs).** The RTKC at the Center for Integrated Research and Community Development focuses on field-testing and other types of monitoring. The RTKC at the Centre for Research in Energy and Energy Conservation (CREEC) is a knowledge hub for bioenergy technologies, research, design, and development. CREEC is a key driver for the Standards and Testing taskforce of the UNACC and is working toward ISO accreditation.



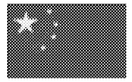
KENYA

In partnership with the Clean Cookstoves Association of Kenya (CCAK), the Alliance has driven $20 million in grants, investment and in-kind support to enable the market for clean cookstoves and fuels in Kenya. The government has made a commitment to advancing the sector and helped formulate a **Country Action Plan that set a goal of 5 million clean cookstoves and fuels by 2020.** The Alliance is working with its global partners to develop international standards and the Kenya Bureau of Standards is playing an instrumental role as the co-secretariat of ISO TC285. In addition, the Alliance is supporting the Kenya Industrial Research and Development Institute in the establishment of a Regional Testing and Knowledge Center and has commissioned studies on consumer segmentation and on consumer access to financing in Kenya. Further, in partnership with USAID/Winrock, it is supporting the Kenya Union of Saving and Credit Cooperative Organization (KUSCCO) in establishing a credit facility for cookstove businesses and consumers. KUSCCO will lend money through its national network of over 5,000 savings and credit cooperatives. In anticipation of rising consumer demand, **the Alliance has grown the business capacity of four clean cookstove production facilities** through its Spark Fund (SF) grants. The Alliance is also in active discussions with OPIC and Equity Bank on possible ways to enable further enterprise and consumer financing. GVEP, EzyLife and Burn Manufacturing Co. were awarded SF grants in 2013 and Sim Gas in 2014. The 2014 awards were announced in February in front of an audience of entrepreneurs and sector champions at a Clean Cooking National Conference in Nairobi.



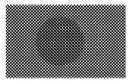
INDIA

The Alliance has made great strides in India, especially in engaging national and state-level government officials in awareness and advocacy, standards, testing, and enterprise capacity building. Under the new government, the Ministries of New and Renewable Energy, Health and Family Welfare, and Petroleum and Natural Gas, have expressed their interest in working quickly to scale solutions using biomass, and their intention to extend the clean fuel supply chains for LPG and induction stoves to rural areas. **The Alliance has set a goal of delivering clean cooking solutions to 5 million households** in Phase 2 and is supporting enterprise capacity building through the launch of the Sankalp Award for Innovation in Clean Cooking Solutions. The 2014 winner, Nokooda, manufactures fuel pellets from horticultural waste. The Alliance has also awarded Pilot Innovation Fund (PIF) and Spark Fund grants to three Indian enterprises: Prakti Design won a 2014 PIF grant; former 2013 PIF winner Greenway Appliances was awarded a 2014 Spark grant; and Grassroots Trading Network for Women, SEWA, won one of the inaugural Women's Empowerment Fund grants in 2014. Further, **two Regional Testing and Knowledge Centers have been established** at the Indian Institute of Technology Delhi and at The Energy and Resources Institute. The Alliance has commissioned several studies such as the India Cookstove and Fuels Market Assessment and a multi-scale geospatial data map of nonrenewable fuels harvesting for biomass fuels in South West India (Karnataka). The burns and safe cookstoves working group also helped develop a global burns surveillance tool at Lok Nayak Hospital, Delhi.



CHINA

Over 700 million people rely on solid fuels for cooking in China and the size and scope of this market is unique. Recognizing the magnitude of the issue and the considerable number of stakeholders in the sector, the Chinese Central Government has appointed the influential National Development and Reform Commission (NDRC) to shape **a long term, comprehensive clean cookstove policy.** Vice-Chair of NDRC Minister Xie Zhenhua will lead a collaborative effort with the Ministry of Agriculture, Ministry of Science and Technology and the All-China Women's Federation to advance stove adoption, technology innovation, international standards, public awareness, knowledge sharing and technology transfer. Recognizing that adoption is one of its key goals, the Alliance has signed a memorandum of understanding with China's Ministry of Agriculture. It has also committed considerabe resources to launch two testing centers and fund an in-depth cookstoves and fuels market assessment. The assessment includes studies in six provinces that are representative of national variations in climate, geography, fuel availability, and stove type. Those findings will inform a pilot program to encourage adoption of clean cookstoves in 8 million households by 2017 and will ultimately be incorporated into a national clean cookstoves and fuels program under China's 13th Five Year Plan. Minister Xie was recently appointed to the Alliance Leadership Council. He has said that **Chinese stakeholders are committed to working with the Alliance** towards a shared goal: Achieving the adoption of clean cookstoves and fuels in 40 million household by 2020 and securing universal adoption by 2030.



BANGLADESH

The Government of Bangladesh has declared its goal to make the country's kitchens smoke free by 2030. To that end, the Power Division, Ministry of Power, Energy and Mineral Resources, SNV Netherlands Development Organization, GIZ Bangladesh, the U.S. Agency for International Development, and the World Bank have worked with the Alliance to develop a **Country Action Plan to distribute clean and improved cookstoves to 5 million households by 2017.** With Alliance support, the Power Division has developed a Household Energy Platform to coordinate the sector's efforts and ensure that stakeholders are working on a cohesive strategy. In addition, the Bangladesh Standards and Testing Institute is developing national standards for cookstoves and its staff has participated in recent ISO TC285 meetings. To support that push towards standardization, the Infrastructure Development Company Ltd, a non-bank financial institution which promotes economic development by encouraging investment in energy and infrastructure projects, has funded a National Cookstove Testing Center. **The Alliance has commissioned research on consumers and on marketing strategies** and plans to launch an awareness-raising campaign in 30 districts. It has also provided capital to two enterprises through its Pilot Innovation Fund. Rahimafrooz Renewable Energy Ltd, a solar product distributor, will expand into the clean cooking market by building on the WASHplus study conducted in Bangladesh, and Prakti Design is developing a clean cooking, two-burner, multi-fuel stove in response to growing consumer demand.

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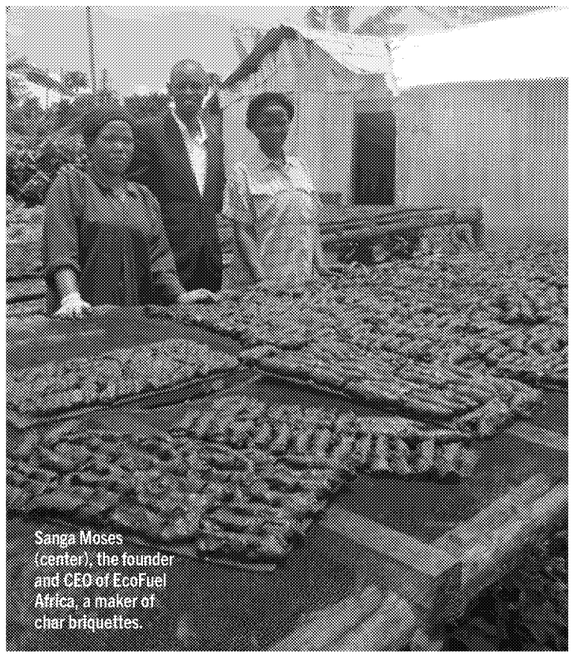
DRIVING INVESTMENT, STRENGTHENING ENTERPRISES, ENCOURAGING INNOVATION

The Alliance is using grants and other forms of soft and patient capital to prepare a pipeline of new opportunities for investors. To date, $50 million of private capital has flowed in to the sector to support the growth of enterprises along the cookstoves and fuels value chain. In fact, the Alliance is currently leveraging a dollar of investment funding for every dollar of grant funding. Access to finance is key to scaling up a sustainable supply of cleaner and more efficient cookstoves and fuels and the Alliance has worked with investors to stimulate their engagement in the sector. It has also focused on developing a suite of financial products to bridge the "pioneer gap" and to strengthen enterprises to the point of investment readiness. The Alliance's Pilot Innovation Fund finances creative approaches to business development and the Spark Fund provides capacity building and growth capital so that a business can become more investment ready. The Women's Empowerment Fund provides grants to partners who offer gender and empowerment interventions within their business models. All three funds have attracted a stellar range of applicants who prove that there is no shortage of entrepreneurial talent in this market.



Sanga Moses (center), the founder and CEO of EcoFuel Africa, a maker of char briquettes.

Applied Sunshine staff demonstrate a solar stove in Guatemala.

THE SPARK FUND

The Spark Fund invests grant capital in established but underfunded enterprises that have the ability to reach financial viability and real scale. The first round of Spark grantees in 2013 included Burn Manufacturing, EzyLife Kenya, GVEP, Impact Carbon and Relief International. Six grants totaling $2.2 million were awarded under the second round of funding in 2014. The winners, chosen from more than 70 applicants, are profiled here:

SimGas is a biodigester design and manufacturing company focused on distribution in the East African market. The company's household biogas system converts organic household waste into cooking fuel that can be used to power biogas stoves.

Eco-Fuel Africa produces green charcoal from biomass waste. Based in Uganda, EFA employs local farmers, leverages local technology, and counts 260 women retailers in its value chain.

Sustainable Green Fuel Enterprises produces and sells clean burning, sustainable charcoal briquettes to low-income households in Phnom Penh, Cambodia. The company's briquettes are made from compressed recycled char-ash and charred coconut husks.

Greenway Appliances designs and distributes efficient biomass cookstoves for rural families. The company's flagship product, Greenway Smart Stove, is sold in 24 districts in India and one district in Bangladesh.

EcoZoom has sold thousands of improved cookstoves in 18 countries. With its launch in Kenya, EcoZoom will expand its operations to include design, manufacturing, and direct distribution of wood and charcoal-fueled clean cookstoves.

SMEFunds is an ethanol gel manufacturing and distribution company focused on distribution in Nigeria. It has developed a method of producing cellulosic ethanol and converting the liquid into gel that can then be used in their cookstove, which is manufactured in China. SMEFunds has a distribution structure similar to that used by Avon Products and empowers individuals to sell the product at a margin throughout Nigeria.

THE PILOT INNOVATION FUND

This year marked the second round of the Pilot Innovation Fund (PIF), which was established to spur innovation and finance game-changing ideas. The winners of the first round of the PIF in 2013 were UpEnergy, Potential Energy, Greenway Appliances, Solar Sister, Sustainable Green Fuel Enterprise and Improved Cook Stoves for East Africa Ltd. Two first round PIF grantees—Greenway Appliances and Sustainable Green Fuel Enterprise—have gone on to become Spark Fund grantees, supporting the Alliance's hypothesis that the PIF creates a pipeline of innovative enterprises with the potential to scale. In 2014, six PIF winners shared $400,000 to support their work:

Applied Sunshine LLC is a startup that has developed an innovative vacuum tube solar cooker to be marketed in Guatemala. This tube can cook various types of foods, including local staples such as tortillas.

Prakti Design will develop a two-burner, multi-fuel stove for Bangladeshi, Indian, and Nepalese markets. The firm hopes to quickly achieve economies

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of scale with this innovative product.

Emerging Cooking Solutions (ECS) manufactures and distributes pellets made from agro-and forestry waste in Zambia. ECS will market test several lower-priced stoves for use with their pellets and look at several options for consumer financing.

Rahimafrooz Renewable Energy Ltd is a solar home systems distributer in Bangladesh. Rahimafrooz will market test several different cookstoves and develop their plan to expand into the clean cooking market.

CleanStar Ventures will develop an ethanol stove with a refillable fuel cartridge, complementary household appliances that can use ethanol, and a fuel distribution process that leverages partnerships with multinational corporations in Kenya.

C-Quest Capital (CQC) is a private equity and carbon finance firm providing clean and efficient household energy technologies and sustainable sources of household cooking fuels. Through TLC Green, a joint venture between CQC and the Malawian NGO Total Land Care, CQC proposes to test a new business model to couple the marketing and sale of sustainable firewood with improved cookstoves.

Prakti CEO Mouhsine Serrar speaking with distributors.

3 FUNDS TO HELP BUILD CAPACITY AND SCALE

➔ Many traditional sources of capital, such as bank loans or lines of credit, are out of reach for smaller entrepreneurs who lack sufficient collateral or financial history for a loan. Even if these enterprises are able to secure a commercial loan, interest rates are often prohibitively high. To help solve this problem, Deutsche Bank's Global Social Investment Group is establishing the $4 million **Clean Cooking Working Capital Fund** to deploy working capital loans and loan guarantees to enterprises that are unable to access more traditional forms of debt financing. The fund will offer flexible financing at reduced interest rates.

➔ The **Country Catalytic Small Grant Program** helps answer the need for country-specific mechanisms that fund capacity building and growth of start-up and venture stage companies, particularly those that are locally owned and operated. Recipients are selected after undergoing an investment readiness analysis. The Alliance has launched the program in Ghana and will roll it out in other focus countries in Phase 2.

➔ The Alliance's **Capacity Building Facility** is designed to fund clean cooking enterprises that are ready to scale and obtain long-term capital. These grants for capacity building are coupled with growth financing from investors.

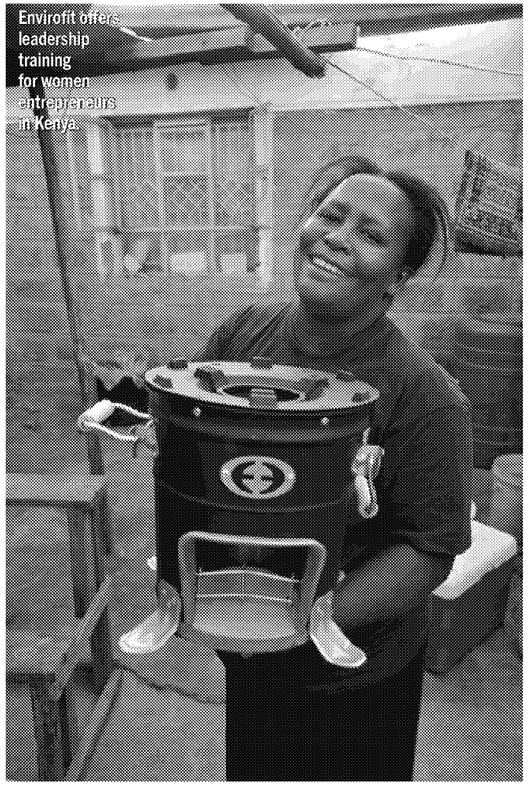
WOMEN'S EMPOWERMENT FUND

in 2014, the Alliance issued its first six Women's Empowerment Fund (WEF) grants to organizations that are implementing gender and empowerment interventions within their clean cooking business models. The following Alliance grantees will test and further develop the best practices highlighted in the resource guide *Scaling Adoption of Clean Cooking Solutions Through Women's Empowerment.*

Envirofit will examine how targeted empowerment and leadership training for women entrepreneurs in Kenya can impact their capacity to educate and support customers and scale adoption of clean cooking technologies.

Fuego del Sol will provide female school cooks with improved institutional stoves and train them in clean cooking techniques and maintenance, as well as support clean cooking entrepreneurs. Fuego del Sol will also work with the cooks to create central distribution hubs in Haiti for household cookstoves and briquettes.

Mercy Corps will analyze affordability and financing barriers for women purchasing improved cookstoves in Uganda. They will design and test a portfolio of consumer financing mechanisms and determine which combinations have the greatest potential to scale clean cookstove adoption.



Envirofit offers leadership training for women entrepreneurs in Kenya.

The Paradigm Project will apply its gender-sensitive approach to the EzyAgent program in Kenya by facilitating the recruitment of women as clean cookstove employees Paradigm will seek to identify the primary characteristics, traits and skills that successful female EzyAgents share, as well as understand the conditions of success for female entrepreneurs in the clean cookstoves value chain.

Grassroots Trading Network for Women will develop a toolkit for a handheld electronic device that can be used to collect data to better understand Indian consumers' willingness to pay for clean cooking technologies. The device will also be used to show consumers the savings benefits they can achieve with improved cookstoves.

Soluciones Apropriadas is designing an improved cookstove for small-scale commercial food businesses in Guatemala. The group will engage home cooks in the research and development process.

CARBON FINANCE

A clean cookstove can save 1 to 2 tons of carbon dioxide (CO2) emissions per year and some clean cooking solutions save considerably more. These CO2 emission reductions can be certified and sold though global carbon markets generating an additional source of revenue for stove businesses. The Alliance's Carbon Finance Platform provides how-to guides, tools, templates, reports, case studies and other tools to assist stakeholders with varying levels of carbon expertise.

MORE NEWS ON CLEAN FUELS

The Alliance is "fuel neutral" because it recognizes that the 3 billion people around the world who rely on biomass for fuel and heating do not have equal access—in terms of supply or affordability—to cleaner fuels. It must also be flexible in its approach since the policy contexts, barriers, and facilitators of market expansions in cleaner fuels and stoves are unique to each market. The Alliance's Phase 1 strategy has therefore focused on understanding the most appropriate cleaner fuel options for each region or country and outlining the steps needed to increase consumer access to that option.

In Ghana, the Alliance will assist the government as it seeks to transition 50 percent of the population to LPG as their primary cooking fuel. Partnering with experts in the LPG field, the Alliance has helped develop an action plan to identify the investments in supply, storage, distribution, retail, and consumer finance required to accelerate the adoption of LPG domestically.

In Nigeria, the Spark Fund is helping a local ethanol gel enterprise reach commercial viability and scale. The Alliance is also convening East African briquette producers and distributors to better understand the barriers that have kept them from penetrating rural markets.

In India, populations in several states have access to electricity and the Alliance is looking at the feasibility of extending the fuel supply chains to rural areas for both LPG and electric induction. Here the Alliance can help households "skip steps" on the fuel ladder and achieve healthier outcomes faster.

In Phase 2, the Alliance will perform a global analysis of different fuel supply chains to identify impacts and barriers, strengthen the case for investors, and identify successful initiatives.

THE EQUATION IS CLEAR: Clean fuels plus cleaner burning stoves equals more lives saved and real progress towards our Phase 2 goal of 60 million households adopting clean cooking solutions by 2017.

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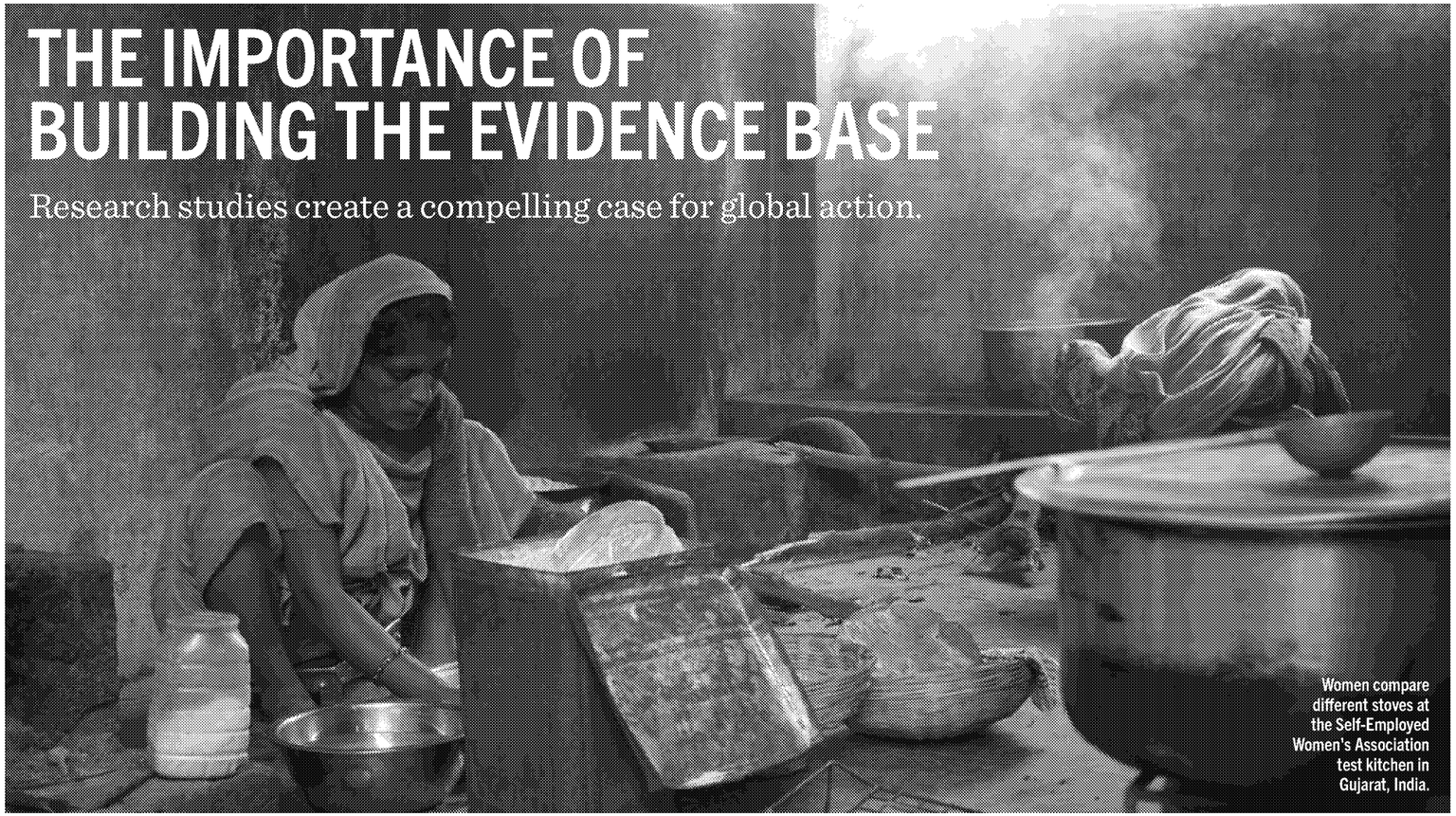
THE IMPORTANCE OF BUILDING THE EVIDENCE BASE

Research studies create a compelling case for global action.



Women compare different stoves at the Self-Employed Women's Association test kitchen in Gujarat, India.

In order to reach its goal to spur adoption of clean cookstoves and fuels in 100 million households by 2020, the Alliance must both demonstrate that the adoption of these technologies will significantly improve public health and quantify the extent of that impact. Despite the fact that household air pollution has been linked to more than 4 million premature deaths each year, too few studies clearly demonstrate the benefits of adopting cleaner cooking technologies. As a result, the general awareness of clean cookstoves and fuels as a public health intervention remains low. Yet we know that electricity and clean fuels including ethanol, solar and LPG, have the ability to reduce exposures to household air pollution to levels that provide health impacts. New more advanced stoves have overcome some of the technical challenges associated with earlier versions of improved biomass stoves and also promise benefits.

The Alliance believes that by providing governments, NGOs, impact investors, and donors with scientifically based information on the benefits of clean cooking technologies, it can help them quantify the impact of their investments in the sector. The Alliance set out to build this evidence base, and over the last four years, has helped direct almost $5 million in research grants to the sector and supported 39 studies across 23 countries. Those studies show clean cooking solutions not only protect public health, but also offer clear environmental, gender and economic benefits that when aggregated, create a compelling case for global action.

The Alliance has formed a Research Advisory Committee (RAC), which includes distinguished research experts in health, energy, standards and testing, environment, gender and economics. Its committee members support the Alliance research team and provide oversight to ensure that its research priorities are comprehensive, balanced and globally representative. RAC members also support the review and issuance of research grants and help determine which investments will most effectively demonstrate the impact of clean cooking interventions. All members serve two-year voluntary terms and help leverage funding for research while reducing duplication of research efforts, sharing information across research areas, and providing technical assistance to Alliance partners.

FAST FACT Exposure to household air pollution during pregnancy is associated with a 90 gram reduction in a baby's birth weight.

The Alliance is continually attracting new researchers from different disciplines to the sector and to maximize the effectiveness of its work, it has created a Research Platform to standardize, synthesize, coordinate, and share those studies with the sector, donors, and other researchers. The Platform also makes the results more accessible and understandable to other stakeholders and it drives innovation by showcasing improvements in stove design, new materials, and factors that influence adoption.

Health Research

In Phase 1, the Alliance supported three child survival research studies in Ghana, Nigeria, and Nepal. These studies explore how the adoption of clean cooking during pregnancy can impact pregnancy outcomes including birth weight. The studies address a range of clean cooking technologies, including biomass stoves, ethanol, and LPG. Preliminary results are clear: Adoption of cleaner cookstoves and fuels delivers substantial reductions in exposure to household air pollution. The Alliance has also strengthened research on the causes and risk factors for severe burns, which contribute to 195,000 deaths annually. While a large proportion of these are thought to be cooking related, there is limited data on the direct causes and risk factors for severe burns. To address this data gap, the Alliance, WHO, CDC, and a global network of public health experts have developed a new Global Burn Registry Form so that data collection on burns can be globally harmonized. The form has now been pilot tested in 46 hospitals within 26 countries.

Climate Research

Large-scale adoption of clean cookstoves, fuels and other cooking solutions can help mitigate climate change by reducing carbon dioxide emissions from non-sustainable harvesting of biomass, and by lowering emissions from short-lived climate pollutants and aerosols such as methane, carbon monoxide, and black carbon. However, the sector needs a better understanding and quantification of the net climate impact of emissions from the cooking sector. The Alliance is guiding the sector as it seeks to identify and target regions where the climate benefits from cookstoves will be greatest and is currently working with researchers on the first phase of an innovative woodfuel database and geospatial-mapping tool. Developed by experts from Universidad Nacional Autónoma de México, Yale University, and the UN's Food and Agriculture Organization, it will enable program developers to incorporate environmental concerns, including sustainability of fuelwood, into their planning and identify areas where scaling clean cookstoves and fuels could provide the greatest benefits to the environment. The next phase of research will involve in-depth analyses of the effects of biomass harvesting in 'hot-spot' areas of Africa, Asia, and Latin America, namely Honduras, Kenya, and India.

Gender Research

The Alliance is gathering data on the impacts of clean cookstoves on women's livelihoods, social status, financial situation and overall empowerment. It has funded studies on gender impacts in South Asia, the Andean region, and Kenya, and is supporting research that sets out to understand socio-cultural factors such as how time saved from use of clean cookstoves is spent. The Alliance is also supporting research on the impact that women entrepreneurs working in the cookstove and fuels value chain have on clean cooking adoption rates in Kenya.

FAST FACT Collecting fuel can take up to 5 hours per day. With an improved cookstove, women can use that saved time to care for their children, participate in income-generating activities, and rest.

HOUSEHOLD AIR POLLUTION INTERVENTION TOOL

Policymakers, donors, NGOs and researchers now have access to a simple web-based tool that can compare the impacts of various cooking technologies on health at the national level. With the Household Air Pollution Intervention Tool (HAPIT), users can compare the lifesaving impact of available interventions and make evidence-based decisions. HAPIT was developed at the University of California, Berkeley, with support from the Alliance and funding from the UK's Department for International Development and Environment Canada.

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THE GROWING IMPACT OF GLOBAL STANDARDS AND TESTING

One of the Alliance's key value propositions is its work to lead the development of standards and testing in the clean cooking community. From its engagement in the ground-breaking 2012 International Standards Organization (ISO) International Workshop Agreement, to its work in 2013 with ISO Technical Committee 285 on clean cookstoves and clean cooking solutions, the Alliance has played a strong leadership role. The development of consensus standards is essential if the Alliance is to drive health and environmental gains. Common standards provide a set of indicators against which to rigorously measure the performance of a technology. And ratings, based on data gathered during a consistent and independent testing process, are a valuable benchmark for stakeholders across the sector.

5 REASONS WHY ISO STANDARDS ARE CRITICAL

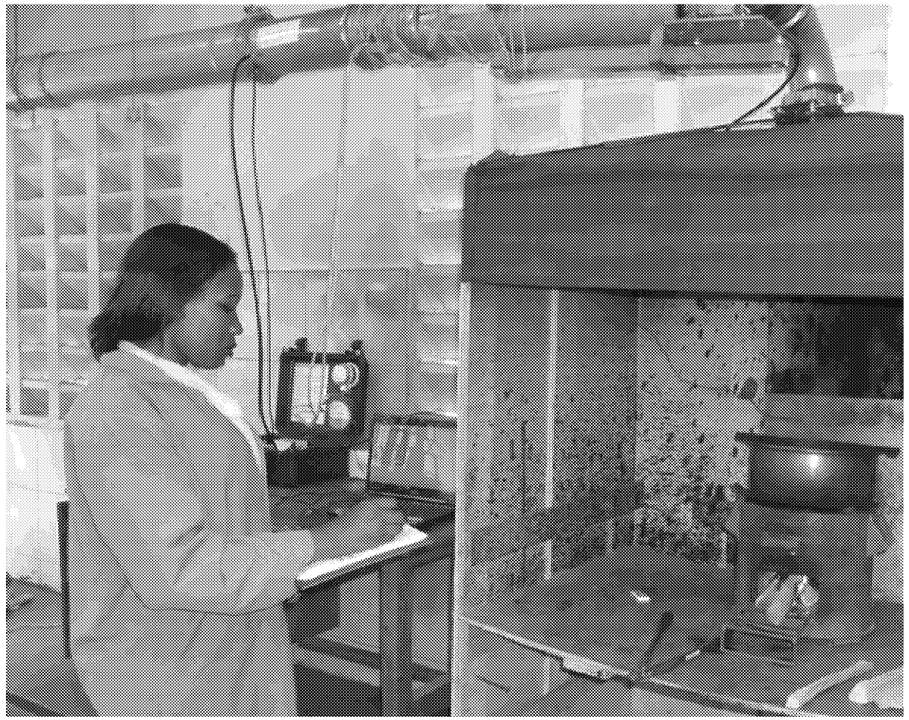
1 FOR CONSUMERS
Expert, independent evaluation of a cookstove's performance inform, protect, and empower consumers. With a reliable source of information, buyers can distinguish hype from fact and choose a cookstove based on the performance metrics that best suit their needs. Some consumers prioritize reduced emissions while others seek fuel efficiency. A stove's durability and safety are also important to some consumers.

2 FOR MANUFACTURERS
Standards will allow manufacturers to differentiate their products in the marketplace. They can be used as independent verification of a stove's quality and performance. Standards also encourage product innovation because the tiered rating system provides a roadmap for product excellence.

3 FOR DONORS AND IMPACT INVESTORS
Guidelines give clear, comparable information on the potential for different enterprises and their technologies and products to have an impact on the environment and health.

4 FOR PRIVATE INVESTORS
Financial institutions and others looking to maximize their return on investment will be able to distinguish companies with the most impressive products and greatest potential.

5 FOR GOVERNMENTS AND REGULATORS
The guidelines can both protect citizens and help measure progress towards clean cookstove and fuel adoption, as well as broader renewable energy and health goals.



A stove is tested at the Centre for Research in Energy and Energy Conservation (CREEC), one of two RTKCs in Uganda.

PHOTO BY CREEC

THE CLEAN COOKING CATALOG IS NOW A DYNAMIC RESOURCE

The Alliance's online global database of cookstoves, fuels, specifications, prices, manufacturers, performance testing and geographic distribution is the go-to resource for distributors, investors and innovators. The latest version has features like the Submit a Stove Form to ensure that the catalog evolves as technologies continue to improve. The Alliance has also worked with RTKC partners to develop standardized templates for collecting and sharing data. These reports will be uploaded into the catalog, allowing for faster data sharing and anonymous test results.

A GLOBAL NETWORK OF TESTING EXPERTS

Regional Testing and Knowledge Centers (RTKCs) support local producers and manufacturers, helping them to improve their products and communicate information on stove performance to their customers and investors. Testing centers provide independent and unbiased reports on emissions, fuel efficiency, safety, and durability. The Alliance has supplied lab and field-testing equipment to build the sustainability and capacity of 13 RTKCs across Africa, Asia, and Latin America, and provided support for the training and development of staff in centers in other countries. For example, the Alliance has helped organize intensive training workshops at the US Environmental Protection Agency's (EPA) lab in North Carolina and at Zamorano University in Honduras. It is also coordinating knowledge sharing and improvements in testing methodologies. To ensure the reliability and value of the RTKCs as a resource for producers and manufacturers, the Alliance is coordinating 25 centers in a round-robin testing, in which the same set of cookstoves and fuels are tested by different organizations. Alliance partners like EPA have also held regional field testing and cookstove performance capacity-building workshops for more than 50 stove developers in Benin, India, Mexico, Nepal, and Vietnam.

THE LATEST ON ISO

The International Standards Organization (ISO) Technical Committee 285 on clean cookstoves and clean cooking solutions was approved in June 2013 with Kenya and the United States serving as Co-Secretariat, and a representative from the Alliance as committee chairperson. In 2014, at the first ISO meeting in Nairobi, committee members from 35 participating and observing countries discussed issues such as laboratory testing, field testing, durability and social impacts, which led to the launch of Working Groups that will have detailed discussions on the highest priority issues. Since then, countries have been nominating experts to participate in these Working Groups to ensure the proposals are relevant for the individual countries and their stakeholders. These four Working Groups, as well as Fuels and Communications Task Groups met in October 2014, for a ISO TC 285 meeting in Guatemala, to address comments from stakeholders and develop drafts.

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ROADMAP FOR PHASE 2

The Alliance's strategic plan includes a goal for 60 million households to adopt cleaner and more efficient cookstoves and fuels by 2017. These strategies will raise awareness to create that demand, bring smart products and ideas to market, build the evidence base for clean cookstoves and fuels, and fully engage impact investors. Working with its partners, and following this action plan, the Alliance will make great progress towards defeating this silent killer.

2015

20 MILLION HOUSEHOLDS ADOPT CLEANER AND MORE EFFICIENT COOKSTOVES AND FUELS.

We are already ahead of our Phase 1 target.

Launch public awareness campaigns in all eight focus countries. National and local champions drive home our messaging.

Work with at least three financial institutions in each focus country to support consumer finance and develop products that will enable families to move up the energy ladder.

Promote certification, labeling, and testing programs in accordance with ISO standards.

Make investments to strengthen at least four different fuel supply chains across focus countries.

DEMONSTRATE THE LIFE-SAVING IMPACT OF CLEAN COOKING INTERVENTIONS. STUDIES ON CHILD SURVIVAL, BURN FATALITIES, AND CARDIOVASCULAR AND LUNG DISEASE CONTINUE TO BUILD THE EVIDENCE BASE.

Increase efforts to drive private investment in the sector and encourage financial institutions to allocate capital for clean cookstoves and fuels enterprises.

BUILD A STRONG GLOBAL NETWORK FOR EVALUATION OF RESEARCH.

Help provide access to clean cooking solutions for 5 million people in refugee camps and other humanitarian contexts.

CONTINUE TO DEVELOP A PIPELINE OF INVESTMENT-READY ENTERPRISES THROUGH THE SPARK, PILOT INNOVATION, AND WOMEN'S EMPOWERMENT FUNDS.

Pursue meaningful policy and regulatory reforms to optimize the clean cookstoves and fuels market, especially in focus countries.

The global health community will fully embrace and act on the issue of household air pollution.

Use research results to continue to demonstrate the environmental and climate benefits of clean cooking. Affirmation of global energy goals in Post-2015 SDGs, Beijing+20, and Sustainable Energy for All will increase our profile and momentum.

2017

60 MILLION HOUSEHOLDS ADOPT CLEANER AND MORE EFFICIENT COOKSTOVES AND FUELS

PROJECTED IMPACTS

110,000 lives saved

25,000 children's lives saved

430,000 sector jobs

350 million trees saved

310 million metric tons CO_2 emissions saved

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GLOBAL ALLIANCE FOR
CLEAN COOKSTOVES

The Global Alliance for Clean Cookstoves is a public-private partnership hosted by the United Nations Foundation that seeks to save lives, improve livelihoods, empower women, and protect the environment by creating a thriving global market for clean and efficient household cooking solutions. The Alliance's 100 by '20 goal calls for 100 million households to adopt cleaner and more efficient cookstoves and fuels by 2020. The Alliance is working with its public, private and non-profit partners to help overcome the market barriers that currently impede the production, deployment, and use of clean cookstoves and fuels in developing countries.

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RESULTS REPORT

Sharing Progress on the Path to Adoption of Cleaner and More Efficient Cooking Solutions

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

ED_005941_00000100-00001

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An always expanding list of Alliance partners is available within the Alliance community's searchable online directory (http://community.cleancookstoves.org/). We are also grateful to those carbon market participants that provided additional survey information about their clean cookstoves market activities via Ecosystem Marketplace's 2014 survey of carbon offset providers. For additional information on the results of that survey and a list of clean cookstove carbon offset provider respondents, see Sharing the Stage: State of the Voluntary Carbon Markets 2014, available on the Ecosystem Marketplace website (http://www.ecosystemmarketplace.com/).

The Alliance is grateful for the generous financial and in-kind support for its monitoring and evaluation work provided by the Dutch Ministry of Foreign Affairs and the Department for International Development, United Kingdom of Great Britain and Northern Ireland.

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

2013 RESULTS REPORT

Sharing Progress on the Path to Adoption of Cleaner and More Efficient Cooking Solutions

Developed and written by:

Ecosystem Marketplace
A FOREST TRENDS INITIATIVE

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

Designed by:

USILIO design

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1. Overview

The Global Alliance for Clean Cookstoves (the Alliance) was launched in 2010 with a goal to drive the adoption of clean and efficient cookstoves and fuels in 100 million households by 2020. The Alliance's strategic business plan provides a clear roadmap for the creation of a dynamic market for clean cooking solutions via a three-pronged approach focused on strengthening supply, enhancing demand, and creating an enabling environment for sector growth. Phase one of its strategic plan, which extends from 2012-2014, has been focused on launching global and in-country efforts to rapidly grow the sector.

Overview of Alliance Activities in 2013

The Alliance's partner base grew steadily in 2013, with 365 new partners by the end of the year. In 2013, many market-enabling activities, including efforts to strengthen supply, were well under way, with the establishment of a suite of funding mechanisms to drive enterprise capacity building and innovation. The Alliance also commissioned numerous market assessments and launched Country Action Plans to inform its selection of eight initial focus countries (Bangladesh, China, Ghana, Guatemala, India, Kenya, Nigeria, and Uganda). In addition, several critical enabling environment activities were also in progress, including a process to create the first internationally recognized standards for the sector, support to enhance regional testing centers, and numerous studies to demonstrate the potential benefits of scaling up cleaner, more efficient cooking.

Beyond these efforts to accelerate market growth globally, the Alliance also worked to facilitate safe access to fuels and energy in humanitarian settings, promote the empowerment of women, and ensure the wide range of benefits associated with the adoption of clean cooking, including improved livelihoods, public health, and reduced environmental degradation and climate change mitigation.

Results Reporting Overview

The Alliance remains committed to routine monitoring and reporting on sector progress. The *2013 Results Report: Sharing Progress on the Path to Adoption of Cleaner and More Efficient Cooking Solutions* is the second Alliance results report illuminating traction and trends in the cookstove and fuel sector. Building on results reporting first conducted by the Alliance in 2012, this report tracks partners' self-reported progress in 2013 toward their shared adoption goal. As such, where possible, the report also offers year-over-year analysis of Alliance partner activities, including analyses comparing new and repeat respondents to ensure that results are accurately stated and interpreted.

Data Collection

The majority of the data was collected via an online survey designed and administered by Forest Trends' Ecosystem Marketplace with technical and outreach support from the Alliance secretariat and its regional market managers. The Alliance also partnered with Ecosystem Marketplace to analyze the survey results that are presented in this report. Submitted responses were reviewed for clarification and confirmation where necessary.

This year, the report has also integrated information from the Alliance's **Clean Cooking Catalog**, a new global database of cookstove and fuel performance information using key indicators such as stove features, specifications, emissions levels, efficiency, fuel types, and safety from laboratory and field-testing. The continued integration of additional technologies into the catalog will enable better tracking of trends in the availability of cleaner and more efficient stoves and fuels over time.

The report structure begins with a **"Results"** section that highlights partners' aggregate accomplishments, globally. A new **"Focus Country Views"** section provides a more in-depth description of the momentum within each of the Alliance's eight focus countries, pairing data analysis with real-world experiences as described by key Alliance representatives working on market development in each of the focus countries. Finally, the broader implications of these global and focus country results are explored in a **"Discussion"** section that relates the Alliance's strategy and sector developments to its current growth trajectory.

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2. Results

Interpreting the Results

Findings are not meant to be comprehensive of the sector as a whole, but rather serve to illustrate the momentum of the Alliance's partners and the sector in general. Readers should consider these findings as conservative, to be weighed alongside the rapidly expanding body of knowledge in the sector.

Respondents Profile

Approximately 45% of partners that were active in 2013 responded to the survey (Table 1), with a total 458 organizations participating in the 2013 survey compared to 246 in 2012. Almost three out of every four organizations that reported engaging directly in the clean cooking value chain in 2013 also responded to the 2012 annual survey.

Figure 1 illustrates respondents' headquarters and countries of operation. Partners active in Asia were central to market activity and growth, with the number of responses from Asia-based partners almost tripling in 2013. This is partly due to the Alliance's intensified support to and survey outreach in China (Section 3).

The response rate for partners from Africa also rose steadily, with an increase of 33% from 2012. In keeping with 2012 results, Africa retained its position as

Table 1: 2013 Alliance Partner Performance: By the Numbers

Response Rate:	458	Partner Headquarters:	
		Africa: 22%	US & Canada: 14%
		Asia: 42%	Europe: 13%
		Latin America: 8%	Oceania: 1%
Stoves Manufactured:	11.7 million	Portability:	
		Portable: 68%	Fixed: 32%
Stoves Tested:	75% of all stove models	% Testing Occurrences by Setting:	
		Lab: 39%	Both: 14%
		Field: 47%	
Stoves Disseminated:	14.3 million	Stove User Location:	
		Africa: 31%	Latin America: 6%
		Asia: 63%	
		Stove User Setting:	
		Rural, above poverty line: 3%	Urban/peri-urban, above poverty line: 7%
		Rural, below poverty line: 76%	Urban/peri-urban, below poverty line: 14%
Fuels Produced:	8.3 million (kg)* 3.4 million (L)*	Fuel Types Produced:	
		Briquettes/pellets: 33%	Liquid petroleum gas: 27%
		Biogas: 22%	Ethanol/alcohol: 9%
Fuels Disseminated:	10.0 million (kg)* 2.0 million (L)*	Fuel Types Disseminated:	
		Briquettes/pellets: 36%	Liquid petroleum gas: 34%
		Ethanol/alcohol: 18%	Charcoal: 10%

Source: 2013 Results Report, Global Alliance for Clean Cookstoves.

*Notes: Based on thousands of data points from 458 survey respondents. * kg = kilogram and L = liter*

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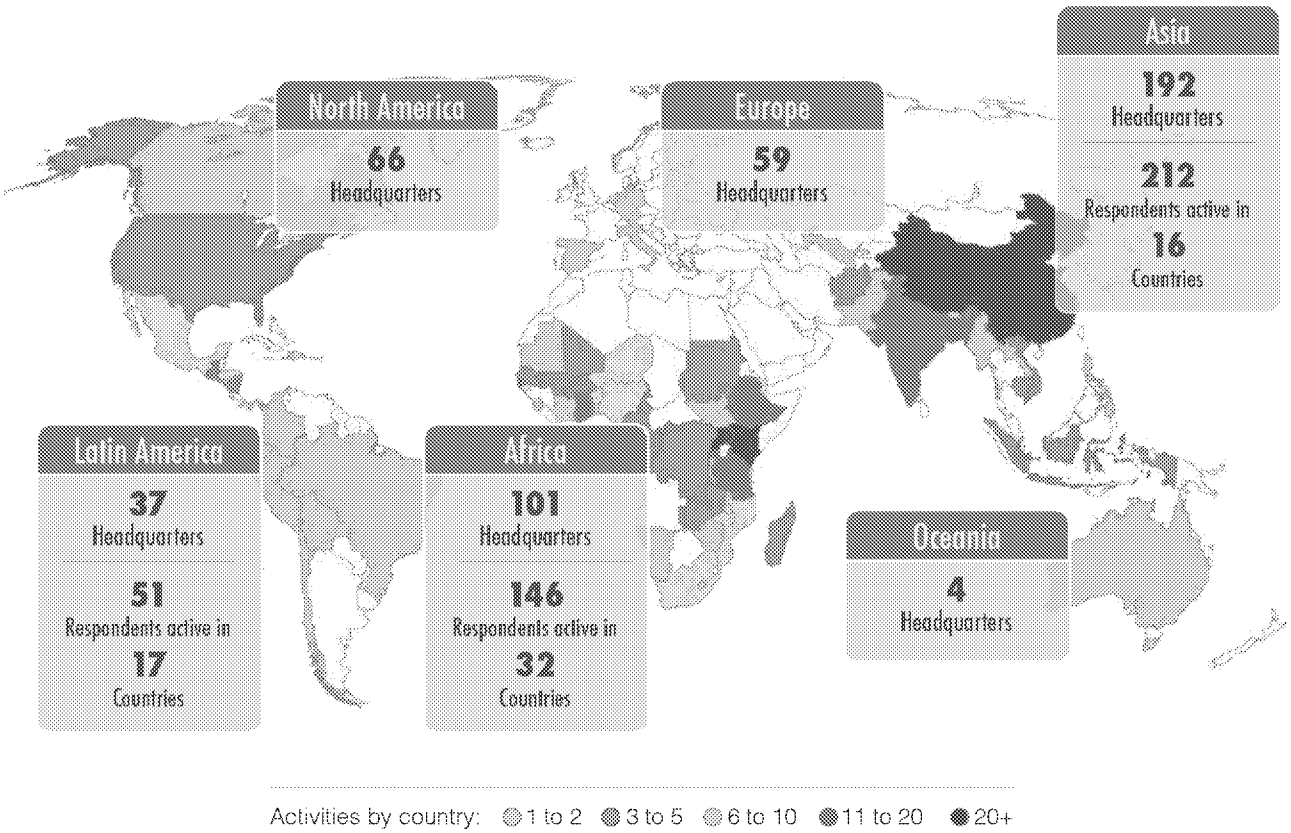
Figure 1: Distribution of Regional Response Rates by Respondent Headquarters and Count of Reporting Partners Active In-Country



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 455 organization responses. Shading represents locations of respondents' activities, not headquarters.

a key region for organizations working in the sector, and in a variety of roles. Responses from Latin America showed an even greater increase at nearly double the 2012 rate (+76%).

Manufacturing and Distribution

Stoves

The number of stoves manufactured by Alliance partners grew 22%, to 11.7 million, in 2013, from 9.6 million in 2012. Consistent with 2012 findings, two-thirds of these stoves were portable, while the remaining third were built in place. Two out of every three stoves tracked in the report survey were manufactured in China. Stoves manufactured in China were distributed across a reported seven countries, but most commonly within China itself. Another 2 million stoves were manufactured in Africa - a critical focal area for distributors, humanitarian agencies, and the Alliance.

Overall, close to half of the growth in manufacturing from 2012 can be attributed to first-time respondents, with those reporting in both 2012 and 2013 actually reporting lower manufacturing volumes (Figure 4). Part of this decline may be attributed to organizations shifting focus along the supply chain; reported activities in Ethiopia, for example, suggest a 2 million+ shift from last year's production into this year's distribution.

Globally, **respondents distributed 14.3 million stoves in 2013, growing by 75% over distribution reported in 2012** (8.2 million) (Figure 3). **Partners reporting stove distribution activities in both 2012 and 2013 marked a 19% year-on-year increase in distributed volumes.**

Figure 5, which tracks the volume of stoves distributed in 2012-2013 by partners' distribution capacities, shows that organizations of all sizes saw

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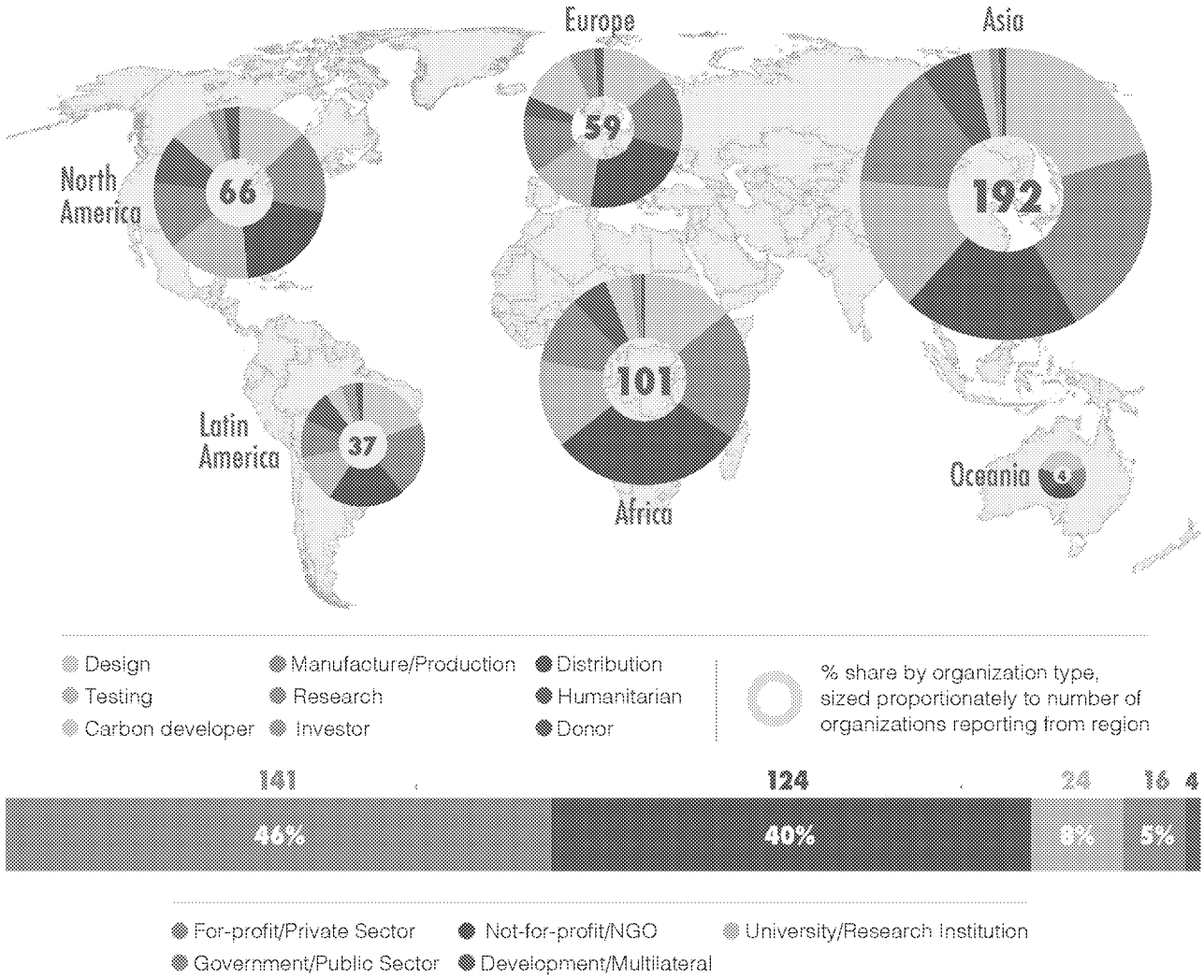
Figure 2. Distribution of Survey Response Rates (Region) by Respondents' Roles in Value Chain



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 458 organization responses.

increases in the volume of stoves distributed. First-time respondents contributed to over half of 2013 distribution volumes (Figure 6) .

At least 4.8 million stoves were sold to retailers that then sold them to end users in 2013 or planned to do so in the future. Trade fairs were the primary outlet for organizations to market their products (Figure 7).

Alliance partners also distributed a substantial proportion of stoves and fuels directly to end users of which poor and low-income consumers in rural areas were the most commonly targeted user types, followed by users above the poverty line in urban and peri-urban areas (Figure 8).

Emergency aid programs account for approximately 3% of the 14.3 million cookstoves distributed, impacting at least 400,000 crisis-affected house-holds in nine countries, as reported through an on line database hosted by the Safe Access to Fuel and Energy (SAFE) Reference Group which the Alliance co-chaired in 2013 (Box 1).

This is an almost fourfold increase over the 82,000 stoves reported as distributed in humanitarian settings in 2012.

Fuels

Partners distributed at least 11.6 million kilograms (kg)1 of fuel in 2013 – 55% more than

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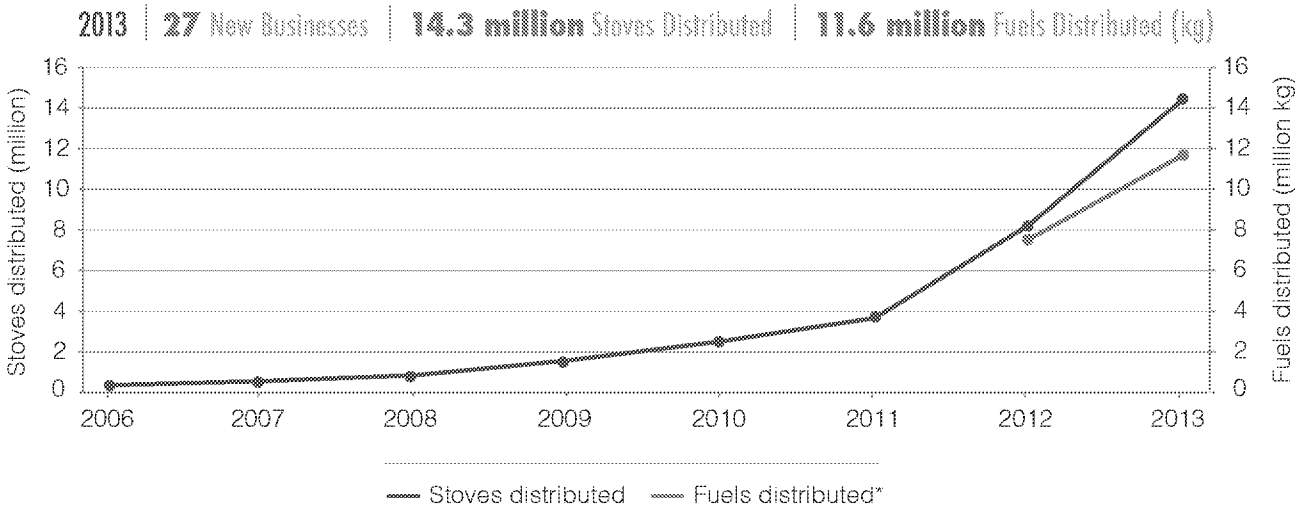
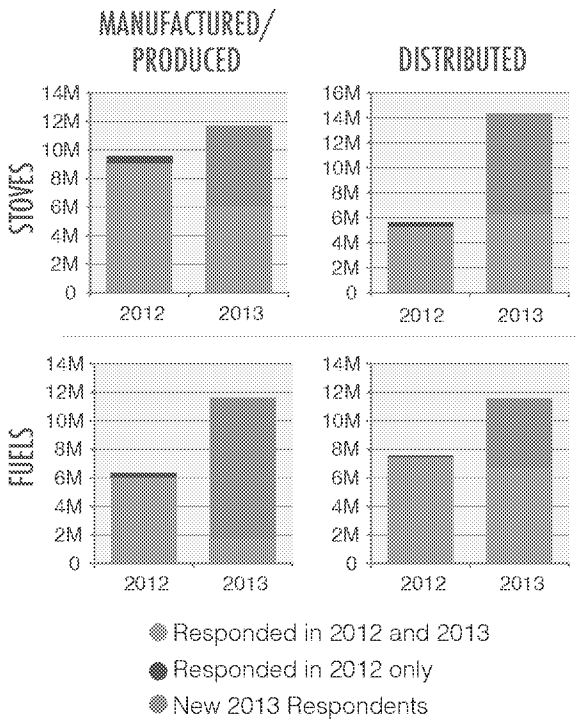
Figure 3. Cumulative Survey Respondents Active in Stove Market and Stove Distribution to Date by Year of Business Start



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.

Notes: Based on 282 organizations reporting year of business start, of a total response rate of 458 organizations. 2006-2011 amounts based on tracking led by the U.S. Environmental Protection Agency's Partnership for Clean Air (PCIA), which led the results reporting process for the sector prior to the establishment of the Alliance.

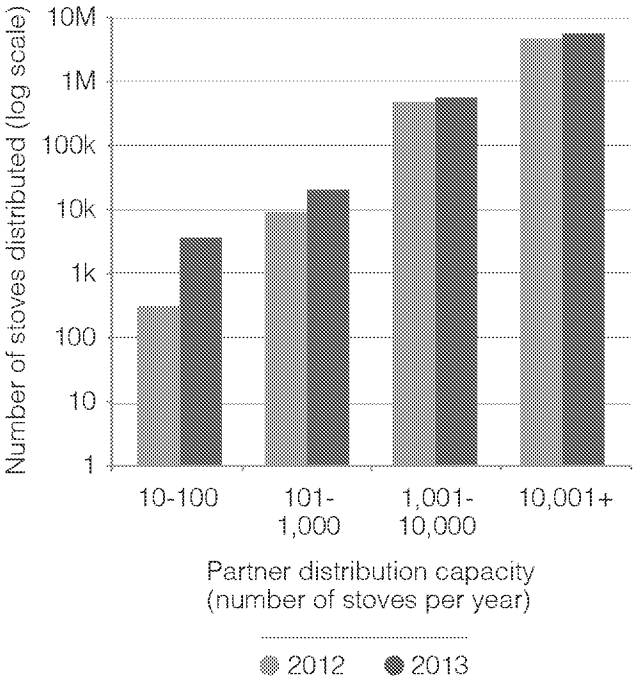
Figure 4: Volume Comparison by Respondent Activity and Survey Year



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.

Notes: Based on 458 organization responses from 2013 and 246 organization responses from 2012.

Figure 5: Distribution Response Rate In-Depth Comparison 2012-2013



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.

Notes: Based on 92 organization responses from 2012 and 2013.

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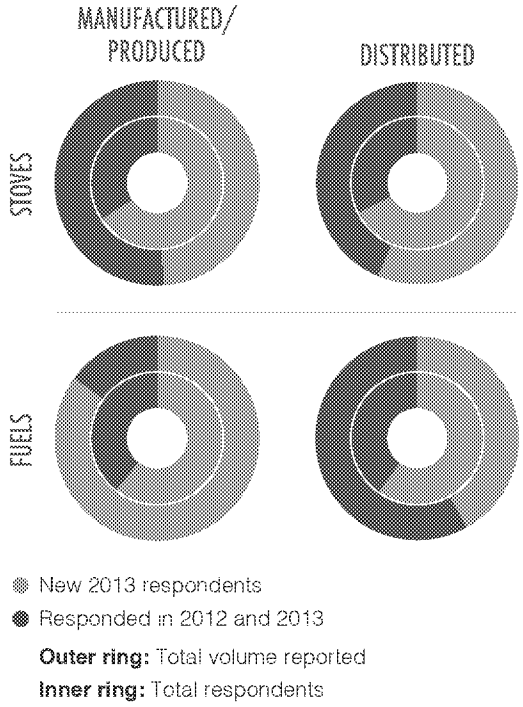
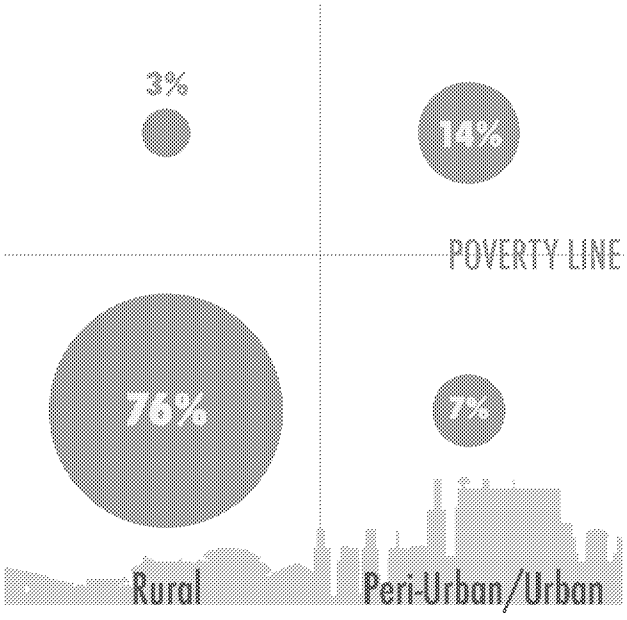
Figure 6: Comparison of Respondents by Survey Year and Market Activity



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 486 organization responses from 2013 and 246 organization responses from 2012.

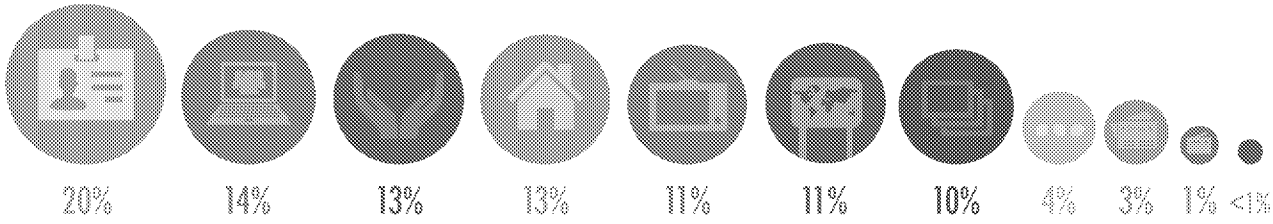
Figure 7: Stove Distribution by End User Income and Setting



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 237 observations.

was reported in 2012 and over one-third of which was clean-burning liquid petroleum gas (LPG) (Table 1). Behind this increase in fuels distribution was an increase in production, which grew 84% from 2012 to 11.7 million kg in 2013. Fuel producers in India contributed a significant proportion of this volume. In addition, fuels production and distribution volumes also drew significantly upon new respondents, with close to half or more volumes reported by first-time respondents.

Figure 8: Percent Share of Primary Methods Utilized to Market Stoves and Fuels



Primary methods of marketing stoves:

- Trade Shows
- Internet
- Public Demonstration
- Door-to-Door Campaigns
- TV Ads
- Billboards/Other Outdoor Advertising
- Flyers
- Other
- Newspaper/Other Print Media
- Radio Ads
- Mobile Messaging

Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 556 observations (respondents had option for multiple selections).

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Box 1: Humanitarian Activities and Safe Access to Fuel and Safety (SAFE)

The Alliance has a goal of 1 million households in humanitarian settings adopting clean cooking solutions. As part of the Safe Access to Fuel and Energy (SAFE) in humanitarian settings initiative, the Alliance has been leading efforts to integrate fuel and energy access into humanitarian responses by commissioning research, facilitating sector coordination, building partnerships, and enhancing the capacity of humanitarian workers.

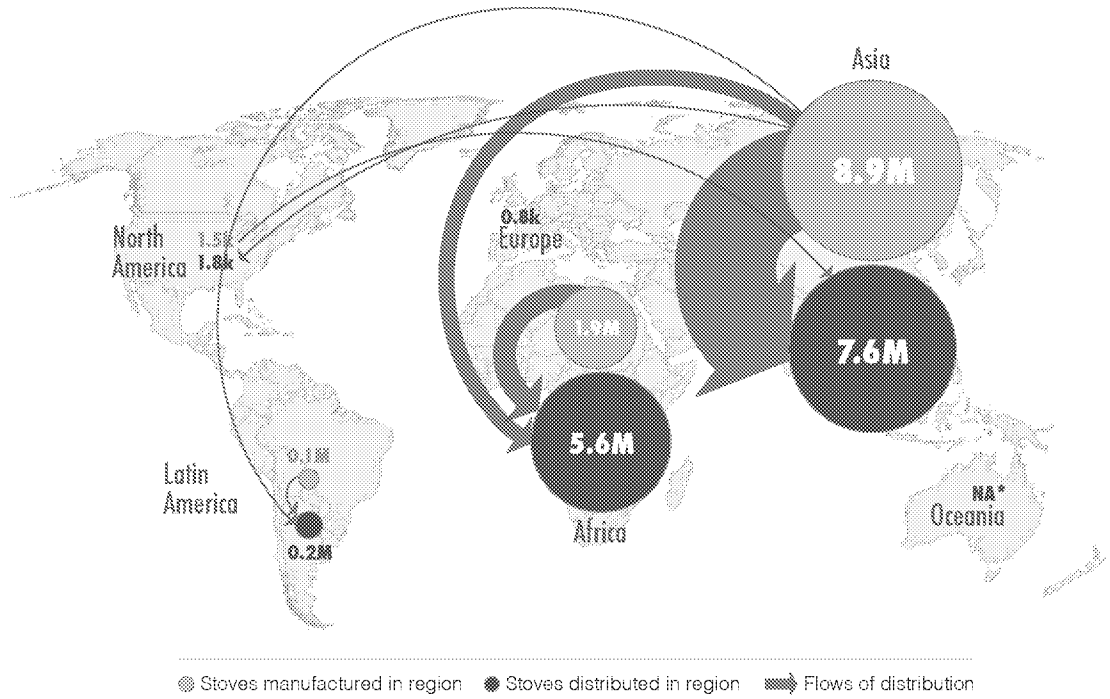
In 2013, the Alliance convened manufacturers, humanitarian implementers, and carbon financiers to discuss the technology needs of humanitarian projects, including technologies that are currently available and adaptations that are necessary for these contexts. This workshop, held in Nairobi, helped manufacturers and humanitarian agencies begin to bridge the gap between supply and demand for cookstoves in humanitarian settings. The workshop also focused on the benefits, challenges, and potential pathways to utilize carbon finance of humanitarian initiatives.

The Alliance co-chairs the SAFE Reference Group, a consortium of international humanitarian agencies working to improve access to fuel and energy for crisis-affected populations. The Alliance also served on the steering committee to develop the United Nations Refugee Agency's (UNHCR) SAFE strategy.

The UNHCR SAFE strategy is one of five guidance documents readily available to humanitarian practitioners: these include the SAFE Decision Tree Diagrams on Factors Affecting Choice of Fuel Strategy in Humanitarian Settings; the SAFE Matrix on Agency Roles and Responsibilities for Ensuring a Coordinated Multi-Sectoral Fuel Strategy in Humanitarian Settings; the Food and Agriculture Organization (FAO) Guidance Note on SAFE in Humanitarian Settings; and the World Food Programme's (WFP) SAFE handbook.

One-third of the 29 humanitarian projects described in this year's Results Report survey reported utilizing the WFP handbook or other SAFE guidelines. An additional 19 cookstove and fuel projects were reported in 2013 by partners of the Alliance through the SAFE Reference Group's online project database. These projects provided cleaner stoves and fuel to approximately 400,000 crisis-affected households in nine countries.

Figure 9: Stove Flow from Manufacturing to Distribution



Source: 2013 Results Report, Global Alliance for Clean Cookstoves

*Notes: Based on 176 organization responses for stove manufacturing activities, and 206 organization responses for stove distribution activities. * Data is insufficient to report partner volumes.*

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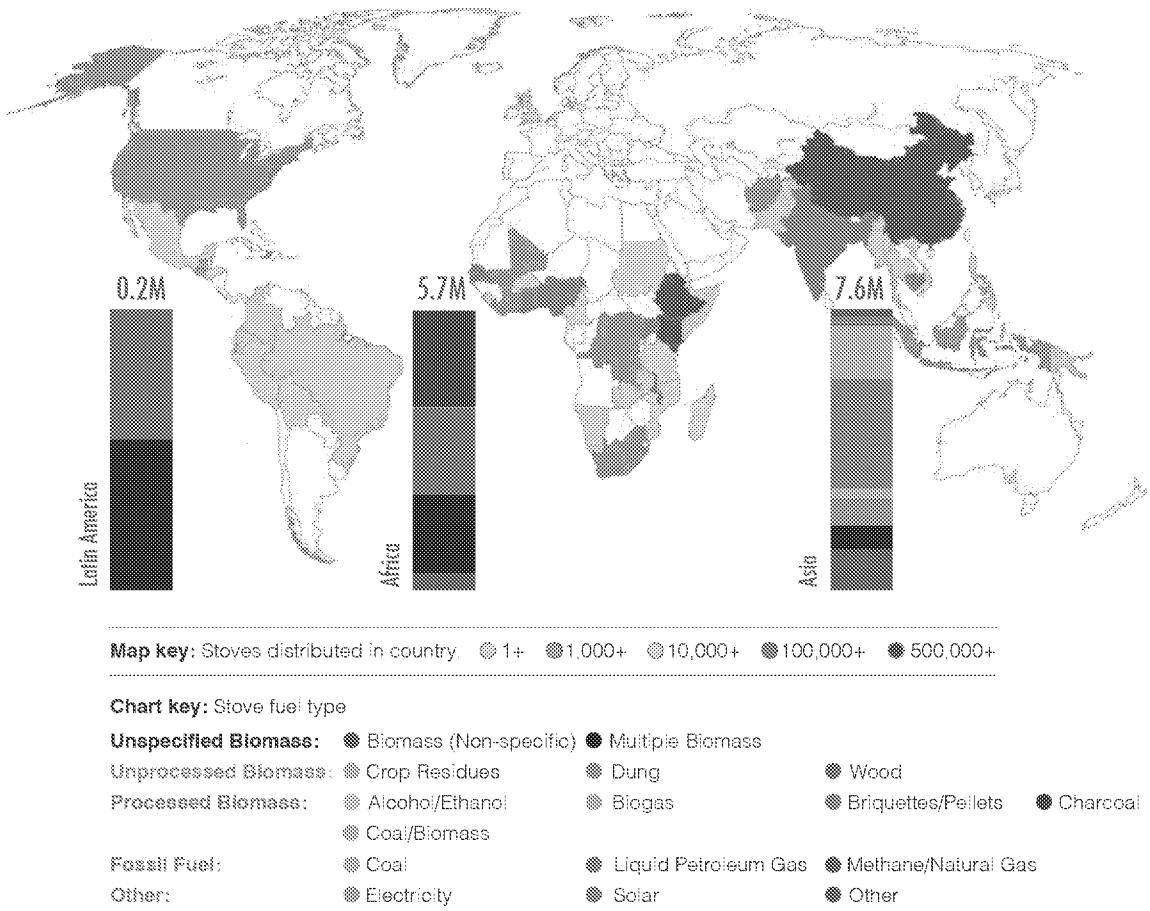
Figure 10: Volume of Stoves Distributed by Country, Region, and Stove Fuel Type



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 545 observations.

Regional Results

Approximately two out of every three stoves (9.2 million) were distributed in focus countries where the Alliance is intensively supporting partners to promote enabling environments for social investment and market development (Figures 9 and 10). Stoves manufactured in focus countries make up 89% of all stoves reported. Alliance focus countries also showed significant year over year growth, with the number of stoves manufactured and distributed doubling in focus countries compared to more moderate market changes in non-focus countries.

While most regions experienced modest gains, responses from Asia-based partners represented the most sizable change, growing to encompass 192 organizations, which constitute 40% of total respondents.

The Alliance's 130 partners in China, in particular, led the global clean cooking sector in both manufacturing (representing 68% of the total volume) and distribution (a smaller 43%).

Behind Asia, Africa was the second most-active region for Alliance partners and the primary target of finance for carbon offset projects promoting clean cooking technologies. In these countries, as well as in Latin America, partners were predominantly engaged in the stove and fuels distribution value chain, while Europe, Oceania, and North America saw a slightly greater response rate from donor agencies, investors, and carbon market actors (Figure 2).

Overall, surveyed partners were based out of 64 countries in 2013, two more countries compared to 2012, while their direct and indirect market activities were even more far-reaching, encompassing a total

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Box 2: The Clean Fuels Story

The Alliance has a comprehensive approach to the adoption of clean cooking solutions in developing countries. This includes focusing on fuels as well technologies, requiring the Alliance to build strategies to promote informed fuel switching, highlighting best practices for implementers to ensure sustained adoption through market-based fuel interventions, and strategically communicating the evidence that will strengthen the future of clean fuels use in the cooking sector.

While clean cooking fuels production and distribution is underrepresented in this year's survey responses, results reflect a 55% increase from the volume of fuels distributed in 2012. Activities in 2013 were also notably cleaner; liquid petroleum gas (LPG) and briquettes/pellets lead the way as the most popular fuels sources reported by total volume produced and distributed.

The clean cooking fuels space is extensive and multi-faceted, and as the Alliance continues to work to expand its efforts in this area, a number of fuel-related efforts are noteworthy to highlight.

I. Processed biomass fuels making an impact

Wood and other sources of biomass are likely to continue to be a major source of domestic energy use going forward. Innovative and scalable improvements to fuel processing and the supply chain are needed to improve the fuels that are available.

Biomass is among the largest sources of energy worldwide, but burned in its raw form, often provides less heat control, harmful indoor and outdoor emissions, and reduced combustion efficiency. Processing biomass into forms such pellets or briquettes leads to a higher energy dense fuel source and also provides entrepreneurial opportunities along the fuel value chain. Sustainable Green Fuel Enterprise (SGFE), an Alliance Spark Fund grantee, has developed a type of clean energy that offers a more sustainable alternative for Cambodia's cooking fuel consumption and utilization. SGFE is manufacturing char-briquettes made of biomass waste using modern processing techniques and innovative technologies. The char-briquettes substitute the local traditional unsustainable charcoal, reaching over 400 households every month.

Another Spark grantee, Eco-Fuels Africa, has been training marginalized farmers in Uganda to turn locally sourced biomass waste into briquettes using simple, locally made kilns. Their clean-burning fuel briquettes (green charcoal) burn as well as charcoal from wood, burn longer and more cleanly and at lower cost than charcoal from wood, and can also be used in the same stoves Sub-Saharan Africans already use.

II. Biogas sees organic growth

Widespread dissemination of biogas digesters in developing countries began in the 1970s and has grown, for example, to over 31 million biogas plants in China and India alone, using mostly animal manure as the primary input for the biodigesters[1]. In other areas of the world, the use of biogas technology has waned; however, there will continue to be opportunities for domestic biogas use for household cooking needs, technology improvements, and a wider variety of organic inputs to feed the digesters. SimGas, a design and production company and Alliance Spark grantee, has developed two improved biogas systems for the east and southern African markets that convert manure and organic household waste into methane gas, which can be used for cooking and lighting.

III. Ethanol demand centuries in the making

Ethanol has been used as a fuel for nearly two centuries, primarily in the transportation sector and most often as a substitute for petroleum-based liquid fuel. With its many benefits ranging from decreased greenhouse gas (GHG) emissions and short-lived climate pollutants (SLCPs) and being derived from renewable sources, its use as a

[1] http://www.hedon.info/tiki-download_forum_attachment.php?attId=30

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Box 2: The Clean Fuels Story (cont.)

clean cooking fuel option has gained traction over time. The impact venture development partnership, CleanStar Ventures, is taking the lessons learned from their work in Mozambique where they launched a commercial-scale rollout of ethanol cooking solutions to low-income urban households to develop an ethanol stove with a refillable fuel cartridge, complementary household appliances that can use ethanol, and a fuel distribution process that leverages partnerships with multinational corporations. The overall goal of their work is to create a global distribution network for ethanol that layers on the oil and gas distribution network.These trends and efforts demonstrate that fuel interventions are making progress and many more opportunities are present as the Alliance looks towards more ways to support the scale-up for clean cooking solutions.

IV. LPG for cooking increasingly considered a scalable option

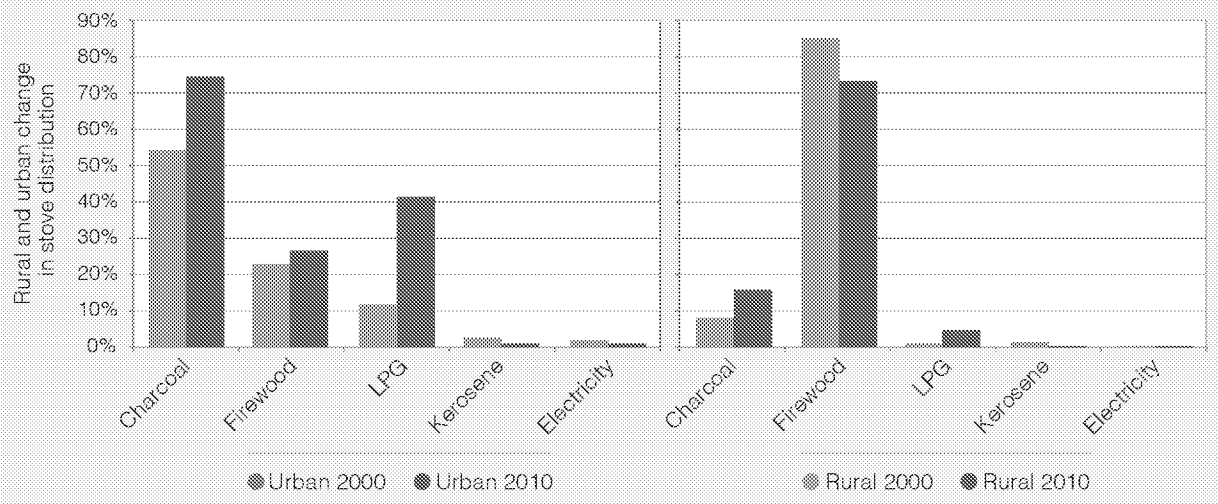
LPG, until recently, was not considered a scalable option for clean cooking for the base of the pyramid, due to supply, distribution, and cost constraints. Several countries and major private sector players are now committed to rapidly expanding access to LPG for the base of the pyramid over the next decade, however.

Case study 1: LPG in Ghana – Moving toward successful fuel switching and adoption

The LPG sector in Ghana has demonstrated tremendous resilience as government policies have waxed and waned since the 1980s. With rapid deforestation and environmental pollution resulting from widespread use of wood and charcoal, the government has been keen on promoting the use of LPG as a cleaner-burning fuel through a variety of national promotion programs, subsidies, and cylinder recirculation models. And while Ghana's current LPG market is still facing a number of challenges, the market is primed for an acceleration of investment and LPG supply that will create a sustainable and bankable LPG market. Trends show that the increase in household incomes in Ghana over the past decade has enabled a shift from woodfuels and kerosene to LPG for cooking.

The Alliance and its partners in the LPG community have been working with the Ghanaian government and practitioners to assess how to reform the underlying LPG market structure, evaluate the critical supply and demand drivers to achieve national LPG access and use, and develop a national plan to realize the government's national LPG goals.

Figure 11: Ghana Fuels Distribution Trends by Stove Fuel Type and Setting 2000-2010



Source: Population and Housing Census of Ghana, 2000 and 2010, Ghana Statistical Service.

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Box 2: The Clean Fuels Story (cont.)

Case study 2: LPG in Indonesia – Successful Fuel Switching

Strides in LPG adoption are not limited to just Alliance focus countries. In 2007, the Indonesian government initiated an energy program to replace kerosene usage by providing free starter packages to households and small- and medium-sized enterprises (SMEs) consisting of 3 kg cylinders, a stove set, and inital gas, while simultaneously reducing the government subsides to kerosene.

Less than six years after the program started, 54 million households and SMEs had received the LPG packages. Before the program was implemented, the majority of households (about 87.5%) relied on kerosene for household cooking, either on its own or in combination with other types of energy. After the program, the majority of households switched to LPG as a source for domestic cooking, increasing from 6.4% to 91.1%.[3]

[3] http://phdtree.org/pdf/32245436-energy-poverty-reduction-by-fuel-switching-impact-evaluation-of-the-lpg-conversion-program-in-indonesia/

of 83 country locations. Almost one in four survey respondents (103) directly employ or otherwise partner with another Alliance partner organization for some aspect of their business, demonstrating the extent of partners' interconnectedness across the value chain.

At both ends of the value chain, growth can be attributed to a larger response rate capturing both new and existing partners' activities – as well as a year-over-year increase in sector activities reported by existing businesses. For example, despite a large influx of new manufacturer responses, especially from China, the newly reported volumes did not see a proportional increase - indicating that many of the largest market participants were previously captured in 2012.

Standards and Testing

In 2013, 75% of all stove models were reported as tested. While many manufacturing organizations reported testing their products internally in order to guide product design and development, only slightly less than half (48%) of manufacturing and distribution organizations reported that an independent, third-party organization or testing center tested their stove.

Around 60% of organizations that responded to the detailed testing section in the survey are independent third-party testing centers. These testing centers reported operating in every geographic region (Figure 12) – a **significant increase in geographic coverage of testing services over 2012.**

This year, for the first time, the survey integrated information from the Alliance's Clean Cooking Catalog, a global database of cookstove and fuel performance information using key indicators such as stove features, specifications, emissions levels, efficiency, and safety from laboratory and field-testing. While 17% of stoves reported by partners had been submitted to the Catalog, fewer have made their testing results publicly available in the Catalog. Of the Catalog-reported stoves, 31% have provided testing details; meaning, overall, only 7% of total reported stoves in this year's report had submitted testing results to the Catalog.

Across all testing activities – which partners reported via the Catalog or otherwise – over half (61%) of tested stoves were submitted to the standard water boiling test (Figure 13 and 14). The kitchen performance test also continued to be well utilized in 2013. In 2013, safety testing, a relatively new protocol, was a significant fraction of testing occurrences. Several instances of durability testing, which has recently been developed into a standard protocol, were also reported.

This year was the first that the Alliance has tracked manufacturing and distribution by International Workshop Agreement (IWA) performance tiers. Performance on safety, efficiency, emissions and/or indoor emissions along the IWA spectrum was

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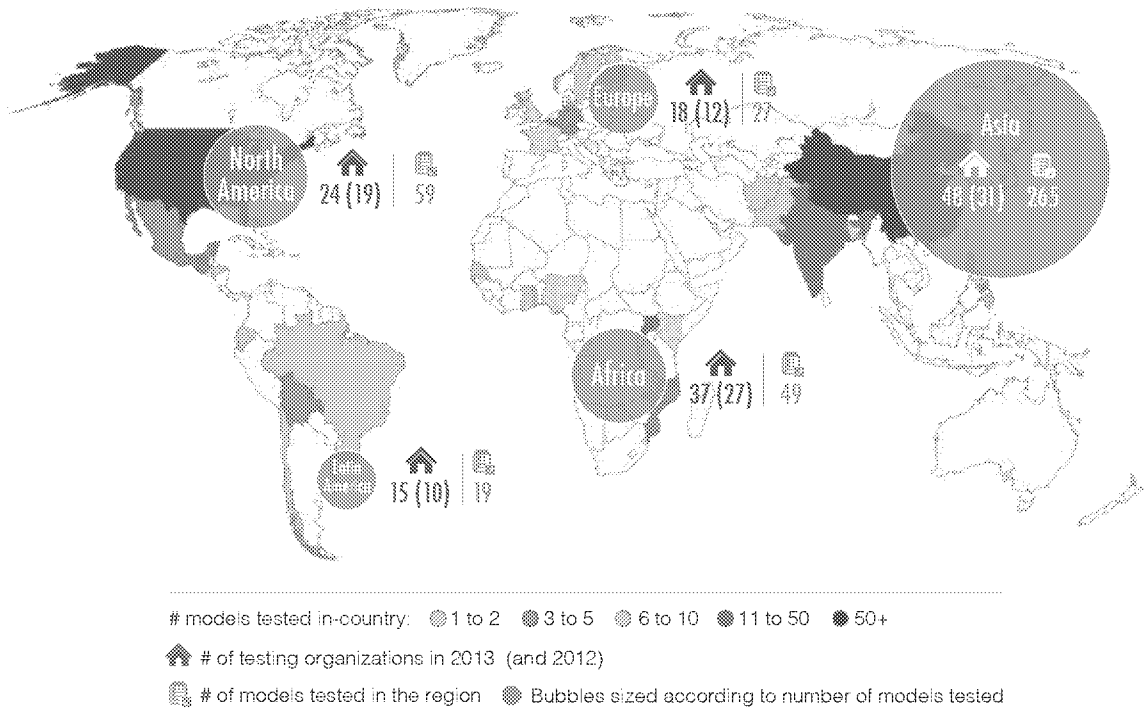
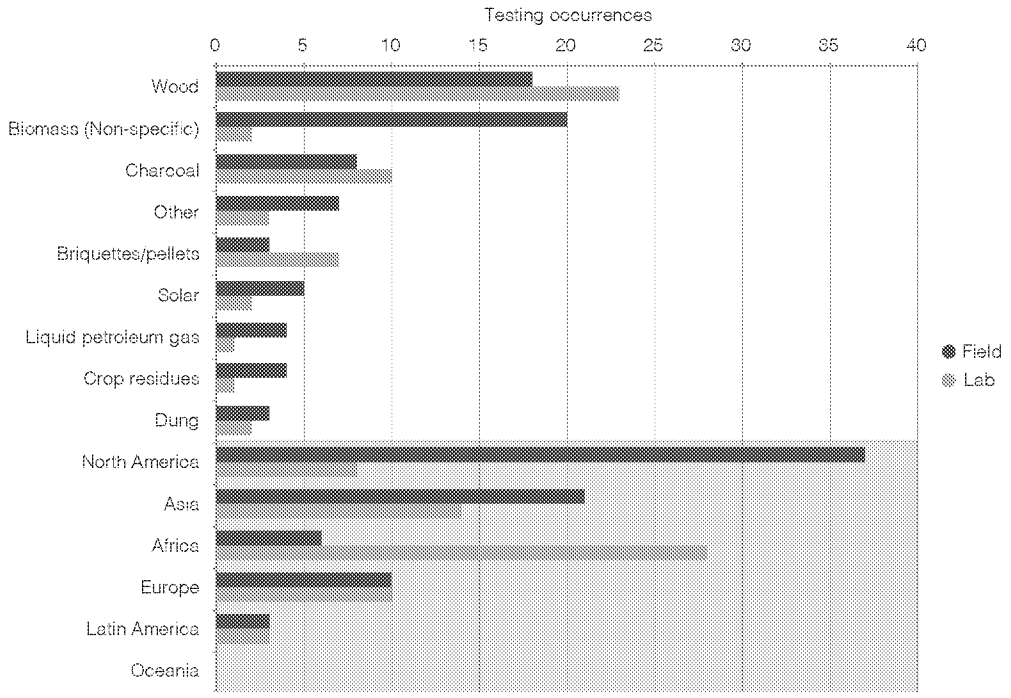
Figure 12: Regional and Country Distribution of Testing Activities by Manufacturers and Testing Organizations



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on responses from 419 unique stoves with locations, out of 437 unique stoves tracked.

Figure 13: Testing Occurrences by Stove Type and Testing Organizations' Headquarters (Count)



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 263 observations.

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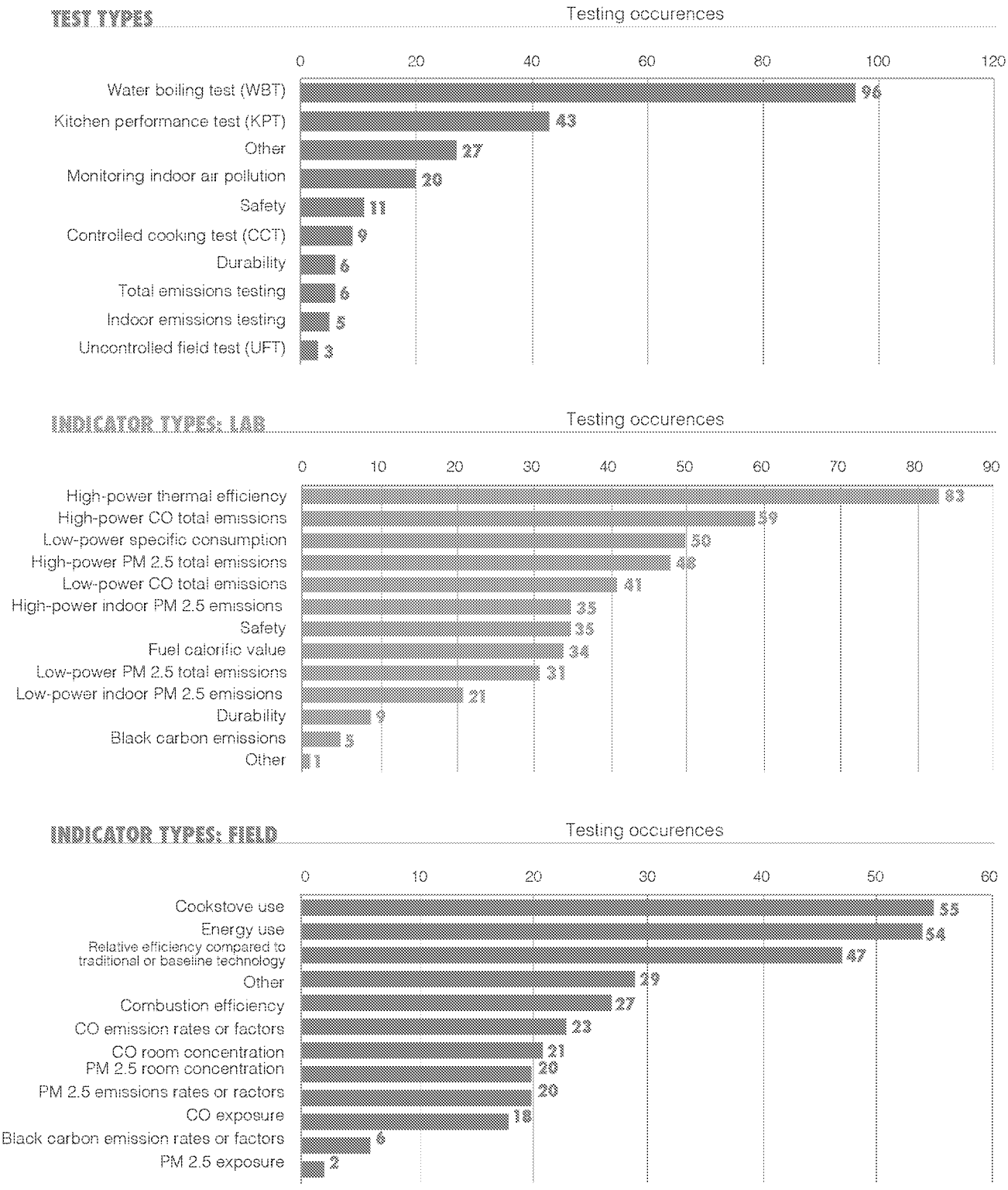
Figure 14: Occurrences of Testing by Test and Indicator Types



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 1000 observations.

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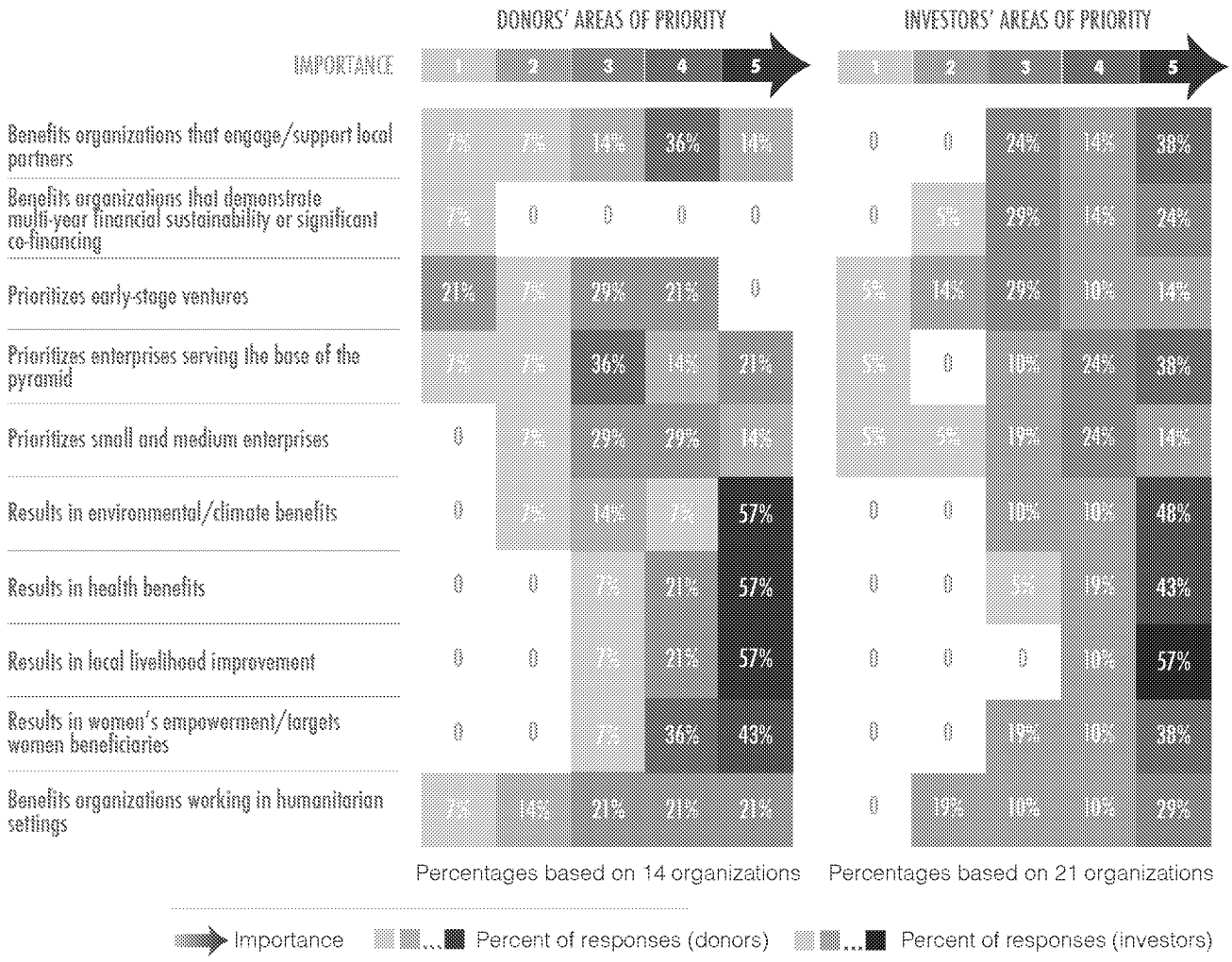
Box 3: Progressing Partnership: The International Organization for Standardization (ISO)

All stakeholders benefit from a common terminology for communicating, understanding, and improving stove performance and adoption. To accomplish this, the Alliance partnered with the International Organization for Standardization (ISO), a network of 164 national standards bodies, to develop international stove standards.

Building from earlier progress, ISO Technical Committee 285 was approved and launched in July 2013. The TC 285 includes dozens of experts drawn from the 34 participating and observing countries.

At the first plenary meeting in February 2014, the ISO TC 285 formed four Working Groups and two Task Groups to develop standards and perform tasks for the following topics: Harmonized Laboratory Protocols, Conceptual Framework for Testing, Guidelines for Field Testing, Social Impacts, Fuels, and Communications. Over the next year, these groups will be considering the technical details of the standards and guidelines, which will then be submitted to the full committee for comment and voting. The working and task groups will convene in October 2014 in Guatemala to discuss progress to date and finalize their recommendations.

Figure 15: Ranked Priority Areas for Donors and Investors



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.

Notes: Based on 35 organization responses.

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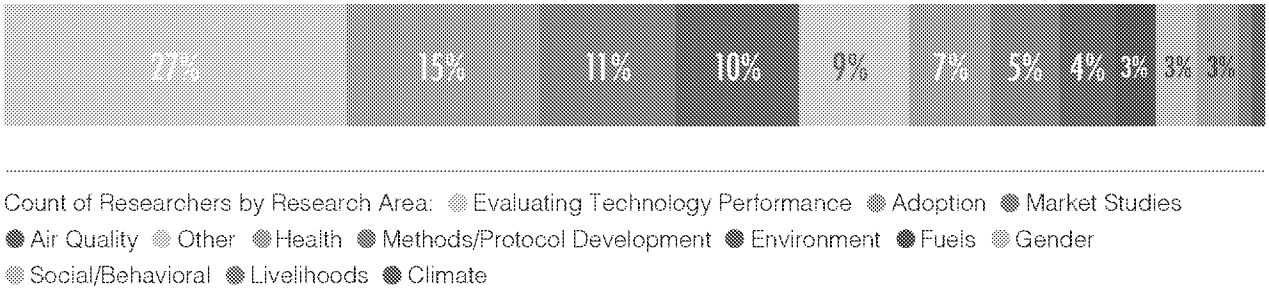
Figure 16. Percent Share of Researchers by Research Area



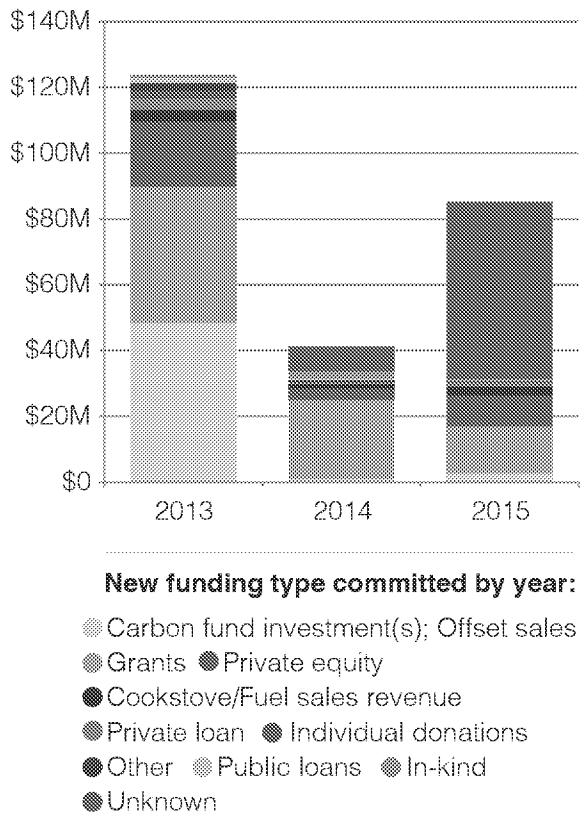
Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 92 organization responses.

reported for 0.5 million stoves. It is clear, however, that a vast majority of the available performance data remains focused on efficiency. With such a small number of partners providing publicly reported stove performance data, it is difficult to provide accurate estimates of the number of stoves by performance tier at this time.

Research and Evaluation

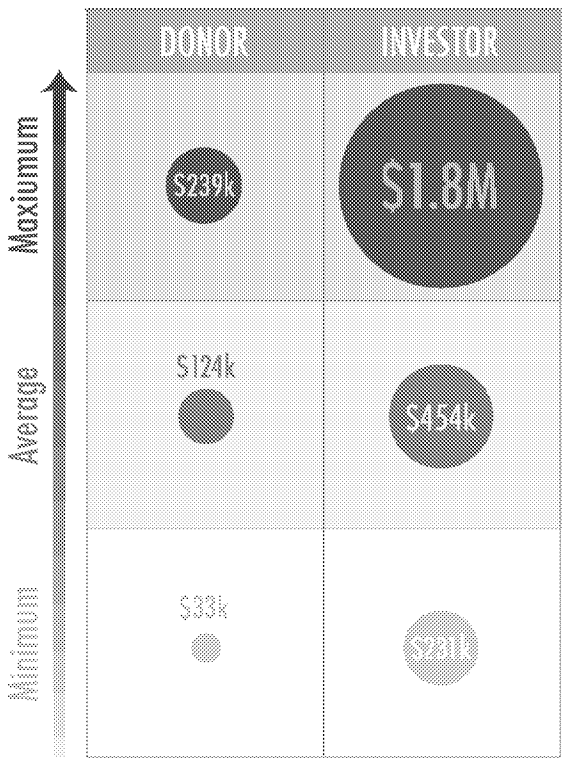
While testing ensures that clean stoves and fuels have the potential to perform as expected, research and evaluation helps to inform future designs, improve current practices, identify and mitigate barriers, and elevate best practices.

Figure 17: Value of New Funding Committed by Funding Type



Source: 2013 Results Report, Global Alliance for Clean Cookstoves

Figure 18: Average Investment Size, Donors, and Investors



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 35 organization responses

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In 2013, research topics were decidedly focused on end users, with over half (53%) of all research focused on evaluating technology performance, adoption, and market studies (Figure 15). Health was the next-highest reported research topic, with air quality and health-related research making up 17% of all research topics. It should be noted, however, that the number of researchers focused on each area is not necessarily proportional to the financial and human resources devoted to each topic. We know, for example, that applied health research is generally far more resource intensive than lab- or market-based research.

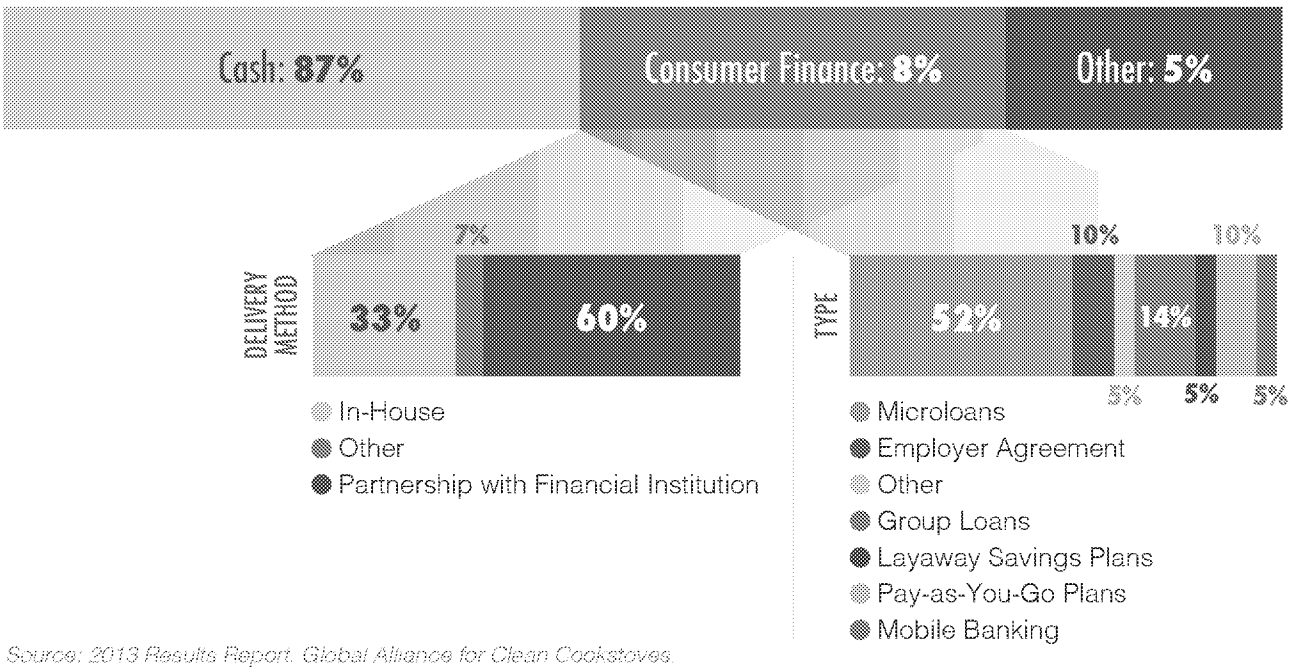
Over **one-third of partners said they measure and report on the social and environmental impacts of their work**, while over half of respondents utilize impact data for internal purposes – including marketing to investors, and stove and fuels end users – their most commonly cited motivation was to respond to donor or investor requirements. Indeed, as can be seen in Figure 15, Alliance partners that identified as donors or investors were keen to prioritize funding to organizations that could demonstrate measurable results – particularly demonstrable benefits to the environment, climate, health, and livelihoods. The largest proportion of donors and investors (57%) ranked these criteria as their key decision point, followed by consideration of organizations that support women's empowerment or closely engage and/or support local partners.

Finance and Carbon Markets

Partners reported $240M in new funding commitments made to their organizations or enterprises in 2013, including commitments disbursed in 2013 ($113M), as well as commitments made in 2013 for 2014 ($41M) and 2015 ($85M). Behind carbon offset sales in 2013 ($45M), government grants were the dominant source of funding in each year ($56M total), followed by private equity investment ($26M) (Figure 17).

While private equity investment made up a smaller proportion of the previous years' financial support, Figure 18 illustrates that at the low, average, and high end of award sizes, single private investments injected more capital into recipient businesses than did the typical donor award. Most often – but not always – private equity investments were reported by organizations engaged in stoves and fuels design, production, and distribution, while grant-based resources were targeted toward organizations working beyond the sector's direct value chain to support research and evaluation, humanitarian goals, training, and other supporting mechanisms.

Figure 19: Primary Methods of Stove Payment, Consumer Finance Type, and Delivery Method



Source: 2013 Results Report, Global Alliance for Clean Cookstoves.
Notes: Based on 267 observations.

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In the 2013-2015 time frame, the revenues from stove and fuel sales contributed or are expected to contribute approximately 10% of all funds flowing into the sector, a total of $14M, including $3M in in-kind payments. Last year, the vast majority of this value was contributed by end users in the form of cash payments for stoves and fuels, while another 8% of purchases were financed by a variety of consumer finance vehicles including microloans, group lending, and employer agreements (Figure 19).

At least 43% of new funding reported for 2013 was attributed to carbon offset sales ($45M) or carbon fund investments ($3.6M). This includes a commitment from Sweden's Energy Agency to pay above-average prices for offsets that comply with Europe's Emissions Trading System. A full $35M of this value flowed from the sale of 4.5 million carbon offsets (each representing one tonne of carbon reduced) from projects in Africa.

Altogether, clean cookstove distribution projects earned and sold 6.3 million carbon offsets in 2013, down 63% from 2012's 16.9 million, despite a comparable survey response rate. 62% of these offsets were certified to the Gold Standard (seeing an average offset price of $12/tonne). Another 38% were certified to UN Clean Development Mechanism methodologies. Across all markets and certification types, the sale of carbon offsets drove the distribution of 1 million stoves to almost as many households (955,813).

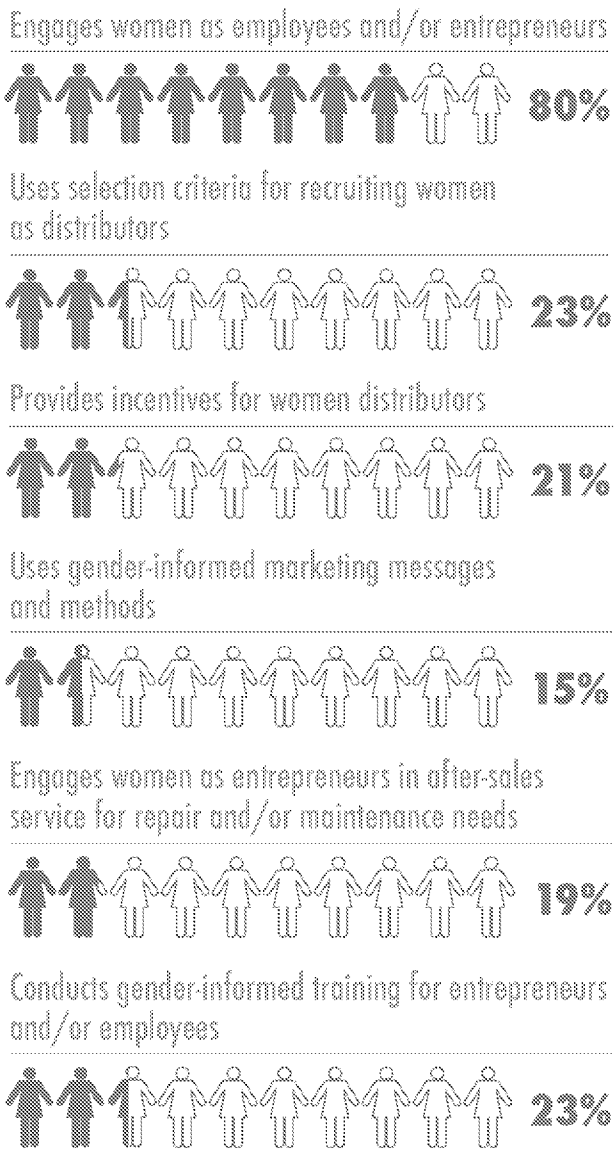
Gender

Almost all cookstove and fuel organizations are aware that women, as the primary users of cookstoves, comprise their largest clientele. Nearly two-thirds of respondents targeted women in distribution activities, for example.

Although many of respondents to this year's survey reported that they employed women directly or engaged with them as entrepreneurs, there was less of an emphasis on engaging women in manufacturing/production, finance or after-sales service activities: only one-third of organizations reported those as areas of focus.

While 80% of partner organizations reported employing women, with 10% of those holding a leadership or management position, only 23% reported actively using selection criteria to recruit women.

Figure 20: Gender Inclusion in Stove Distribution



Source: 2013 Results Report, Global Alliance for Clean Cookstoves

Notes: Based on 247 observations.

At least 77% of partners reported having a gender-focused strategy – be it though gender-topical meetings, gender training, or some other form of strategy. Other gender-inclusive practices are less wide-spread (see Figure 20).

Most organizations (35%) cited funding as a key barrier to further implementation. Other commonly cited issues include internal capacity, capacity of partners, ability to scale, and sustainability of such operations.

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3. Focus Country Views

As part of its strategy to accelerate clean stoves and fuels adoption in 100 million households by 2020, the Alliance prioritized eight "focus" countries, namely Bangladesh, China, Ghana, Guatemala, India, Kenya, Nigeria, and Uganda for intensive engagement during Phase 1 of its efforts based on a data-driven and consultative process of evaluating potential impact, scalability, opportunity to test innovative business models, ability to leverage other resources, and greatest need. A wide range of complementary market development efforts are being undertaken in each of these countries, including collecting and publishing market information, working with governments to create favorable regulatory and policy environments, and enhancing the clean cooking value-chain through capacity building and improved access to finance. It is through the partners in these countries, and the regional market managers who support them that the Alliance's differentiated efforts, successes and lessons learned can be readily seen. This section explores these experiences in-depth, accompanied by country performance data that illustrates early outcomes and potential pathways to progress.

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A View From Bangladesh

BY THE NUMBERS*

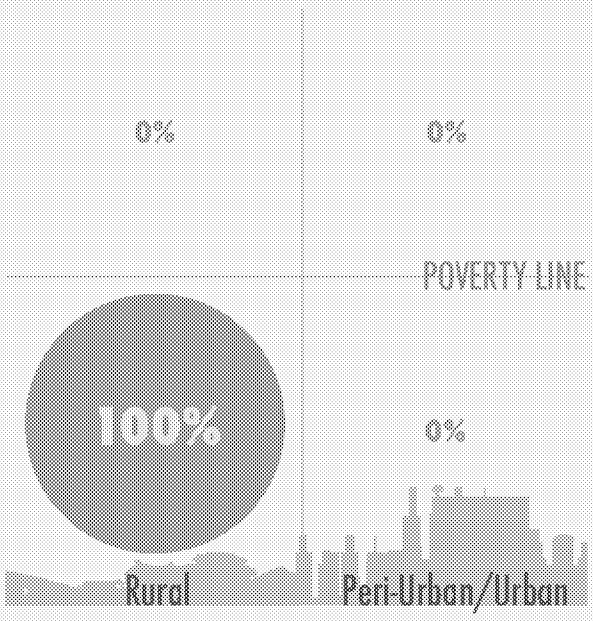
695k
Stoves manufactured

690k
Stoves distributed

AVERAGE RETAIL PRICE: $9

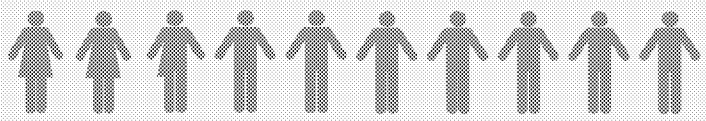
99% OF STOVES TESTED**

LOCATION



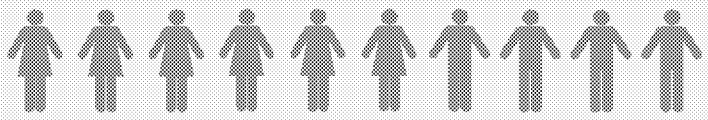
EMPLOYMENT

Employees:
670



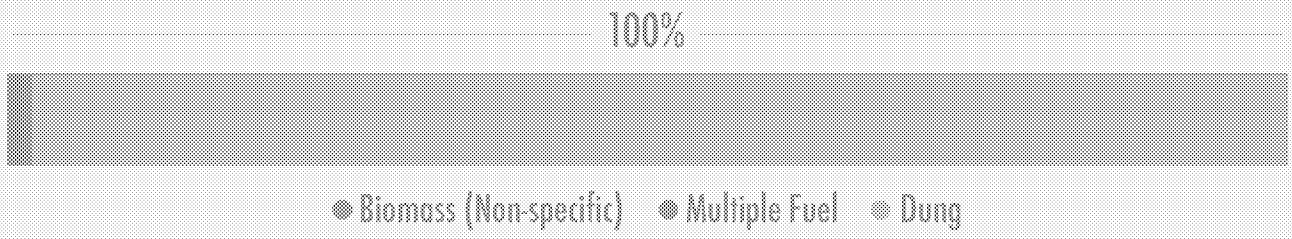
24% women

Microentrepreneurs:
13,422



63% women

STOVE FUEL TYPES



* Data on clean fuels manufactured and distributed not available at this time due to limited responses.

** Includes internal and third-party testing.

The government of Bangladesh has been researching, developing, and supplying improved cookstoves since the 1980s – largely motivated by the potential health benefits offered by these stoves. The challenge now is to jump-start a private-sector supply chain that better connects buyers to the market.

On the demand side, the first step is to let people know why they should pay for something they are used to getting subsidized or for free, says Asna Towfiq, the Alliance's Regional Markets Manager for Bangladesh.

"The problem is that people here look at cookstoves the way they look at contraceptives," she says. *"They see it as a product the government and NGOs promote rather than as a commodity the private sector should get involved in."* In many cases, these stoves come from large international or non-profit organizational projects. Indeed, all of the financing reported by partners in Bangladesh for 2013 stems from some form of grant – be it from a government, development multilateral, or foundation.

And the potential market is still largely untouched, with the almost 700,000 manufactured and distributed stoves reported representing only a fraction of the estimated size of the Bangladeshi market. The organizations currently supplying stoves are aware of the need for expanding the market-based approach to scale up, since only so much can be accomplished through grants.

"Bangladesh needs domestic manufacturers, because imports can't fill the gap," Towfiq says, explaining that Bangladeshis, unlike people in many other countries, use fixed stoves unique to the country rather than portable ones in other countries. She hopes to see offshore manufacturers setting up in Bangladesh itself – a development that would help promote knowledge-sharing between Bangladesh and the rest of the world.

"We're hoping that some foreign manufacturers will create local stove factories here," she says. *"We're educating people in other countries about the growing cookstove market happening in Bangladesh."* The Alliance aims to start by boosting imports, in part by advocating for a reduction in the 60% tariff that currently deters manufacturers abroad. Even with the tariff, however, imports can be made viable by importing just the combustion chambers and then building the stove around them domestically.

Bangladesh's Country Action Plan (CAP) called for the creation of a private-public partnership, which will act as a conduit between the cookstove sector and the governmental agencies that impact it. Next steps involve a nation-wide awareness campaign through a government initiative called the Household Energy Platform (HEP), with relevant public and private actor support.

While this is not the first time for such a campaign, the focus has shifted: the new campaign will be focused on the fuel efficiency and potential for long-term cost savings of an improved stove, whereas past campaigns have focused on indoor pollution and health issues alone, without considering the economic constraits that face many poor Bangladeshis.

"When you're talking to extremely poor people, they can't really care about health benefits" Towfiq says. *"At some point, it comes down to the basic need to cook."* To make stoves more affordable for this segment, the Alliance has recommended financing programs built in part on carbon finance to help lower costs.

For the emerging middle class, the Alliance has proposed a campaign that emphasizes prestige over health. For this customer segment, *"the idea is to make clean cookstoves something people aspire to,"* Towfiq says. *"It's got to be something they want, rather than something they need."*

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A View From China

BY THE NUMBERS*

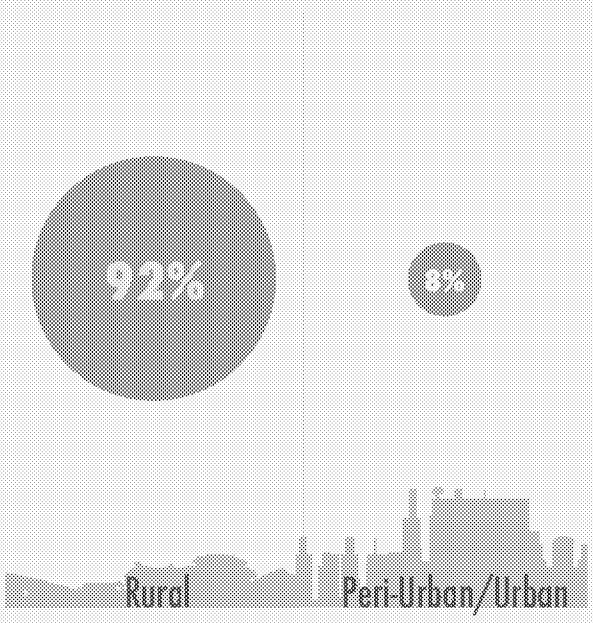
7.8M
Stoves manufactured

6.3M
Stoves distributed

AVERAGE RETAIL PRICE: **$234**

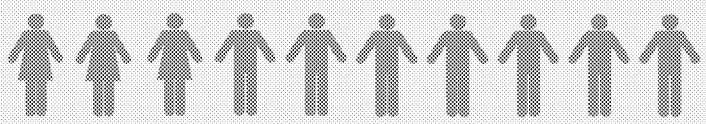
100% OF STOVES TESTED**

LOCATION



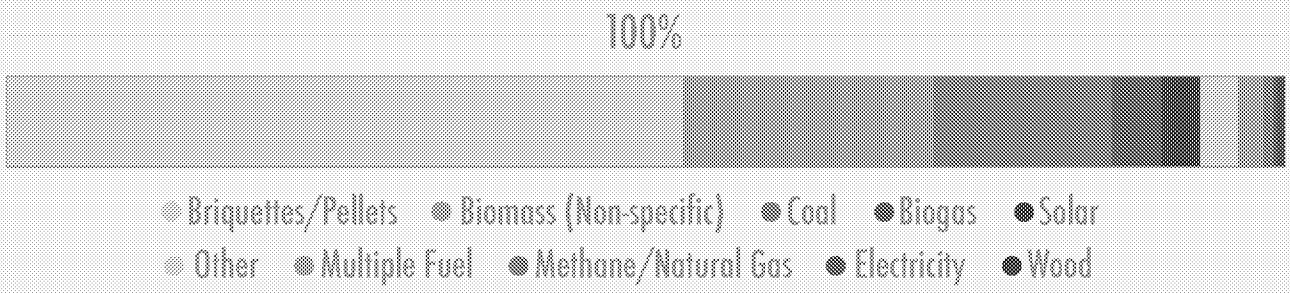
EMPLOYMENT

Employees:
8,064



28% women

STOVE FUEL TYPES



* Data on clean fuels manufactured and distributed not available at this time due to limited responses.

** Includes internal and third-party testing.

When Jichong Wu joined the Alliance in late 2012, he assumed he would have a hard time persuading the Chinese government to support a market-based initiative for distributing clean cookstoves as China's improved stove programs have been historically heavily subsidized. But then he sat down across from the Ministry of Agriculture officials who had overseen the government's last big clean cookstove push in the 1980s-1990s.

"It was actually a smooth discussion," he says. *"They not only agreed with me – they told me the government has already started on that transition path."* Specifically, officials from the Ministry of Agriculture told him they had concluded from past experience that a fully subsidized cookstove program would not work.

"When you gave stoves away for free, people stopped using them at some point," Wu explained. *"To ensure actual adoption of more efficient stoves, the government has learned they have to ask the end user to pay something – even if it's only one third of the cost – because otherwise they're not invested."*

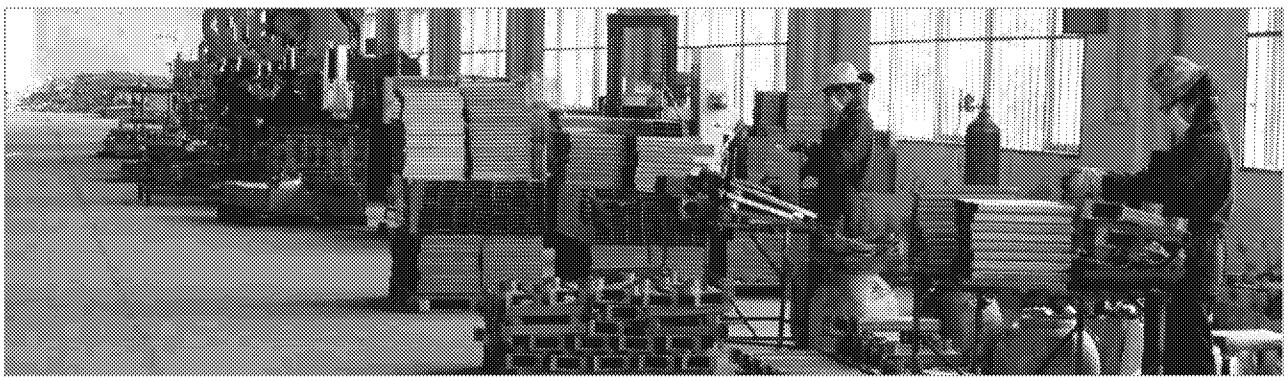
He then found the manufacturers, too, were in favor of the market-based approach. *"Our market research team interviewed two manufacturers during a field visit for a national study – Liangqi, in Chongqing City, and Huabao, in Hubei Province – and asked what they thought of the government procurement or subsidy program,"* he says. *"I expected them to be all for subsidies, because they provided a guaranteed buyer, but both of them said they would rather shift away from a subsidy program because they realized this was not a healthy market."*

This confidence may come from several successful distribution efforts that currently rely on a holistic quality product instead of on initial subsidies. Hebaiyi Bioenergy Technology Development, a company based in Liaoning, has seen success through meeting with environmentally conscious village leaders and using word of mouth to increase distribution to nearby villages. Mr. Tong, Sales Manager, explained that while the leaders help the company get their foot in the door, *"Quality after-sale services is key to our business too."*

With the backing of both government and industry, the Alliance teamed up with the Ministry of Agriculture on a year-long study of the market, and now they are embarking on a three-year pilot program from 2015 through 2017 that will test the findings of the study and mobilize actions to spur the adoption of eight million improved stoves. *"The ultimate goal of these efforts is to help China launch a new national clean stove program,"* says Wu.

On the international front, he also sees an opportunity for China, as an exporter of cookstoves, in South-South technology transfers and best practice sharing with other developing countries. Already, 14% of the reported stoves manufactured last year in China, and tracked through to distribution, were exported. However, for this to increase, companies need to value research and development (R&D) like Xunda Science and Technology Group. With heavy emphasis on R&D, Xunda has sold their products not only across countries in the "Global South," including Bangladesh, Guatemala, and India, but also to the United States and several European countries.

Xunda is not the only Chinese manufacturer interested in exporting clean cookstoves. A delegation from the China Alliance for Clean Stoves (CACS), led by Wu, visited Uganda in 2013 to gain better insight into the East African market, including its trade and investment policies, and to explore partnerships with local manufacturers and distributors.



ED_005941_00000100-00027

A View From Ghana

BY THE NUMBERS*

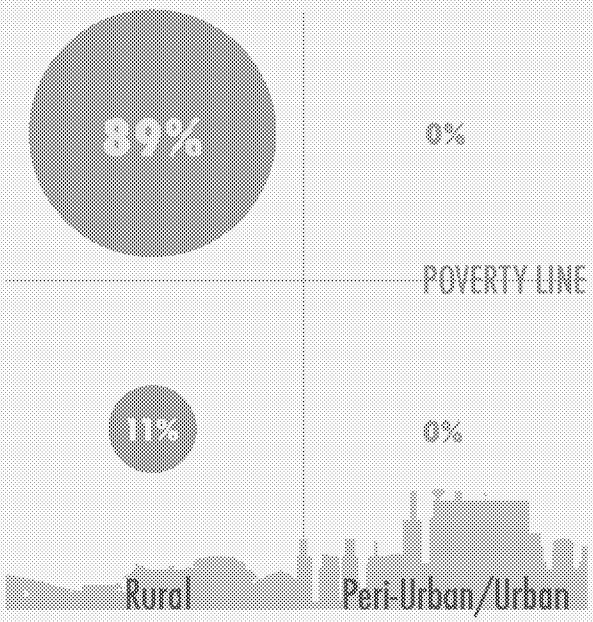
406k
Stoves manufactured

414k
Stoves distributed

AVERAGE RETAIL PRICE: $16

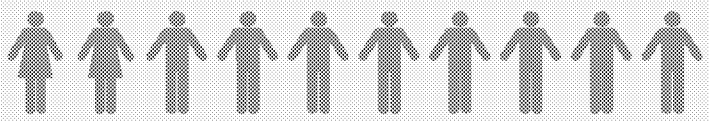
98% OF STOVES TESTED**

LOCATION



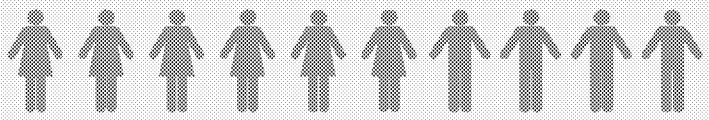
EMPLOYMENT

Employees:
107



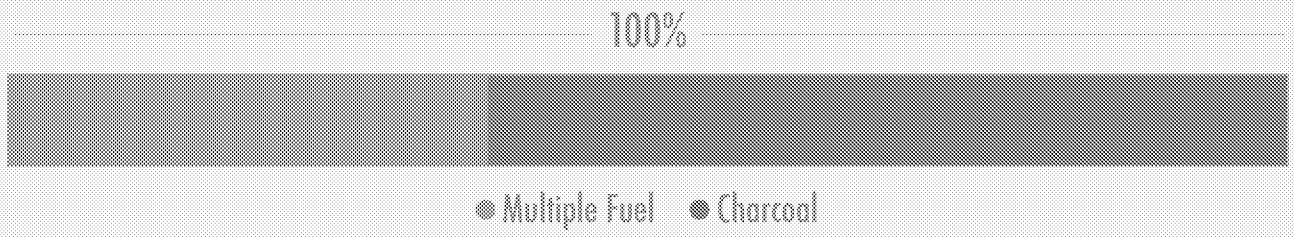
19% women

Microentrepreneurs:
1,140



57% women

STOVE FUEL TYPES



* Data on clean fuels manufactured and distributed not available at this time due to limited responses.

** Includes internal and third-party testing.

More than 80% of Ghanaian households cook with wood or charcoal, and the sector is well positioned and committed to scaling up adoption of cleaner biomass stoves and cleaner fuels, like LPG.

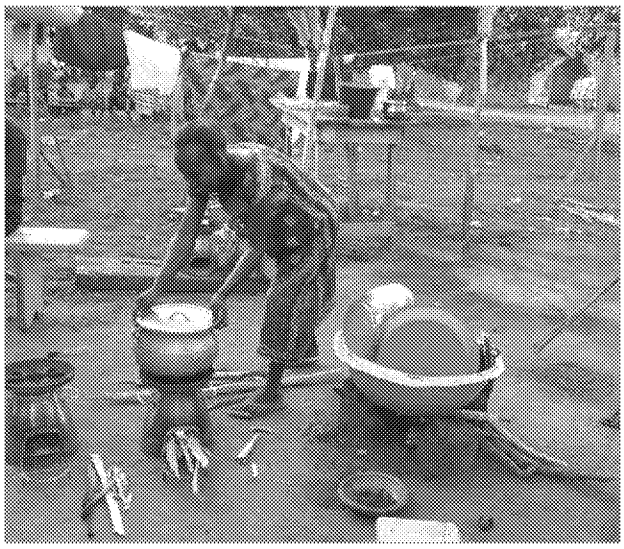
In fact, the government has committed to ensuring half of solid fuel-using households gain access to LPG by 2020. One way the Alliance intends to help ratchet up the use of LPG stoves is by facilitating a "Coca-Cola model" of distribution: instead of expecting people to refill empty cylinders themselves, distributors will start swapping empty cylinders for full ones – saving people time, trouble, and money.

The Alliance spent much of 2013 helping cookstove manufacturers here to strengthen their businesses. It is a process that is designed to attract investors, and market manager Kwesi Baffour Sarpong says five companies could be "investor-ready" within a year. Sarpong estimates that this effort has already boosted production to 900,000 stoves in 2014, up from 406,000 reported in 2013.

This increased supply will be crucial as the Alliance launches a nationwide awareness campaign in January 2015. It is a campaign that Arijit Basu believes will generate greater demand. He is the Global Alliance's Regional Director for Market Development in Africa and Asia, and he says Ghana is the only country where clean cookstoves may enjoy a price advantage even before you factor in the fuel savings.

"One challenge we generally face in the countryside is that rural people tend not to buy clean cookstoves because the wood is free, so efficiency doesn't matter," he says. *"But in Ghana, there is an economic incentive because it's the only country where the traditional stove is double the price compared to the improved cookstove, but people just don't know it."*

Last year's reported average price of $16.07 remains affordable. That could be good news for local producers, because some imported stoves may not be optimal for making banku, a dumpling-like bread made from either pounded cassava or fermented corn meal. Like the ugali of Kenya, banku forms a thick paste that must be stirred as it cooks – and stirring any meaningful quantity requires big pots that sit on low-lying stoves. On top of that, says Sarpong, most restaurants make their own traditional staples, and that means the country is dotted with massive traditional stoves that could be ten times the size of a typical household model.



"This overlap between commercial and home stoves is unique to Ghana, and you have to factor that into the investment needs," he says. *"Otherwise, you'll have a shortfall."*

Sarpong joined the Alliance in July 2013 and immediately found two motifs that have been playing out across the sector: "fragmentation" and "good on the surface".

"People in Ghana tend to be comfortable working by themselves and not in groups," he says. *"For that reason, the local companies and the local alliance looked good on the surface, but internally, things weren't as properly structured as needed."*

He also found that: manufacturers who donors found shabby on the surface often made first-rate products. There is now a testing center in Accra to ensure stoves meet the standards of ISO 285.

"We picked seven companies who had previously had subpar applications, and then we came in with third-party consultants for on-the-ground due diligence," he explains. *"After that, the donors said they were willing to fund companies they wouldn't have funded without having done the due diligence first."*

So he turned the process around and began visiting manufacturers in person before accepting their applications – a reality-based approach that helped win the support of Foreign Minister Hanna Tetteh, who is an active member of the Alliance's Leadership Council – helping to ensure continued government support.

ED_005941_00000100-00029

A View From Guatemala

BY THE NUMBERS*

9.8k
Stoves manufactured

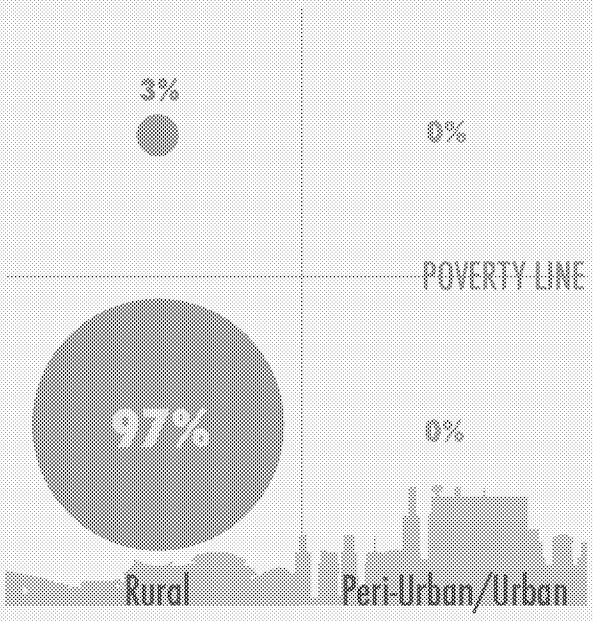
1.5M+
Fuels manufactured (kg)

8.2k
Stoves distributed

AVERAGE RETAIL PRICE: $106

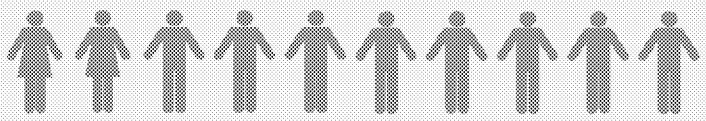
100% OF STOVES TESTED**

LOCATION



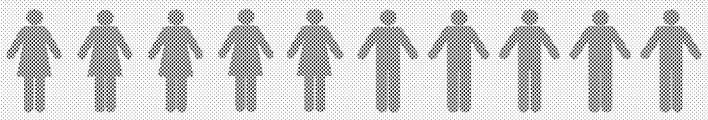
EMPLOYMENT

Employees:
176



18% women

Microentrepreneurs:
39



49% women

* Data on clean fuels manufactured and distributed not available at this time due to limited responses.

** Includes internal and third-party testing.

Stove fuel type data not available for this country at this time, due to limited responses about stove characteristics.

In 2012, President Otto Pérez Molina and his cabinet participated in a ground-breaking and bridge-building initiative called Despertemos (Awakening), which invited 1500 government officials to live among Guatemala's poor and rural communities. That's when he and his Commissioner for Competitiveness and Investment, Juan Carlos Paiz, first realized the impact that something as simple as clean cooking could have on their existing priorities of hunger and malnutrition, not to mention additional health, environment, and livelihood benefits.

That same year, the Alliance commissioned a market assessment of the Guatemalan clean cooking sector, and in 2013 Paiz, a member of the Alliance's Advisory Council, was one of 150 local participants invited to validate and discuss the study. Impressed with what he saw, he introduced Alliance Executive Director Radha Muthiah to President Molina, who became the first sitting president of any country to join the Alliance's Leadership Council.

Together, they put clean cookstoves and fuels on the national agenda for the first time, launching an inter-ministerial working group that will soon become a legal entity within the government structure and drawing nearly 30 manufacturers, implementers, and importers into the Guatemalan Cluster for Improved Cookstoves and Clean Fuels.

The Cluster soon began organizing monthly meetings and periodic exhibitions around the country while reinforcing lines of communication with the government to keep all the players coordinated. While the current number of stoves tracked in 2013 remains under 10,000 (less than all other focus countries), 2013 represents the beginning of larger distribution programs.

In November 2013, the Inter-Institutional Wood and Energy Roundtable set a goal of disseminating 650,000 cookstoves over the next 10 years, and the government is stepping up to deliver under the leadership of the Ministry of Energy and Mines.

The Alliance harnessed this energy to involve more than 100 national and international stakeholders in the creation of the Country Action Plan, which was released in May 2014 and outlines a course of action with related international institutions and initiatives including the World Bank's Central America Clean Cooking Initiative, the UN's Sustainable Energy for All, and the combined Low-Emissions Development Strategy of the US Agency for International Development and the Inter-American Development Bank.

Guatemala is the Alliance's newest focus country and the first in Latin America. That makes it the proving ground for efforts to distribute stoves that are larger and more expensive than those in other parts of the world, because stoves here range in price from around $30 to over $200 dollars – averaging at $106 dollars – mostly because of the broad surface or plancha (griddle) needed for making tortillas.

"It's not always that the end user can't pay for a stove, but they may not be able to pay for it up front," says the Alliance's Chloe Shields, who has worked closely with Guatemalan partners over the last year. *"There are challenges of credit, and a history of donation-based models have filled part of that void."*

Guatemalan partners are receptive to the Alliance's market-based approach, which can work to grow both business and impact as more base-of-the-pyramid consumers gain and sustain access to clean cooking technologies. To address the up-front cost barrier, several NGOs have expressed an interest in shifting to a co-payment model, where donations can cover most of the cost of the stove, but families would still pay part of it. This establishes a connection between the buyer and the supplier, and also generates the sense of ownership. The change may have already started, as responses from Guatemalan partners in 2013 indicate that the majority (84%) of financing for enterprises stemmed from stoves and fuels revenue.

ED_005941_00000100-00031

A View From India

BY THE NUMBERS

90k
Stoves manufactured

4.8M
Fuels manufactured (kg)

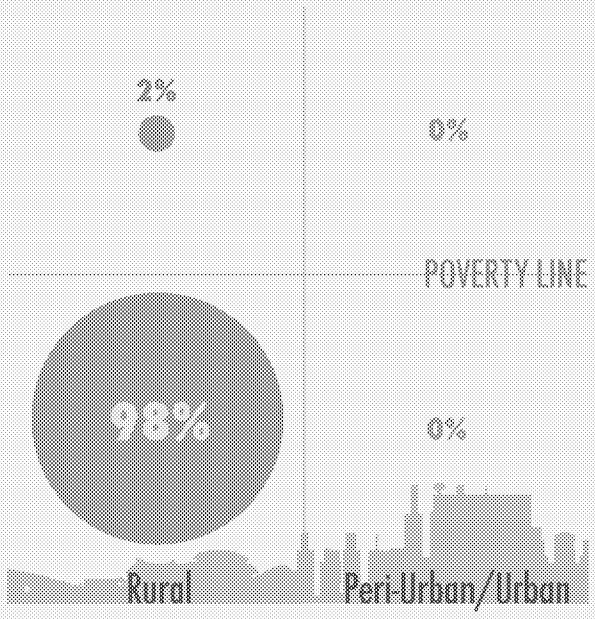
159k
Stoves distributed

4.8M
Fuels distributed (kg)

AVERAGE RETAIL PRICE: $25

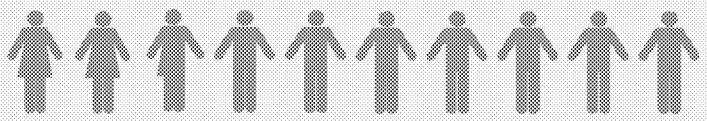
94% OF STOVES TESTED*

LOCATION



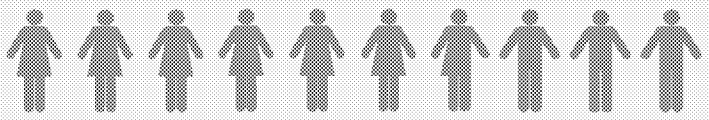
EMPLOYMENT

Employees:
252



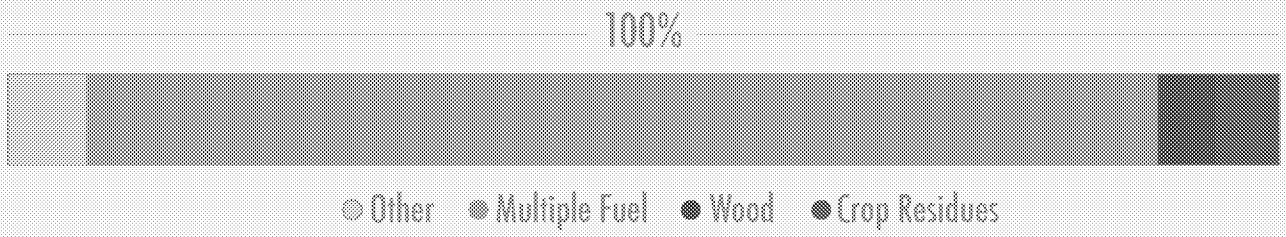
25% women

Microentrepreneurs:
1,606



66% women

STOVE FUEL TYPES



* Includes internal and third-party testing.

India's business community is primed to scale up solutions such as efficient use of biomass and the extension of clean fuel supply chains for LPG and induction stoves to rural areas, according to Sudha Setty, the Alliance's India Country Representative.

Setty emphasizes that India's clean cookstoves sector *"will have to bring about behavior changes if it's to be successful."* Thus, the Alliance is concentrating on two population segments – poorer urbanites and rural people with little or no access to electricity – with a likely emphasis on LPG, briquettes, and, for those with electricity, induction stoves.

The overall energy efficiency of induction stoves is still being assessed, but these modern appliances generate notably less household pollution than the wood-burning variety. They are also popular among India's emerging middle class, where demand is driven by both status and marketing.

Induction stoves are particularly relevant to India since 75% of households have some access to electricity which is often subsidized. With the ability to heat quickly and evenly, alongside programmable temperature controls, induction cookstoves' estimated market size has already doubled to 6-7 million units sold in 2012-2013.

The current biomass stove data represented in this year's report falls short of capturing the momentum of India's manufacturing and distribution activities – partly because reporting did not include figures from state-level biomass stove programs that historically distribute tens of thousands of improved stoves annually or from the large number of local artisans producing improved stoves for local consumption. The Alliance is in discussion with central ministries and states to support pilot stove programs focused on cleaner, more efficient stoves and fuels.

Similarly, while there is great momentum surrounding the adoption of clean fuels, results data only captured a fraction of in-country activities (4.7 million kg manufactured and distributed). Another study found a steady year-on-year increase in LPG sales, driven in part by India's Vision 2015 strategy to release 55 million new LPG connections by 2015 and achieve minimum 75% penetration of LPG across all of India, including rural areas.

India's interest in LPG began in 1955, when Burma Shell started marketing LPG in Mumbai, and it has since then become the most popular clean cooking fuel in India. Today, LPG production in India accounts for 63% of the clean fuels distributed or manufactured. Part of its success can be attributed to the cultural prestige of owning an LPG stove and their ease of use.

"An improved biomass stove is smaller than what people are used to, and they are uncertain about its usage and effectiveness," says Setty. *"But if you give a household an LPG stove, they are excited to use it because it is an aspirational product."*

Ultimately, Setty says that India's sheer size and diversity influence how the market will unfold. *"India is definitely not a one-size-fits-all place."* Different states and regions eat and cook food differently, requiring various stove technologies and fuels. In addition, awareness-raising messages must be tailored to the many local languages.

On the sales side, the local language barrier can be partly overcome by India's large share of village-level micro-entrepreneurs active in the sector. Additionally, 66% of active micro-entrepreneurs are women, who can have a gender advantage in helping educate women at home about benefits.

To further India's adoption of clean stoves and fuels, the Alliance will launch advocacy and awareness campaigns in phase two, which is set to begin in January of next year and run until December 2017.

ED_005941_00000100-00033

A View From Kenya

BY THE NUMBERS

612k
Stoves manufactured

577k
Fuels manufactured (kg)

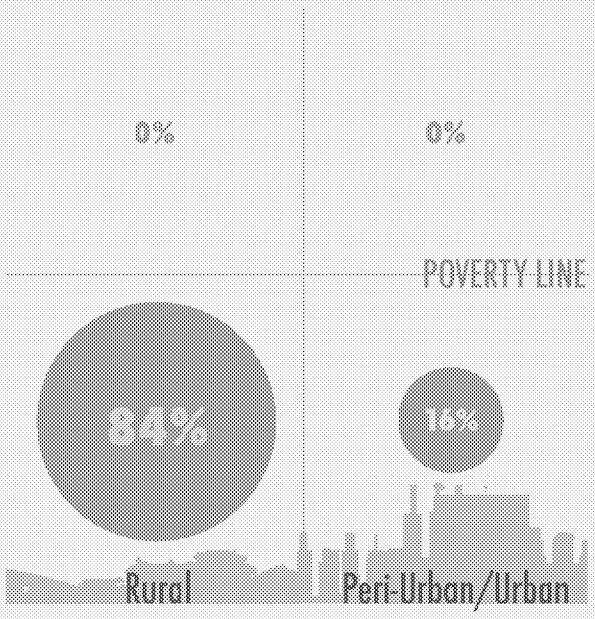
1.0M
Stoves distributed

1.9M
Fuels distributed (kg)

AVERAGE RETAIL PRICE: $24

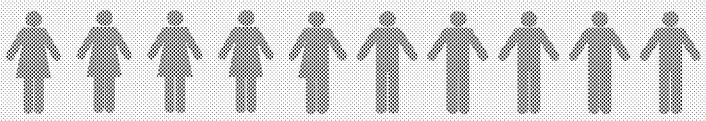
54% OF STOVES TESTED*

LOCATION



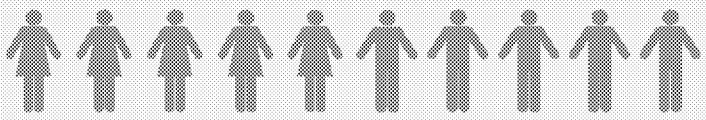
EMPLOYMENT

Employees:
959



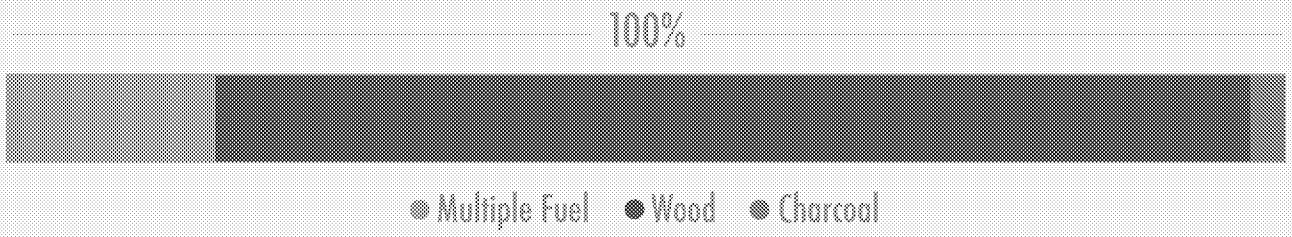
46% women

Microentrepreneurs:
1,675



47% women

STOVE FUEL TYPES



* Includes internal and third-party testing.

The improved cookstove sector in Kenya started in the early 1980s with the Kenya Ceramic Jiko (KCJ), and today about half the homes in Nairobi and Mombasa use this relatively efficient charcoal burning stove to make everything from rice to chapatti – a flatbread that takes hours to prepare over traditional smoke-belching stoves. But while the stove's a winner in cities, where people buy their own charcoal, it has been less successful in the countryside, where wood is free and three-stone fires are common. Progress is being made outside the cities, however; according to survey respondents, the majority of Kenyan stoves sold in 2013, 84%, were to the rural poor.

Historically, the government has concentrated on policy development and joint programs with development partners, but has not had a dedicated cookstove initiative as seen in some other countries. The Alliance helped spearhead the creation of an inter-ministerial committee on cookstoves comprising of all the relevant ministries, with the Ministry of Energy chairing.

What makes Kenya unique is that many of its manufacturers have developed without support from government or international donors. Most KCJs are assembled in home-grown shops concentrated in the cities, and those independent shops have historically lived off their sales. Of the one million plus stoves distributed in Kenya in 2013, just 612,000 of those reported were manufactured domestically, likely due to reports from smaller producers getting missed by the survey.

While an entrepreneurial mindset already exists, the challenge is to help local craftsmen and entrepreneurs master the art of business management. *"We're now starting to see artisanal manufacturers approach this as a real business – as something they can grow wealthy from,"* says Alliance regional representative for East Africa Daniel Wanjohi.

The Alliance is also working with international stove manufacturers to both support the development of manufacturing plants in Kenya and to encourage stove imports. Initially, engaging three global players – Envirofit, EcoZoom, and Burn – raised resentment among domestic suppliers. But now that inclusion is proving to be positive, as many local producers are starting to innovate and improve their locally produced cookstoves.

"The Kenyan market has huge potential, and the injection of international companies is a game changer," explains Wanjohi, *"People are now starting to understand and appreciate why they need to formalize their operations and produce quality products. They also understand why they need to ensure every part of their business has been documented: because it applies to the financial aspect."* For example, the Alliance is finding that artisans are motivated to be good accountants – if they are given a reason to be.

n October 2014, the Alliance will launch a multimedia awareness raising pilot in Kenya, with road shows, radio spots in local languages, and printed material. The Alliance is also exploring partnerships with fast-moving consumer goods companies such as edible oil and dairy to further spread the message about the benefits of clean cooking. *"The demand will grow,"* says Wanjohi. *"And I have no doubt the providers will be able to scale up and meet it."*

Alongside increased cookstoves will come clean fuel use. While there has been limited participation in Kenya, Wanjohi expects that recent Alliance-led efforts to engage more fuel organizations will result in a significant change come the next reporting period.

ED_005941_00000100-00035

A View From Nigeria

BY THE NUMBERS

40k+
Stoves manufactured

750k+
Fuels manufactured (kg)

296k
Stoves distributed

600k+
Fuels distributed (kg)

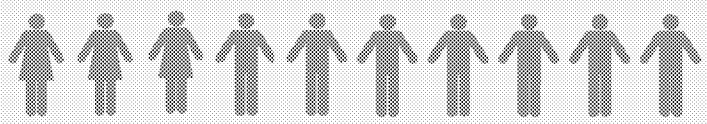
AVERAGE RETAIL PRICE: **$30**

95% OF STOVES TESTED*

LOCATION

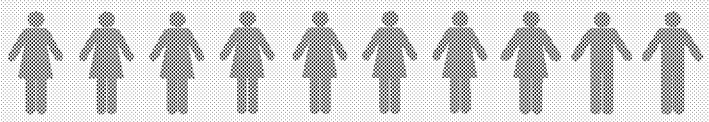
EMPLOYMENT

Employees:
78



31% women

Microentrepreneurs:
219



77% women

* Includes internal and third-party testing.

Stove fuel type data not available for this country at this time, due to limited responses about stove characteristics.

Oil has propelled Nigeria to the top of Africa's economic pyramid while leaving close to 100 million people in poverty. As a result, more than 70% of the population depends on wood-burning stoves, and most of those 30% who do not use wood use kerosene – a subsidized fuel associated with serious health concerns.

"We're a big country full of huge paradoxes," says Ewah Eleri, who coordinates the Nigeria Alliance for Clean Cookstoves. *"As one of Africa's largest producers of petroleum, we're also one of its largest producers of LPG,"* he says. *"But we export 90% of what we produce, so most of our own people remain dependent on wood-burning and kerosene stoves."*

To change that, Eleri has engaged members of the National Assembly to get clean cookstoves on the national budget for the first time ever. That has led to the creation of testing centers at six universities across the country, and the Alliance recently arranged for a researcher from the University of Nigeria, Nsukka, to travel to Oregon for training on in-stove testing and protocols.

"Now he's come back and he is helping to train others," Eleri explains. "This way, as the federal stove program takes shape, we will have a degree of certainty as to quality." This can help increase the number of locally designed stoves that are tested.

Nigeria's Ministry of Environment is also working to foster greater adoption of cleaner cookstoves and fuels through initiatives like the Rural Women Energy Security (RUWES) project. A key component of RUWES is the National Clean Cooking Scheme (NCCS), which focuses on using social networks in rural settlements to facilitate increased use of improved woodstoves, LPG, ethanol and biogas.

"In a perfect world, we'd just shift everyone to LPG, and then you and I wouldn't be sitting here talking about efficiency and the use of wood," Eleri says. *"But instead of a perfect world, we have widespread poverty and persistent policy gaps."* For now, the goal is to persuade the 70% who use biomass to shift to more efficient methods and to persuade those who use kerosene to switch to cleaner fuels, including ethanol and LPG. After that, LPG should begin replacing biomass.

On the biomass front, US-based Envirofit is partnering with Nigerian household goods maker Aluminum Power to manufacture and distribute efficient wood and charcoal stoves. Meanwhile, several companies

have started importing ethanol and gel stoves from China, with a reported 700 thousand stoves produced last year in China that are destined for the Nigerian market.

The problem with LPG is twofold: First, the cylinders and burners are expensive, so the rural poor simply can't afford them. Second, the cylinders come in standardized sizes, which makes them a hard sell even among those who use kerosene.

"If you need kerosene, you can buy what you can afford based on the money in your pocket," says Eleri. *"But with LPG, you have to buy cylinders standardized at 3, 6, 12.5, or 50 kilograms; so if you can't afford 3 kilograms, you can't afford any."*

On the LPG supply front, some promising solutions are starting to emerge – Kreditanstalt für Wiederaufbau (KfW; German development bank) is helping Nigerian venture capital firm Alithea team with O&O PLC, a Nigerian oil and gas company, to start making cylinders. There are plans underway to reduce the cost of cylinders by implementing a policy pioneered in Ghana: namely, by swapping charged cylinders for empty ones. At the same time, the Nigerian Alliance is lobbying for reduced import duties and tax holidays for companies that invest in cylinder manufacture in Nigeria.

Eleri believes that 50% of Nigeria's households could be converted to LPG by 2020, saying *"that's quite achievable, because we have the resources to do so, but we'll need very bold measures from both the government and the private sector to achieve this."*

ED_005941_00000100-00037

A View From Uganda

BY THE NUMBERS

152k
Stoves manufactured

1.6M
Fuels manufactured (kg)

335k
Stoves distributed

2.8M
Fuels distributed (kg)

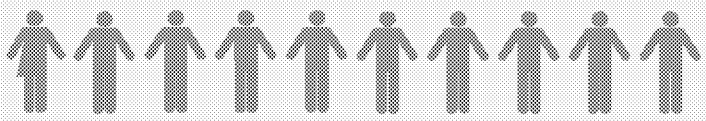
AVERAGE RETAIL PRICE: $ 14

44% OF STOVES TESTED*

LOCATION

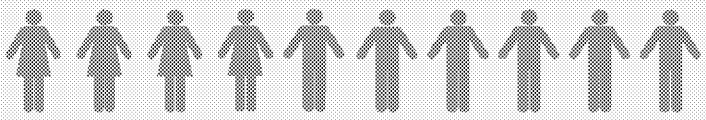
EMPLOYMENT

Employees:
4,564



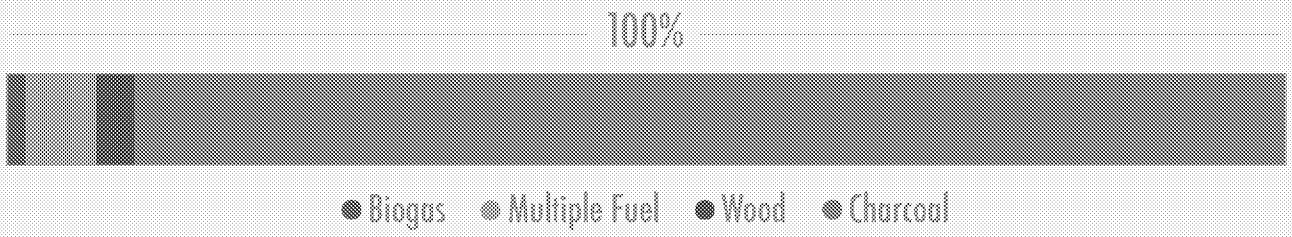
6% women

Microentrepreneurs:
891



38% women

STOVE FUEL TYPES



* Includes internal and third-party testing.

The Alliance's active engagement in Uganda started relatively recently, since the country was a major focus of the World Bank's ACCES (Africa Clean Cooking Energy Solutions) program. *"We didn't want to be duplicating efforts,"* says Arijit Basu, the Global Alliance's Regional Director for Market Development in Asia and Africa. *"At some point, however, we realized there were areas where the Alliance could complement ACCES efforts and provide added value."*

As a result, in May of 2014, the Alliance offered to support the Uganda National Alliance for Clean Cookstoves (UNACC), which brings together 80 partners, many of them small-scale cookstove manufacturers. As with Kenya, the smaller manufacturing volumes were more difficult to track, leading to a discrepancy between manufactured and distributed volumes. With these small businesses, and a reported 90% of Ugandan partners receiving their main source of revenue from stove sales, providing support to entrepreneurs to help grow their businesses is critical.

"UNACC is chaired by the Ministry of Energy, which means we have the government on our side," says Basu. *"In fact, UNACC's office is in the Ministry of Energy. That's enabled us to get some inter-ministerial dialogue going between the Ministry of Education, the Ministry of Environment, and others that can support the sector."*

The country has more than 50 small-scale manufacturers, most of which make fewer than 100 units per month, and Basu realized that all of them were buying the sheet metal for the external casings from one company: Roofings Ltd. He also learned that the preferred provider of combustion chambers was a company called Uganda Clays.

"Here we had this relationship between the cookstove manufacturers and the component providers," he says. *"So we went to Roofing Ltd and told them that the goal of the Alliance is to help facilitate the distribution of three million stoves in the next three years, and we asked if they'd like to meet the people who will be buying the sheet metal to make those stoves."* The Alliance followed the same approach with Uganda Clays, and now both companies may be willing to support new customers with capacity-building exercises and volume discounts.

"I think the leadership at both companies is trying to do a good thing, but they're also trying to make a profit," says Basu. *"So there is both a corporate social responsibility and a commercial angle to this."*

Carbon finance can also help with profits and sustainability. Almost 90% of Ugandans live in the countryside, where wood is free. That is one reason the country has lost a third of its forests since 1990, and it is also a reason that nearly 200,000 stoves were distributed through carbon finance projects in 2013 – more than in any other country surveyed. *"Carbon finance can help the sector in three ways,"* says Basu. *"It can empower consumers, it can create awareness, and it can provide loans to small companies looking to scale up."*

Uganda, through the Uganda National Bureau of Standards (UNBS), is participating in the international standards process and developing national standards. The UNBS has been participating in local UNACC meetings as well, and they have put their voice behind efforts to make testing mandatory for all stove manufacturers – a clear need, as this year's results report shows that less than half of all stoves are currently being tested. The Alliance has also supported the growth of testing center partners Center for Integrated Research and Community Development Uganda (CIRCODU) and Center for Research and Energy and Energy Conservation (CREEC) which provide laboratory and field-testing services to manufacturers in-country as well as throughout the East African region.

In the months ahead, UNACC will hire a full-time director to manage its activities. In October, they will begin a detailed mapping of the sector to lay the groundwork for a series of catalytic grants designed to give small and medium enterprises the capital they need to meet the coming demand.

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4. Discussion

The Alliance's 2013 annual Results Report provides compelling evidence that the global clean cooking market is scaling up. With over 14.3 million stoves distributed in 2013, the Alliance and its partners have made remarkable progress and remain on track, if not slightly ahead of target, to achieve the adoption of cleaner and more efficient cookstoves and fuels in 100 million households by 2020. Worth celebrating, too, is the fact that this expanded distribution was reported by partners and programs of all sizes, as well as by new entrants to the sector.

This 2013 report is an effort to benchmark early stage progress across the sector during the Alliance's first phase. The quantitative and qualitative data in this report highlights the momentum among Alliance focus countries, where successes and challenges continue to inform broader global efforts to scale adoption of clean cooking solutions. Initial Alliance efforts focused primarily on strengthening supply and enabling markets, and thus growth in adoption of cleaner, more efficient cookstoves and fuels was not immediate. Alliance staff will continue to work intensively with our partners to build local capacity, drive investment in the sector, and develop a body of sector learning that will further adoption of clean cookstoves and fuels. Beyond efforts in Alliance focus countries, knowledge sharing efforts and customized tool kits will help facilitate progress among Alliance partner countries. Focus countries will also serve as regional hubs to support scaling up in neighboring countries as well.

The Alliance remains "fuel neutral" in recognition of the fact that the 3 billion people around the world who rely on biomass for fuel and heating do not have equal access – in terms of supply or affordability – to cleaner fuels. It must also be flexible in its approach since the policy contexts, barriers, and facilitators of market expansion in cleaner fuels and stoves are unique to each market. Nevertheless, early trends are promising, and illustrative of the encouraging momentum to strengthen the global clean cooking market in Phase II. Moreover, wherever possible, the Alliance will help households "leapfrog" to the cleanest possible fuels to achieve healthier outcomes faster.

Much of the sector's growth in 2013 can be attributed to a few different factors. Concerted efforts to strengthen the sector in Alliance focus countries: Bangladesh, China, Ghana, Guatemala, India, Kenya, Nigeria, and Uganda have increased our partners' clean cookstove and fuel sales. At the same time, efforts to support standards, expand research to address key evidence gaps, and increase investment have created a more welcoming environment for new entrants to the sector. Through increased engagement with Chinese manufacturers, many of whom are eager to scale their overseas business, as well as more intensive efforts to increase response rates among our partners in other focus countries, it is clear that partners are increasingly willing to share information in order to ensure that their efforts are 'counted' toward the 100 million adoption goal. In almost every country, the response rate increased from 2012 figures. At the same time, nearly 75% of 2013 respondents who were directly engaged in the clean cooking value chain also responded to the 2012 annual survey. As such, key findings – particularly related to market growth – are likely the result of increasing market scale and not solely an increased response rate.

Both donors (private and public) and private investors play critical and mutually supportive roles in facilitating sector growth. Public funding has facilitated transformational progress on standards development, testing, research, coordination with the humanitarian sector, and the development of indicators to evaluate social impacts. At the same time, increased private sector investment is needed to drive innovation, support consumer finance, and enable entrepreneurs to evolve their business models to achieve scale. As the sector matures, the proportion of private finance, including private equity, convertible debt, and commercial loans, is anticipated to match public funding sources (including bilateral, and multilateral grants and loans).

Other early trends are also promising, including the expansion of resources to programs operating in humanitarian settings. The Alliance is closely collaborating with several global humanitarian

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implementers, including the United Nations High Commissioner for Refugees (UNHCR) and the World Food Programme to develop a robust humanitarian program to scale up clean cooking and fuel solutions for refugees, internally displaced people (IDPs), host communities, and other crisis-affected populations.

In contrast, results indicate the need for better tracking of clean fuels activities, as well as a continued need for gender inclusiveness in all aspects of program and product design and adoption. While the results show that there is a growing focus in the sector on mainstreaming gender throughout business models and project designs, there is still a need to strengthen and scale these efforts to ensure that the most effective approaches are implemented and that women's empowerment and gender impacts are scaled. There is a continued need to monitor and evaluate effective gender-informed approaches, build capacity of partners in this area, provide finance for innovative empowerment interventions, and to raise awareness and conduct advocacy to influence gender and energy policies.

Further work is also needed by the sector in testing and monitoring of clean cooking technologies and fuels. While the majority of the Alliance's partners understand the need to evaluate their cookstove, product, and/or fuel performance, less than half (48%) of manufacturing and distribution organizations reported that a third party tested their cookstove. Data compiled in the report suggests promising momentum around third-party testing activities in-country, however, with a noteworthy year-on-year increase in the number of testing organizations that were operating in every geographic region. The other good news is that new standardized protocols developed through the ISO process are being utilized; several instances of durability and safety testing were reported.

Increasing the availability of stove performance data in the sector will also be critical as it enables better tracking of trends in the availability of cleaner and more efficient stoves and fuels over time. In addition, testing results are also intended to inform the public about the potential health, environmental, and economic benefits of clean cookstoves and provides evidence to donors, investors, and consumers, keeping the market transparent and competitive. A greater number of organizations will have to allow third-party testing of their products; however, and more work has to be done to encourage public reporting of these externally validated stove performance results. This year, only 7% of submissions to the Alliance's Clean Cooking Catalog included testing results. The Alliance will continue to encourage organizations to share testing results publicly, including through the Catalog, and will further facilitate the process through new Catalog features for automatic submission of information.

Until very recently, innovation within the sector has focused on achieving environmental benefits, with a focus on reducing fuel use through improving stove efficiency. As a result, there has been substantial progress in scaling up more efficient cooking technologies. Across the sector, recent efforts aimed at achieving health and climate benefits through cleaner cooking have resulted in an additional emphasis on reducing emissions, and as a result, exposures to household air pollution. Early trends indicate progress in the distribution of 'cleaner' fuels and technologies. In order to ensure health, climate (through lower emission stoves), and environmental (though more efficient stoves) benefits, the Alliance and its partners will continue to increase the rate at which the adoption of cleaner and more efficient stoves is taking place.

Finally, while this report is a key tool for benchmarking and tracking the Alliance's progress, it should be viewed as only one component of the Alliance's overall monitoring and evaluation strategy. Accurately tracking progress towards the adoption of 100 million cleaner and more efficient stoves will involve a more intensive effort to address the following:

- **Repeat customers:** Until now, as the market is being established, the assumption has been that stove purchases represent first time purchases, i.e. stoves are being distributed to new households. In reality, and particularly as the market grows, an increase in the number of cleaner and more efficient cookstoves acquired per household can be anticipated, and repeat customers will have to be quantified to avoid double-counting.
- **Stove stacking:** Similarly, the reality is that households often tend to use more than one "burner equivalent" to meet their cooking and/or heating needs. Strategies to better capture the use of multiple stoves need to be implemented, particularly since the continued use of lower-quality stoves

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will hinder the ability to achieve potential benefits with the cleaner technologies, including time savings for women, increased public health, and a healthier environment. This would involve awareness-raising activities to facilitate the near exclusive use of the best technologies, and a commitment to increasing access to multiple burner 'equivalents' to meet all the household's cooking needs.

- **Intensity of adoption:** While it is most pragmatic for partners to report on distribution, strategies for assessing the extent to which households are using these stoves need to be refined and implemented. Key drivers and deterrents to sustained adoption, including availability of spare parts and maintenance, will need to be addressed. Clearly, not all of these issues can be adequately assessed on the basis of voluntary partner reporting. The Alliance will employ pragmatic approaches to complementing self-reported data, including participatory approaches to monitoring progress, country-specific monitoring strategies in focus countries developed to track progress against country action plans, and collection of in-depth qualitative and quantitative data on sustained adoption.

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Key Alliance Resources and Online Tools:

Alliance Homepage

www.cleancookstoves.org

Partner Directory

community.cleancookstoves.org

Reports and Research

www.cleancookstoves.org/resources/reports-and-research/

REPORT:

Igniting Change: A Strategy for Universal Adoption of Clean Cookstoves and Fuels

www.cleancookstoves.org/resources/fact-sheets/igniting-change.pdf

PRESENTATION:

Alliance Business Plan

www.cleancookstoves.org/resources_files/alliance-business-plan.pptx

Testing, Standards, and Technology

Clean Cooking Catalog

catalog.cleancookstoves.org

Standards and Testing

www.cleancookstoves.org/our-work/standards-and-testing/

Carbon Finance

Carbon Finance Platform for Clean Cooking

carbonfinanceforcookstoves.org

Investment

Increasing Investment in the Clean Cooking Sector

investment.cleancookstoves.org

Country Strategy

Partner Country Toolkit (also available in Spanish)

www.cleancookstoves.org/resources_files/partner-country-toolkit.docx

Country Action Plans / Market Assessments

www.cleancookstoves.org/resources/reports-and-research/

Adoption

A recipe for developing adoption and impact indices

www.cleancookstoves.org/blog/recipe-for-developing-adoption.html

Gender

Scaling Adoption of Clean Cooking Solutions through Women's Empowerment: A Resource Guide

www.cleancookstoves.org/our-work/gender-guide.html

Humanitarian

Safe Access to Fuel and Energy Online Knowledge Hub

www.safefuelandenergy.org

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Global Alliance for Clean Cookstoves
1750 Pennsylvania Avenue NW, Suite 300
Washington, DC 20006
+1 (202) 650-5345
www.cleancookstoves.org
info@cleancookstoves.org

Message

From: stove-bounces@lists.berkeley.edu [stove-bounces@lists.berkeley.edu]
on behalf of Kirk R. Smith [krksmith@berkeley.edu]
Sent: 10/5/2014 6:30:30 PM
To: Kirk R.Smith [Krksmith@berkeley.edu]
Subject: [stove] That was quite a camping trip
Attachments: ATT00001.txt

One way to develop a processed biomass fuel industry/k

Who Made That Charcoal Briquette?

Short version of article in the SEPT. 28, 2014 , NY Times Magazine

By DASHKA SLATER

In the summer of 1919, a Michigan real estate agent named Edward G. Kingsford was invited on a camping trip by his wife's cousin, the industrialist Henry Ford. In addition to Ford, the adventurers included Thomas Edison, the tire magnate Harvey Firestone and the naturalist John Burroughs. Although the group called themselves the Vagabonds, they traveled with chauffeurs and a chef in a convoy of six vehicles, one of which was a fully equipped kitchen truck.

Kingsford was invited to join this annual adventure so that he and Ford could discuss timber, specifically the timber that might be found in Michigan's Upper Peninsula. Americans bought one million Model T's in 1919, and between the frame, wheel spokes, dashboard and running board, each car contained about 100 board feet of hardwood. So Ford wanted to produce his own. By the following spring, Kingsford had helped the industrialist acquire 313,000 acres of timberland in Iron Mountain, Mich. Ford built a sawmill and a parts plant there, along with a neighboring town named Kingsford to house the workers.

The mill produced plenty of lumber for Ford cars, but it also generated waste in the form of stumps, branches and sawdust. This irked Ford, who didn't like to leave money lying on the ground. The solution came from a University of Oregon chemist named Orin Stafford, who had invented a method for making pillow-shaped lumps of fuel from sawdust and mill waste combined with tar and bound together with cornstarch. He called the lumps "charcoal briquettes." Ford, ever efficient, shortened the word to "briquet."

Edison designed a briquette factory next to the sawmill, and Kingsford ran it. It was a model of efficiency, producing 610 pounds of briquettes for every ton of scrap wood. At the beginning, the charcoal sold to meat and fish smokehouses, but supply exceeded demand. By the mid-1930s, Ford was marketing "Picnic Kits" containing charcoal and portable grills directly from Ford dealerships, capitalizing on the link between motoring and outdoor adventure that his own Vagabond travels popularized. "Enjoy a modern picnic," the package suggested. "Sizzling broiled meats, steaming coffee, toasted sandwiches."

But the Great Depression might not have been the best time to evoke the charm of outdoor cooking, which must have called to mind the Hooverville shantytowns springing up in every city. It wasn't until after World War II that backyard barbecuing took off, thanks to suburban migration, the invention of the Weber grill and the marketing efforts of the businessmen who bought Ford Charcoal in 1951. They renamed it Kingsford Charcoal and persuaded the major supermarket chains to carry it. By 1963, barbecues, like cars, were icons of American leisure. As an article in Reader's Digest observed, "Cooking with charcoal . . . is now as deeply ingrained in American life as the long weekend and the servantless kitchen."

Message

From: info@cleancookstoves.org [info@cleancookstoves.org]
Sent: 10/3/2014 2:34:47 PM
Subject: Reminder: Global Alliance for Clean Cookstoves Webinar on OCT 6: Sustainable Fuels and Spark
Attachments: Global Alliance for Clean Cookstoves Webinar on OCT 6: Sustainable Fuels and Spark

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

Please join us on **Monday, October 6th at 8:00 AM Eastern US time** for a webinar that will present the results and share the lessons learned from activities undertaken to support some of our Spark Fund grantees focused on fuels. This webinar will offer a unique opportunity for attendees to benefit from direct feedback of three clean cooking fuel companies on their experience as grantees of the Spark Fund.

In 2013, the Global Alliance for Clean Cookstoves launched the 2nd round of the Spark Fund – a grant facility designed to mirror early stage investment. The goal of this facility is to help enterprises reach commercial viability and scale by funding business capacity development and growth and invest in enterprises with scalable approaches that have the potential to transform the sector through their success. Four of six grantees selected for Round 2 are scaling up the manufacturing and distribution of clean cooking fuels such as green charcoal, biogas, and bioethanol. To supplement the support to these fuel-focused Spark grantees, the Alliance partnered the grantees with fuel experts from ENEA Consulting. The support they provided to the grantees ranged from risk analysis studies, life cycle analyses, training and capacity building in the field, methodological support, technical assistance, critical review of scale-up strategy and recommendations for how the Spark grantees can plan for scaling up production while ensuring a sustainable supply of resources.

Presenters:

- Eco Fuel Africa – Production of green charcoal in Uganda
- SGFE – Production of green charcoal in Cambodia
- Simgas – Production of biogas systems in Kenya and Tanzania
- ENEA – Fuel sustainability consultants

Each grantee will describe their issues and needs for support, how the Spark Fund allowed them to overcome barriers for their growth, with both financial and technical support. ENEA will share its main conclusions and lessons learned from these support activities, with general recommendations particularly applicable to green charcoal briquettes and biogas fuels.

Instructions for joining the webinar:

This webinar will be conducted via Soundpath GlobalMeet. When you are ready to join, please click the "Connect Me" link below to easily connect to both web and audio.

If you are not at a computer and need to dial in by phone, please use one of the access numbers provided below and enter the guest passcode: 9749723246.

If you experience technical difficulties please email Alex Trueman at atrueman@cleancookstoves.org.

For those who are not able to join on the date of the webinar, a recording will be made available on the Alliance's website

You're invited.

You've been invited to a web meeting starting Monday, October 06, 2014 at 8:00 AM Eastern.

Have the meeting call you.
Click the Connect Me link below. **No need to dial-in.**

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Local - Canada, Montreal:	+1 514 669 5884
Local - Canada, Toronto:	+1 416 915 3623
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Local - Czech Republic, Prague:	+420 225 986 534
Local - Denmark, Copenhagen:	+45 32 72 78 04
Local - Estonia, Tallinn:	+372 622 6536
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Local - France, Paris:	+33 (0) 1 70 37 55 34
Local - Germany, Frankfurt:	+49 (0) 69 2222 13400
Local - Germany, Munich:	+49 (0) 89 2030 31243
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Local - Ireland, Dublin:	+353 (0) 1 526 9517
Local - Israel, Tel Aviv:	+972 (0)3 721 7903
Local - Italy, Milan:	+39 02 0066 1709
Local - Italy, Rome:	+39 06 4523 6756
Local - Japan, Osaka:	+81 (0) 6 4560 2402
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International toll free - Poland:	00 800 121 4342
International toll free - Portugal:	800 784 438
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International toll free - Slovakia:	0800 001 660
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International toll free - Vietnam:	1800 9275
Lo-call - France (lo-call):	0811 655 127
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Local - Hong Kong, Hong Kong:	+852 3018 9144
Local - India, Mumbai:	+91 (0)22 6187 5131
Local - South Korea, Seoul:	+82 (0) 2 6007 0014
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Message

From: Winrock & EPA Cook Stoves & Indoor Air [moderator@cookstovesandindoorair.org]
Sent: 3/24/2014 10:10:00 PM
To: Mitchell, John [Mitchell.John@epa.gov]
Subject: Reminder about HFI follow-up webinar March 26th

Having trouble viewing this mail? Click here to view it in your browser.
Make sure that you always get our messages: Add moderator@cookstovesandindoorair.org to your contacts.

Click here to unsubscribe or update your email address.

Just a friendly reminder about the Harvest Fuel Initiative follow up webinar taking place this Wednesday, March 26th at 10am Eastern. You can register at: https://attendee.gotowebinar.com/register/8785683371225702 5. **See below for more details!**

Dear Colleagues,

Thank you for your interest in the Winrock International and U.S. EPA webinar "Charcoal Briquette Enterprise Development." This email is to inform you that you can now find the webinar proceedings at www.pciaonline.org/webinars. This is a temporary website for all Winrock/EPA webinars that were held after June 1, 2012.

Here you will find a full recording of the webinar as well as the presentation slides and the follow-up written Q&A. We will send another message once these proceedings have been posted on the permanent U.S. EPA Cookstoves and Indoor Air website.

We also want to remind you about **the Harvest Fuel Initiative's follow-up webinar taking place next Wednesday, March 26th at 10:00am EDT**. Please join Sylvia Herzog, Chief Operating Officer of The Charcoal Project, and Dan Sweeney, Solid Biomass Fuel Research Associate of MIT D-Lab, as they answer questions about enterprise development in this field. You can register for the webinar at https://attendee.gotowebinar.com/register/8785683371225702 5, or find out more information at http://www.harvestfuel.org/news.

For those who attended the March 5th webinar and would like to provide feedback about the webinar, or suggestions for upcoming webinars, there's still time to fill out the post-webinar evaluation HERE.

Please stay tuned for news on upcoming webinars, and feel free to contact moderator@cookstovesandindoorair.org with any questions. We look forward to our continued collaboration with you in promoting high quality, clean and efficient cooking technologies and fuels.

Best regards,

Winrock cookstoves and indoor air team

This email is being sent to Mitchell.John@epa.gov.

Use this link to be deleted or to update your email address
Trouble with the opt out link? Simply **forward** this message to rem@link.rm0005.net or call 773-470-0350.

This message was sent by Winrock International using ReachMail.
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NATIONAL CLEAN COOKSTOVES AND FUELS CONFERENCE

SUMMARY REPORT:

KENYAN AND GLOBAL UPDATES AND ANNOUNCEMENTS

Safari Park Hotel
Nairobi, Kenya
4-7 February 2014

“Kenya is a catalytic force in the global clean cooking sector’s efforts to ensure that cooking does not kill. From supporting new cookstove standards to participating in groundbreaking research to hosting entrepreneurs who are meeting market needs and improving livelihoods, the public and private sectors in Kenya are critical to the achievement of the Global Alliance for Clean Cookstoves’ mission and goals. This week’s series of announcements mark an important turning point in Kenyan, East African and global efforts to save lives and the planet through the creation of a market for clean cooking solutions.”

– **RADHA MUTHIAH**

Executive Director, Global Alliance for Clean Cookstoves

Credit: Rodney Rascona

KENYA UPDATES & ANNOUNCEMENTS

The mission of the Global Alliance for Clean Cookstoves is to catalyze the uptake of clean and efficient cookstoves through a market-based approach to save lives, improve livelihoods, empower women, and protect the environment. Kenya is among six Alliance focus countries that have demonstrated considerable potential to foster a robust market for clean cooking solutions, a determination informed in part by market assessments, a strong Alliance partner base, serious health and environmental impacts, vast consumer potential, and more.

The Alliance's activities in Kenya are guided by a Country Action Plan (CAP) that was developed through locally-led consultations with national stakeholders and adopted in April 2012. The CAP serves Kenyan stakeholders as a blueprint to monitor progress toward the 7 million household goal.

Since launching in 2010, the Alliance and its partners have driven approximately US$ 20 million in research, investments, and testing in Kenya.

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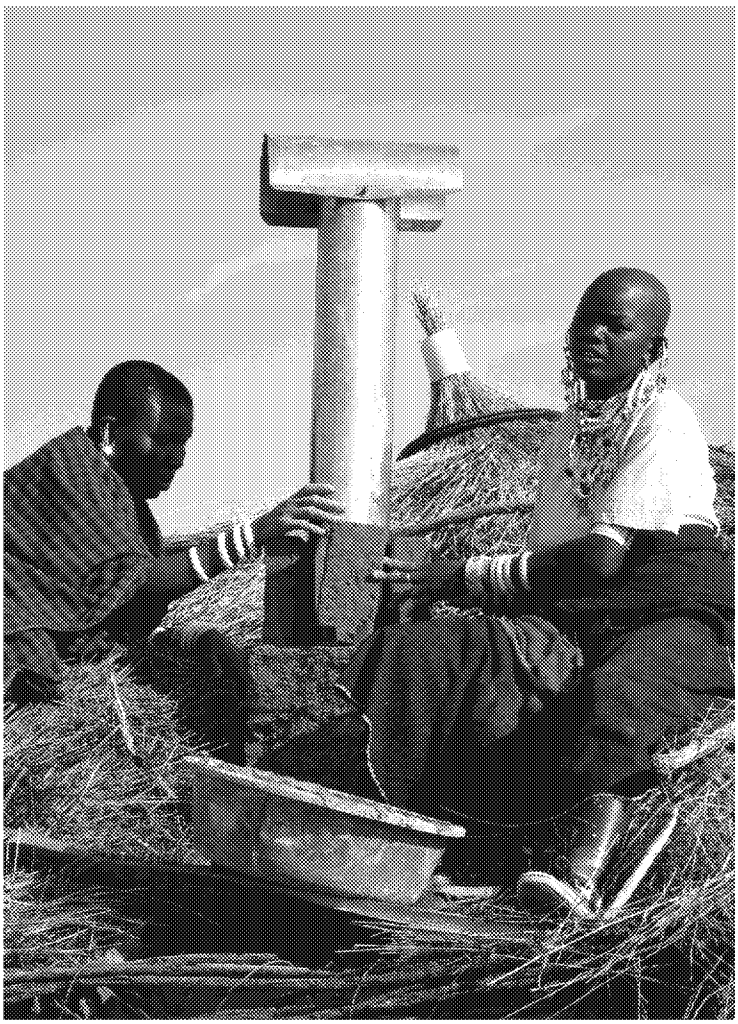
Health and Adoption Research

The Centers for Disease Control and Prevention (CDC) and the Kenya Medical Research Institute (KEMRI) in partnership with the Global Alliance for Clean Cookstoves (Alliance), the World Health Organization (WHO), the US Environmental Protection Agency (EPA), the California Public Health Institute (PHI), and the Safe Water and AIDS Project (SWAP) conducted a one year field evaluation of six biomass cookstoves, with the traditional three-stone fire used as a baseline. The project was conducted in two rural villages in Nyando Province, Kenya, and 45 homes in each village were selected to participate. These communities have some of the highest rates of childhood respiratory illness in Kenya and 99% of homes use a three-stone fire for cooking. The study was designed so that all homes would use each stove for three weeks resulting in six rounds of data collection. The evaluation included community focus groups to assist in selection of the stoves, laboratory evaluation of selected stoves, monitoring on all cooking devices and the kitchen wall, pre- and post-round home interviews with the primary cook, community health worker visits, a kitchen performance test conducted in each home, emission and exposure monitoring, ambient air monitoring in the community, and pre- and post- round collection of specimens to test for exposure.

Initial analysis of women's preferences point to a high degree of interest and aspiration to have greater access to clean and safe cookstoves. Each stove tested brought down emissions from cooking in the home but not to the point that could maximize the public health benefit to the community. Many reasons may contribute to this result including: documented stove stacking in homes, household variation in stove use and performance, and the use of kerosene lamps for lighting. Analysis of all data sets is scheduled for completion in February 2014 with publications planned for summer of 2014.



Credit: Corinne Hart/Global Alliance for Clean Cookstoves

Customer Research

In 2013, the Alliance completed Phase I of its consumer segmentation and preference study of the Kenyan clean cookstoves and fuels market, which examined the existing broad consumer segments in the country in order to identify those with greatest potential to reach scale of clean cookstove and fuel adoption. Phase II will more closely examine the segments identified in Phase I to better understand the needs,

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preferences and behaviors of these consumers and ascertain factors that influence the purchase and sustained use of clean cooking technologies.

Gender Research

The Alliance is supporting a collaborative effort led by the multi-disciplinary team at the Center for Global Clean Air at the Johns Hopkins Bloomberg School of Public Health in partnership with Envirofit International, a large cookstove developer and manufacturer, and ESVAK, a community development and training institution working throughout Kenya. This research addresses three fundamental areas related to cookstove adoption: (1) examination of the impact that women entrepreneurs employed in the cookstove value chain can have on adoption and sustained use; (2) analysis of whether targeted empowerment training of ICS entrepreneurs can enhance overall adoption rates, and; (3) exploration of specific benefits and challenges that clean cooking solutions have on women users and their families.

Non-Renewable Fuel Harvesting Research

A Multiscale Geospatial Mapping of Non-Renewable Fuel Harvesting study by Universidad Nacional Autónoma de México (UNAM), Yale University, and the Food and Agriculture Organization includes updated estimates for Kenya at finer spatial resolution than previously available. Given that deforestation is a concern in Kenya and that collection of firewood contributes to environmental degradation, this information can be used to identify areas where scaling clean cookstoves and fuels could provide the greatest environmental benefits.

Kenya Market Update

To date, the Alliance has facilitated other specific initiatives in the country to further grow the clean cookstoves and fuels market:

- Bolstered the work of partners with established track-records of success in Kenya through Spark Grants, such as the Global Village Energy Partnership (GVEP), BURN Manufacturing, and EzyLife;
- Conducted enterprise capacity building workshops to support the growth of smaller enterprises so that they can strengthen their businesses and become more investment ready;
- Facilitated the Kenya Industrial Research and Development Institute (KIRDI) in establishing a regional testing and knowledge center for cookstoves;
- Worked with the Kenya Bureau of Standards and other global partners to develop the first-ever cookstoves standards to define cleanliness, safety, emissions, and performance;
- Convened national stakeholders in setting up the Clean Cookstoves Association of Kenya that aims to bring the highly fragmented sector together; and
- In partnership with USAID/Winrock, supported the Kenya Union of Saving and Credit Cooperative Organisation (KUSCCO) in establishing a credit facility to lend to cookstoves businesses and consumers through its network of over 5,000 savings and credit cooperative organizations throughout the country. This is expected to spur growth as well as make clean and efficient cookstoves more accessible to consumers.

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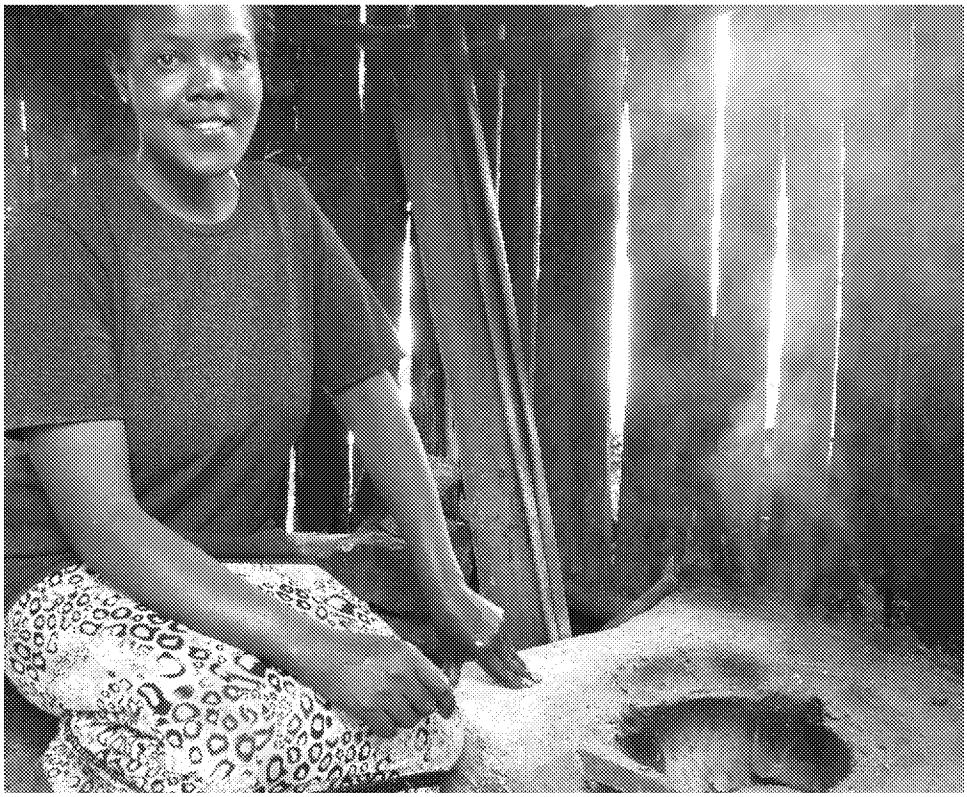

Credit: Global Alliance for Clean Cookstoves

GLOBAL UPDATES & ANNOUNCEMENTS

On the occasion of the National Clean Cookstoves and Fuels Conference in Nairobi, the Alliance is pleased to announce more than US$ 3 million in grants and loans for entrepreneurs and significant progress in the processes to advance new WHO indoor air quality guidelines and the first-ever global cookstove standards.

As the Alliance works in 2014 to transition from Phase I to Phase II of its strategic operating plan, it will place a strong emphasis on expanding support for entrepreneurs to reach customers and improve lives; raising awareness among targeted consumer segments; conducting new research to underscore the magnitude of the health, environmental, livelihood and gender impacts of inefficient and dangerous cooking practices; and establishing global standards for air quality and clean cookstoves that bolster the market and make products that people aspire to own.

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Spark Fund

This year marked the second round of the Alliance Spark Fund, introduced in 2012 to help venture and growth stage enterprises reach commercial viability and scale by funding business capacity development and growth. More than 70 Spark Fund applications were received, and 17 of those businesses underwent due diligence site visits. This year's pool of applicants was exceptional and our investor panel had a difficult time selecting the winners.

We are pleased to announce the following enterprises will share Spark grant funding of US$ 2 million:

- **SimGas** is a biodigester design and manufacturing company focused on distribution in the East African market. The company is structured as a joint venture between the parent design company based in the Netherlands (SimGas BV), and in-country manufacturing company (Sumaria Group Ltd).
- **Eco-Fuel Africa (EFA)** produces green charcoal from locally sourced biomass waste as an alternative to traditional wood fuel. Based in Uganda, EFA employs local farmers, leverages local technology and involves 260 women retailers in its value chain to create a sustainable impact.
- **Greenway Grameen Infra** designs & distributes efficient biomass cookstoves for rural families. The company's flagship product – Greenway Smart Stove – is an improved biomass cookstove sold in 24 districts (5 states) in India and one district in Bangladesh.
- **EcoZoom** has sold 83,000 improved cookstoves in 18 countries through distributors and 5,000 stoves in the U.S., targeting the camping industry. With its launch in Kenya, EcoZoom plans to expand its operations to include design, manufacturing, and direct distribution of wood and charcoal clean cookstoves.
- **Sustainable Green Fuel Enterprises** produces and sells clean burning, sustainable charcoal briquettes to lower income households in Phnom Penh, Cambodia. The company's briquettes are made from compressed recycled char-ash and charred coconut husks.
- **SMEFunds** is an ethanol gel manufacturing and distribution company focused on distribution in Nigeria. The business has developed a ground-breaking method of producing cellulosic ethanol and converting the liquid into gel that can then be used in their cookstove, which is manufactured in China. SMEFunds has a distribution structure similar to that used by Avon Products by empowering individuals to sell the products at a margin throughout Nigeria.

We thank our Spark Fund donors: Royal Dutch Shell, the Climate and Clean Air Coalition (CCAC), and the German Ministry for Economic Cooperation and Development (BMZ).

Pilot Innovation Fund

This year also marked the second round of the Pilot Innovation Fund (PIF), which finances innovative approaches for enterprises across all stages of development. Two Alliance first round PIF grantees have gone on to become Spark grantees – Greenway Grameen Infra and Sustainable Green Fuel Enterprise. This supports our hypothesis that the PIF is an important mechanism to support early stage enterprises and create a pipeline to the Spark Fund.

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Areas of support for this year's PIF include product design and performance, business models that create local livelihoods, and marketing and distribution. We also received more than 70 PIF applications this year, and after significant deliberation we are pleased to announce the following enterprises will share a US$ 400,000 grant:

- **Applied Sunshine LLC** is a startup company that has developed an innovative vacuum tube solar cooker to be marketed in Guatemala. This tube structure has the capability of cooking various types of foods that other solar cooking models cannot, including local foods such as tortillas.
- **Prakti Design** will complete a two-burner, multi-fuel stove design for Bangladesh, India, and Nepal. This stove is being developed in response to the increasing demand from consumers for multiple burner stoves and hopes to quickly achieve economies of scale through sales to more markets due to the stove's fuel versatility.
- **Emerging Cooking Solutions (ECS)** manufactures and distributes pellets in Zambia. ECS currently sells the Phillips stove at US$ 100 as the preferred option to burn their fuel. ECS will test the Prime stove (US$ 35) with their pellets and work with employers to provide financing.
- **Rahimafrooz Renewable Energy Ltd** is a solar home product distributer in Bangladesh. Rahimafrooz will expand into the clean cooking market by building on the WASHplus study recently conducted in Bangladesh and begin marketing and distributing the stove most likely to be accepted in the market.
- **CleanStar Ventures** will use Pilot funds and lessons learned from their work in Mozambique to develop an ethanol stove with a refillable fuel cartridge, complementary household appliances that can use ethanol, and a fuel distribution process that leverages partnerships with multinational corporations. The goal of the overall project is to create a global distribution network for ethanol that layers on the oil and gas distribution network.
- **C-Quest Capital (CQC)** is a private equity and carbon finance firm providing clean and efficient household energy technologies and sustainable sources of household fuels. Through TLC Green (TLCG), a Joint Venture between CQC and the Malawian NGO Total Land Care (TLC), CQC proposes to test a new business model to couple the marketing and sale of sustainable firewood with improved cookstoves.

We thank our PIF donors: UK Department for International Development (DFID); Johnson & Johnson; and the Norwegian Ministry of Foreign Affairs (NORAD).

Women's Empowerment Fund

In conjunction with the Pilot Innovation Fund (PIF), the Women's Empowerment Fund (WEF) was launched in November 2013 with a focus on financing gender and empowerment interventions within clean cooking business models. Using the Alliance's recently released resource guide, *Scaling Adoption of Clean Cooking Solutions through Women's Empowerment* as a foundation, funding will allow organizations to test and implement the best practices highlighted in the guide at each stage of the value chain. The Alliance received over 50 applications this year and is pleased to announce the following winners will share a US$ 375,000 grant:

- **Envirofit** will examine how targeted empowerment and leadership training for women entrepreneurs can impact their capacity to educate and support customers and scale adoption.

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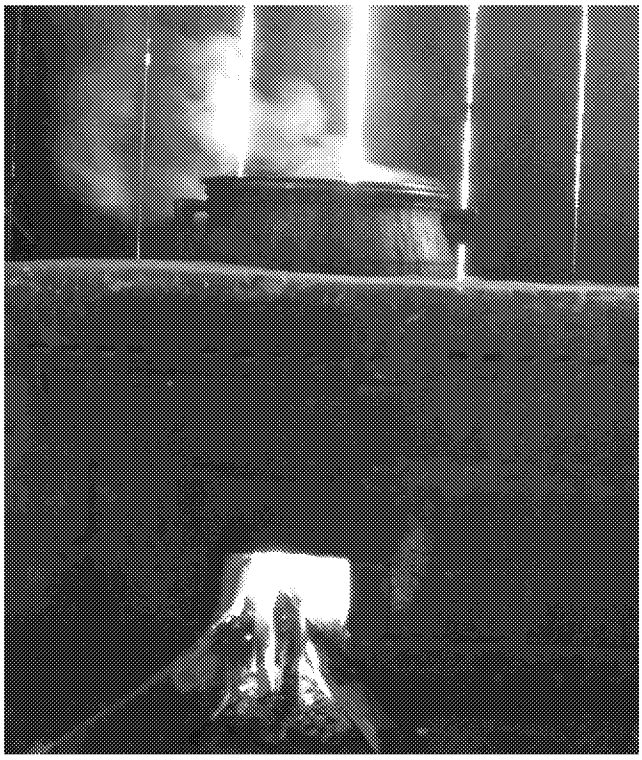
- **Fuego del Sol** will provide female school cooks with improved institutional stoves and train them in clean cooking techniques and maintenance, as well as support them in becoming clean cooking entrepreneurs. Fuego del Sol will also work with the cooks to create central distribution hubs for household cookstoves and briquettes.
- **Mercy Corps** will analyze affordability and financing barriers for women cookstove consumers in purchasing improved cookstoves in Uganda. They will design and test a portfolio of consumer financing mechanisms to help women consumers afford the products and determine which combinations have the greatest potential to scale cookstove adoption.
- **The Paradigm Project** will enhance its gender-sensitive approach to the innovative EzyAgent program in Kenya, with a focus on creating refinements that will facilitate the recruitment and success of women as cookstove entrepreneurs. Within this, Paradigm will seek to identify the primary characteristics, traits and skills that successful female EzyAgents share, as well as understand the conditions of success for female entrepreneurs in the cookstove value chain.
- **Grassroots Trading Network for Women** will develop a toolkit for a handheld electronic device that can be used to collect data to better understand consumer willingness to pay. The toolkit will measure the amount of money saved through use of an improved cookstove and compare it with monthly installments that consumers will pay for the purchase of improved cookstoves.
- **Soluciones Apropriadas** has designed an improved cookstove used for tortilla-making by small-scale commercial ventures in Guatemala. The group will engage women end-users in the research and development process in order to create a product for women entrepreneurs involved in the production and sale of tortillas.

We thank our WEF donors: UK Department for International Development (DFID) and Caterpillar.

Carbon Finance for Clean Cooking Loan Fund

The Alliance supports the use of carbon markets as a way to finance adoption of clean cooking solutions at scale. Carbon finance provides a commercial pathway to generate revenues to scale clean cookstove and fuel deployment while incentivizing monitoring and increased usage and adoption, as well as fostering improvements in fuel efficiency and durability.

Although the sale of carbon offsets provides a valuable revenue stream, clean cookstove projects often find it challenging to fund certification processes due to the one to two year time lag between registration and first revenues from carbon credits. To help overcome this challenge, the Alliance



Credit: Global Alliance for Clean Cookstoves

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is partnering with Nexus Carbon for Development and the Gold Standard Foundation to develop a Carbon Finance for Clean Cooking Loan Fund to provide loans to clean cookstove and fuel enterprises to finance carbon certification costs. Nexus Carbon for Development and the Gold Standard Foundation are committed to working with the Alliance to address the issue of household air pollution by increasing the availability of low-cost financing for carbon finance certification costs for clean cookstoves and fuels projects.

Credit: Jen Tweddell/Global Alliance for Clean Cookstoves

The Alliance has provided US$ 290,000 to capitalize the fund and is currently looking to raise additional capital from interested donors and investors. To learn more about the loan fund, visit carbonfinanceforcookstoves.org.

Global Cookstove Standards

Global standards will strengthen the clean cooking sector's ability to evaluate, communicate, and improve performance and quality of cookstoves and fuels and thus improve adoption. The Alliance has partnered with the international and national standards community to develop standards with an inclusive process for all types of stakeholders and multiple countries. The Alliance is excited to be in Kenya for the first meeting of the International Organization of Standardization (ISO) Technical Committee (TC) 285 on Clean Cookstoves and Clean Cooking Solutions. The Kenya Bureau of Standards (KEBS) is hosting the first plenary meeting of TC 285, which includes participation from 14 countries, 16 observer countries, and 6 international non-profit organizations. During this meeting, delegates will develop the scope and roadmap for standards activities and provide clear direction for the establishment of working groups on specific technical areas, such as safety, efficiency, and cleanliness.

WHO Indoor Air Quality Guidelines

The Global Alliance for Clean Cookstoves has been a driving force behind the effort to update the WHO's Indoor Air Quality Guidelines for household fuel combustion. Experts involved in updating the guidelines reviewed and assessed evidence across a range of key topics, covering emissions of health-damaging pollutants from stoves and fuels, health risks from exposure, burns and other safety issues, impacts of interventions on air pollution and exposure, factors influencing adoption, and the costs and financing of interventions.

From 11-12 February, 2014, in Nairobi, WHO and the Alliance will convene a workshop on *"Reducing the health burden from household air pollution: towards the development of a national strategy for Kenya,"* to present the results of their review and assessment of the current guidelines, as well as their provisional recommendations for new guidelines around emissions, air quality, safety, fuel type, and climate – all toward the purpose of impacting and informing policymaking in Kenya. The workshop will also raise awareness about the new Global Burden of Disease estimates related to household fuel combustion – 4 million deaths annually. Similar workshops will be held in other WHO regions in 2014.

Credit: Global Alliance for Clean Cookstoves

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Message

From: indoor-air-pollution-updates@googlegroups.com [indoor-air-pollution-updates@googlegroups.com]
on behalf of Dan Campbell [dacampbell@fhi360.org]
Sent: 5/15/2013 2:18:53 PM
To: indoor-air-pollution-updates@googlegroups.com
Subject: {IAP Updates} Saving & Empowering Lives through Clean Cooking Innovation | Implications of Charcoal Briquettes | Behaviour change for better health: nutrition, hygiene and sustainability

Below are the latest posts to IAP Updates, http://blogs.washplus.org/iaqupdates

IAP Updates contains peer-review literature and HAP/IAP publications and we have also set up an IAP Alert on Scoop.it to capture IAP news items at: http://www.scoop.it/t/household-air-pollution

Saving & Empowering Lives through Clean Cooking Innovation

MAY 15, 2013 · 0 COMMENTS

Saving & Empowering Lives through Clean Cooking Innovation | Source: Radha Muthiah, USAID Impact blog, May 11th 2013 |

A major study published in December cited high blood pressure, alcohol, and tobacco as the top three health risks in the world. Could you guess the fourth? You probably did it last night.

Example of a pine needle powered cook stove. Photo credit: USAID

The seemingly simple act of cooking a meal is responsible for 4 million deaths each year.

That's because nearly 3 billion people burn solid fuels such as wood, charcoal, coal, and other fuels to cook every day. When burned in open fires and basic stoves, solid fuels emit a harmful smoke that causes a range of cancers, heart and lung diseases, developmental and neurological impacts, cataracts, and more.

Inefficient and dangerous cooking practices are also a major cause of burns, and the acts of collecting and burning fuelwood lead to deforestation and the release of climate-changing gases, respectively.

Women and children have the primary responsibility for cooking and fuel collection in developing countries, and are therefore most at risk from the side effects: smoke inhalation, crippling burns, time lost for schooling or work, human or animal attacks during fuel collection, and myriad others.

[click to continue...]

Intrauterine exposure to fine particulate matter as a risk factor

MAY 15, 2013 · 0 COMMENTS

Intrauterine exposure to fine particulate matter as a risk factor for increased susceptibility to acute broncho-pulmonary infections in early childhood.*International Journal of Hygiene and Environmental Health, 2013.*

- Full text

Over the last decades many epidemiologic studies considered the morbidity patterns for respiratory diseases and lung function of children in the context of ambient air pollution usually measured in the postnatal period. The main purpose of this study is to assess the impact of prenatal exposure to fine particulate matter (PM2.5) on the recurrent broncho-pulmonary infections in early childhood.

In conclusion,the study suggests that prenatal exposure to PM2.5 increases susceptibility to respiratory infections and may program respiratory morbidity in early childhood. The study also provides evidence that the target value of 20?g/m3 for the 24-h mean level of PM2.5 protects unborn babies better than earlier established EPA guidelines.

The state of scientific evidence on air pollution and human health in Nepal.

MAY 15, 2013 · 0 COMMENTS

Environ Res. 2013 May 7. pii: S0013-9351(13)00067-4. doi: 10.1016/j.envres.2013.03.007.

The state of scientific evidence on air pollution and human health in Nepal.

Gurung A, Bell ML. School of Forestry and Environmental Studies, Yale University, New Haven, CT 06511, USA.

Abstract

Air pollution has been linked to acute and chronic health effects. However, the majority of evidence is

based in North America and Europe, with a growing number of studies in Asia and Latin America. Nepal is one of the many South Asian countries where little such research has been conducted. We summarized the state of scientific evidence and identify research gaps based on the existing literature on air pollution and human health in Nepal. We performed a systematic literature search to identify relevant studies. Studies were categorized as those that estimate: (1) health impacts of indoor air pollution, (2) health impacts of outdoor air pollution, (3) health burdens from outdoor air pollution in Nepal based on existing concentration-response relationships from elsewhere, or (4) exposure and air quality but do not link to health.

We identified 89 studies, of which 23 linked air pollution to health impacts. The remainder focused on exposure and air quality, demonstrating high pollution levels. The few health studies focused mainly on indoor air (n=15), especially in rural areas and during cooking. Direct exposure measurements were for short time periods; most studies used indirect exposure methods (e.g., questionnaire). Most health studies had small sample sizes with almost all focusing on respiratory health. Although few studies have examined air pollution and health in Nepal, the existing studies indicate high pollution levels and suggest large health impacts. Nepal's dearth of scientific research on air pollution and health is not unique and likely is similar to that of many other developing regions. Future research with larger studies and more health outcomes is needed. Key challenges include data availability.

Implications of Charcoal Briquette Produced by Local Communities on Livelihoods and Environment in Nairobi Kenya

MAY 15, 2013 · 0 COMMENTS

Implications of Charcoal Briquette Produced by Local Communities on Livelihoods and Environment in Nairobi Kenya

- Full text

Mary Njenga, et al.

Abstract

The residents of Nairobi, Kenya, use 700 tonnes of charcoal per day, producing about 88 tonnes of charcoal dust that is found in most of the charcoal retailing stalls that is disposed of in water drainage systems or in black garbage heaps. The high costs of cooking fuel results in poor households using unhealthy materials such as plastic waste. Further, poor households are opting to cook foods that take a short time to prepare irrespective of their nutritional value.

This article presents experiences with community self-help groups producing charcoal fuel briquettes from charcoal dust in poorer nieghbourhoods of Nairobi for home use and sale. Households that produced charcoal fuel briquettes for own use and those that bought them saved 70% and 30% of money spent on cooking energy respectively. The charcoal fuel briquettes have been found to be environmentally beneficial since they produce less smoke and increase total cooking energy by more than 15%, thereby saving an equivalent volume of trees that would be cut down for charcoal.

Charcoal briquette production is a viable opportunity for good quality and affordable cooking fuel. Bioenergy and waste management initiatives should promote recovery of organic by-products for charcoal briquette production.

Behaviour change for better health: nutrition, hygiene and sustainability

MAY 15, 2013 · 0 COMMENTS

Behaviour change for better health: nutrition, hygiene and sustainability. *BMC Public Health 2013, 13(Suppl 1):S1*

- Full text

Rachel S Newson, et al.

As the global population grows there is a clear challenge to address the needs of consumers, without depleting natural resources and whilst helping to improve nutrition and hygiene to reduce the growth of noncommunicable diseases. For fast-moving consumer goods companies, like Unilever, this challenge provides a clear opportunity to reshape its business to a model that decouples growth from a negative impact on natural resources and health. However, this change in the business model also requires a change in consumer behaviour. In acknowledgement of this challenge Unilever organised a symposium entitled 'Behaviour Change for Better Health: Nutrition, Hygiene and Sustainability'.

The intention was to discuss how consumers can be motivated to live a more healthy and sustainable lifestlye in today's environment. This article summarises the main conclusions of the presentations given at the symposium. Three main topics were discussed. In the first session, key experts discussed how demographic changes – particularly in developing and emerging countries – imply the need for consumer behaviour change. The second session focused on the use of behaviour change theory to design, implement and evaluate interventions, and the potential role of (new or reformulated) products as agents of change.

In the final session, key issues were discussed regarding the use of collaborations to increase the impact and reach, and to decrease the costs, of interventions. The symposium highlighted a number of key scientific challenges for Unilever and other parties that have set nutrition, hygiene and sustainability as key priorities. The key challenges include: adapting behaviour change approaches to cultures in developing and emerging economies; designing evidence-based behaviour change interventions, in which products can play a key role as agents of change; and scaling up behaviour change activities in cost-effective ways, which requires a new mindset involving public–private partnerships.

Dan Campbell, Knowledge Resources Specialist
WASHplus Project
1825 Connecticut Ave NW
Washington DC 20009
Email: dacampbell@fhi360.org
Phone: (202) 884-8887
Website: http://www.washplus.org

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Message

From: David Stillman [ppafoundation@gmail.com]
Sent: 12/29/2016 11:33:44 PM
To: Mitchell, John [Mitchell.John@epa.gov]
Subject: PPAF Featured in GACC News!

PPAF INSIDER

Public Private Alliance Foundation

December 29, 2016

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Special Edition:

PPAF Featured in "Partner Spotlight" of the Global Alliance for Clean Cookstoves Newsletter

Thank you to the Global Alliance for Clean Cookstoves and to our Board, Senior Fellows, Volunteers, Interns, Associates, Collaborators and Donors who make our work possible. The article is given below, plus links to it and to the GACC December Newsletter.

"Most Haitian families are caught in the poverty – respiratory disease – deforestation trap of the country's heavy reliance on charcoal for cooking. The Public-Private Alliance Foundation (PPAF), a non-profit based in New York, promotes a business approach for poverty alleviation, and since the 2010 earthquake, has focused on Haiti and on ways to help families exit that trap.

Established with support from United Nations ambassadors from Madagascar, the Dominican Republic and Haiti, PPAF has conducted various development activities in these countries, and convenes seminars at the UN and elsewhere

to bring attention to energy and climate change, sustainable development, and gender and public health issues.

PPAF conducts research, acts as a voice for clean cooking and women's empowerment, and takes steps toward commercialization of low-cost cookstoves fueled by ethanol from Haitian sugarcane and other agricultural sources, as well as biogas and solar power.

Organizations including Rotary, churches, businesses, Project Gaia, and the Haitian-American business group SiMACT helped launch cookstove fieldwork at several sites, and PPAF has cooperated with distillers and farmers, social entrepreneurships, and nonprofits active in Haiti. Research for the Inter-American Development Bank focused on ethanol fuel production, cookstove use, and building greater awareness of possibilities in the sector, including turning waste products from distillation into additional value streams. Research for the UN Environment Programme enabled PPAF and Haitian company D&E Green Enterprises to jointly design and consumer-test a new stove named "Recho EcoVit" - ecological and fast.

Currently PPAF is working on the fuel side. This includes providing advice and guidelines for small-scale distillers to improve capacity and profitability in moving from beverage alcohol to fuel-grade ethanol, and collaborating with owners to determine priorities and seek funding for distillery upgrades. Regarding biogas, PPAF draws from innovations by Solar C^3ities and HEART in Haiti and works with KDCK, a Haitian nonprofit, to install low-cost biodigesters that use kitchen, agricultural, or animal waste for family and school cooking. Also PPAF collaborates with Solavore LLC and its Haiti representative concerning small solar ovens.

PPAF also promotes the stoves and fuel, educational materials, and relevant events of other organizations. This includes the prize-winning documentary "Death by a Thousand Cuts" which explores the clandestine trade in charcoal from the Dominican Republic to Haiti. PPAF encourages awareness and purchase of improved charcoal stoves from D&E Green and charcoal briquettes made from sugarcane bagasse by Carbon Roots International. PPAF also promotes reforestation by "A Dollar a Tree for Haiti" and microfinance and remittance institutions dealing in clean energy solutions, such as Arc Finance. These efforts are accomplished mainly through the PPAF e-newsletter and through seminars, for example at the UN during sessions at the Commission on the Status of Women.

Being a partner in the Global Alliance for Clean Cookstoves is very important to PPAF. It is a platform for information, networking and fundraising. Membership provides identity in relation to contacts and collaborations. PPAF also maintains linkages with the UN Economic & Social Council, the UN Department of Public Information, the UN Global Compact, the Global Gender & Climate Alliance, the Roundtable on Sustainable Biomaterials, and the UN Association of the USA and its Council of Organizations. Through these partnerships, PPAF is able to offer and receive support relevant to the Global Alliance, including speaking engagements and

references that connect cookstoves and international policy concerns, in the context of the UN Global Goals for Sustainable Development.

For further information please visit the website www.ppafoundation.org and on its Welcome page the short video 'Cookstoves in Haiti: Recent Work and Collaborations by PPAF.' "

The above article appears at this link.

To read the full Global Alliance for Clean Cookstoves December Newsletter, please **click here**.

END-OF-YEAR GIVING

Please make a 2016 end-of-year gift to the Foundation to benefit our work in Haiti, the Dominican Republic and Madagascar. Your gift is tax-free under U.S. laws. You can click on our website (donate button at top right, to give through PayPal, or click on the Razoo link for GivingTuesday.

In January Senior Fellow Tom Setchel and another colleague will travel to Haiti to work with several organizations, on ethanol distilleries, installing two biodigesters, and promoting use of solar stoves. Your gift will promote this work and other upcoming activities.

HOW YOU CAN WORK WITH THE FOUNDATION

Your contributions make it possible for the Foundation to continue our work in bringing organizations and people together for sustainable development and clean energy. "Like" us on Facebook, view our videos on YouTube, join us on Linked In and receive our Twitter feeds.

(1) **Donate Directly.** It's quick, safe and easy to give online. Go to www.ppafoundation.org and click on the donation button you prefer. Please consider a monthly gift. You can also mail a check directly to Dr. David Stillman, PPAF, 166 Edgars Lane, Hastings-on-Hudson, NY 10706, USA. The Foundation is a 501(c)3 non-profit organization. Its EIN is **71-1016293.**

(2) **Become a Corporate Sponsor**. You'll be listed on our website and in our newsletter as a corporation that supports important work in agribusiness, clean energy, and broad assistance to people in Haiti, the Dominican Republic and Madagascar. Contact David Stillman at ppafoundation@gmail.com

(3) **Give through smile.amazon.com** Whenever you make a purchase through Amazon.com, please enter smile.amazon.com . When you start that account, choose Public-Private Alliance Foundation and a fraction of your purchase price will go to PPAF. It costs you nothing, and PPAF programs benefit from your action.

(3) **Live Green!** If you live in Connecticut, Massachusetts, New York, New Jersey, Pennsylvania, Maryland, Delaware, the District of Columbia, Virginia or Illinois, you can help by changing your electricity provider to Viridian Energy. (Depending on where you live, you may also be able to switch your gas provider.) This saves money and supports green energy and a smaller carbon footprint, with the Foundation earning a small fee. Click here to learn more, and feel free to contact us. Go to www.viridian.com/PPAF or call 914-478-3450; email ppafoundation@gmail.com. You can watch a great 2-minute video by clicking at the top right on our page.

(4) Volunteer, serve as an intern, or get involved as a professional. Use the information above to contact us.

Contact us: David Stillman, Executive Director, Public-Private Alliance Foundation, 166 Edgars Lane, Hastings-on-Hudson, NY 10706. Email: ppafoundation@gmail.com

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Moving Forward on Clean Cooking Standards: Updates from Malawi and Ethiopia

Webinar Q&A

September 17, 2020

Presenters:

Khadija Mussa, EnDev Malawi

Solomon Alemu, MoWIE Ethiopia

Alemayehu Zeleke, SNV Ethiopia

Can you please clarify the terminology clean cookstoves vs. clean cooking solutions?

Ethiopia: Clean cookstove refers to the stove while cooking cooking solution goes beyond just the technology. It covers the fuel, stove, availability, acceptability, management, etc.

In Malawi, we use the term CLEANER (**C**onvenient (fast, appropriate); **L**ess smoke; **E**fficient on fuel use; **A**ffordable and available (accessible); **N**ot harmful (safe) **E**asy to use and aesthetic (buy beautiful, cook easy); **R**obust (durable, strong and long lasting) as opposed to clean because we recognize that it is not a stove or fuel that is "clean". Rather, it is how the fuel is prepared and how a stove is operated. For example, for wood stoves, a CLEANER solution would mean that a stove is being operated in a way to achieve a clean combustion, especially if the fuel is dry.

Can wood stoves really be clean? If so, what tier levels have been reported for the stoves?

Ethiopia: It depends upon the design of the stove, stoves such as forced draft biomass stoves are operating with high thermal efficiency and minimal emission can be classified as clean.

Malawi: Wood stoves can be CLEANER (not entirely clean) depending on how the stove is being operated in a way to achieve a clean combustion. Part of the awareness raising on cooking with firewood incorporates messaging on how to dry firewood as opposed to cooking with wet firewood which is more harmful by producing more smoke. Dwindling forests through unsustainable wood use is the biggest concern in Malawi, as opposed to emissions, as most cooking is done outdoors or in well ventilated places. Therefore the National Cookstove Steering Committee (NCSC) Technical Working Group that fed into the draft domesticated standards decided that our priority in Malawi and important criteria for cookstoves are Thermal Efficiency (20% for firewood cookstoves and 30% for charcoal stoves), Safety and Durability. For a stove to be regarded as meeting satisfactory standards, its Thermal

Efficiency score should be anything above 20% (Tier 2 as to the ISO VPT Voluntary Performance Targets) and its Safety score should at least be 68% or above (Tier 2 as to the ISO VPT).

Are you including ethanol stoves in your testing and development efforts?

Ethiopia: Yes.

Malawi: The NCSC has recently begun to have the ethanol for cooking conversation with 2 stakeholders in the committee looking to promote ethanol stoves. It is still in the early stages because in Malawi, ethanol production is very seasonal and mostly used for petrol blending and human consumption (locally brewed kachasu). That makes it not so competitive as a cooking fuel since ethanol prices are pegged to the petroleum import prices, thus not competitive compared to LPG on cost-benefit. The NCSC ethanol members are looking to develop prototypes of ethanol stoves so that local communities can use their ethanol produced in rural areas with subsidized stoves as it is done in Ethiopia.

Do you have standard on wood as fuel?

For the case of Ethiopia, we don't.

No, Malawi does not have standards on wood as fuel because it would not make sense to do so. Wood is a naturally occurring substance and it will always depend on how it is cut, dried and fed into a fire or stove. Wood that is wet and wood that is dry will have very different emission rates. We do have standards for processed fuels such as charcoal, charcoal briquettes and coal briquettes, because in those cases, you can look at the way the original input material has been refined and examine factors such as moisture level, ash content, etc. For wood-related standards, we have standards on cookstoves, including wood cookstoves.

Could you explain Malawi and Ethiopia's take on preparedness in terms of supporting the producers on cutting the costs of establishing testing centers and Business Development Services? Testing must be embraced as a business culture aimed at placing the best quality product on the market.

Ethiopia: It depends on the situation, there are some activities to enhance the stove labeling programme that the Government is interested to cover the cost of stove testing (for certain number of stoves) to encourage producers to voluntarily participate in the labelling program.

Malawi is trying to limit the standards requirements to parameters that can be tested within country and that even a stove producer can test for (fuel consumption, safety) during product development before sending a prototype to a recognized testing facility.

Have you seen a correlation between the development and roll out of these standards and higher adoption of improved cookstoves by the public?

Ethiopia: It is too early to comment on the impacts of standard on the adoption of improved cookstove.

Malawi's standards **will be voluntary** when they are finally rolled out. At the present moment, they are still draft versions waiting approval by the MBS Board so it is still too early to tell with regard to adoption by the public.

Do you track usage of different types of stoves and fuels sold?

Ethiopia: Usage tracking is a difficult task that requires huge investment. However through impact assessment it has been tried to get some information on usage rate of stoves in randomly selected households and the result was encouraging.

Malawi: Some companies and organisations track usage of their stoves and fuels depending on their program and funding requirements or company structure setups. They do this for different purposes. LPG distributers track usage so that they can compare with usage of charcoal and determine their early adopters/market. Other organisations/companies track their usage to determine adoption of their stoves or fuels in their target areas and determine whether to conduct more awareness raising or introduce more varieties or source more funding. It varies based on who and why?

Questions to Malawi:

How long do the chitetezo stoves last? 2 million stoves is over what time period? What is the price for these stoves (USD equivalent)?

Currently, the Chitetezo Mbaula is documented to last on average 47 months (as per a survey of a carbon credit programme document published by HESTIAN). EnDev actually counts stoves on a semesterly basis, incorporating only stoves that have been distributed not more than 2 years prior and takes a conservative estimate of 2 years lifespan. However, there are plans to conduct new surveys to determine the lifespan of Chitetezo Mbaula that have been distributed over the years as we do know that there are some stoves that have lasted even 5-8 years.

The 2 million stoves count is from the year 2013, when the Malawi president declared the goal of 2 million improved stoves to be reached until the end of 2020. We have currently surpassed this goal by a little over 40,000 and are in the process of verifying and updating the online database.

The Chitetezo Mbaula costs MWK1,500 retail price which is equivalent to USD2. Wholesale at the production site can be nearly half of that.

How can I get information on your database? Is it public? [Related: How can we find the map you mentioned?]

The website for the database is [HYPERLINK "https://energypedia.info/wiki/Malawi_Cookstove_DB"]

I understand that the priorities in Malawi were efficiency, safety and durability. Are emissions of PM and CO included in the standards?

Emissions are included in the standards. However, as Malawi is unable to test them (we do not have the required equipment in our labs), we have resolved to importing stoves that come with certified test data from accredited labs for emissions rates that are acceptable according to our standards. The priorities that Malawi has set therefore, are used for our testing protocols (which we have adapted from the ISO and domesticated to define our own tier levels). We also advocate for cooking practices that reduce harmful emissions, such as drying firewood adequately, cooking outdoors in **clean** ODF Zone areas (Open Defecation Free zone) when possible to dilute stove emissions and building well ventilated

kitchens if cooking occurs indoors, especially in the rainy season. Ventilated kitchen designs are part of the government's ODF Zone guidelines. There are 9 districts to date that have been declared ODF Zones adhering to these guidelines which are health-related, discouraging cooking outdoors to prevent winds transporting harmful debris into food unless ODF.

What was needed to "domesticate" the standards? What departure/complement/adjustments from ISO were needed?

This process involved take-aways from the general NCSC membership, the NCSC Technical Working Group defining the benchmarks of our tier levels and taking part in the Malawi Bureau of Standards' (MBS) National Technical Committee (NTC) meeting where final draft Malawi Standards on adaptation/adoption/domestication of ISO19867-1 was discussed. To do this, we looked at Draft Malawi Standards DMS 1512-1: 2019, DMS 1512-3: 2019 and DMS 1513: 2019:

- Standard test sequence for emissions and performance, safety and durability
- Voluntary performance targets for cookstoves based on laboratory testing
- Clean cookstoves and clean cooking solutions —Vocabulary

The MBS NTC was a wide stakeholder group from all sorts of sectors related to cooking. Health, gender, civil society, academia, donors, scientists, manufacturers/producers of technologies, the NCSC, etc. The draft standards documents, upon agreement, were then submitted to the MBS Board for consideration. These standards will initially be voluntary once approved.

In many cases, Energy Ministries don't consider a cookstove to be an "energy" matter - it is only a device which transfers energy from fuel to a cooking vessel. How does the Malawi Energy Ministry manage to prioritize this?

The Malawi Ministry of Energy, through one of its Departments (the Department of Energy Affairs) is actually the Chair of the National Cookstove Steering Committee (NCSC), which was established in 2013 after the Malawi President had declared that Malawi would contribute 2 million cleaner cookstoves towards the commitment of the Clean Cooking Alliance. The NCSC was created to establish a roadmap how to achieve the ambitious goal and to monitor progress towards the goal. This homegrown multi-stakeholder platform has since amalgamated the cooking energy sector and brought together a multitude of stakeholders, putting the cookstove-topic high up on the political agenda. The NCSC's main mandate is to catalyse the adoption of CLEANER cookstoves in the country, most recently achieving (and surpassing) the goal of 2 million cookstoves adopted by the end of 2020. The DoEA conducts its work in the NCSC with support from various stakeholders (e.g.: EnDev, United Purpose, MCHF, the MBAULA Network, CISONECC, etc). The support offered guides the Department on what the priorities of the country are, how to ensure an enabling environment for the private sector and the market to thrive, how to communicate and raise awareness, what are the technical aspects to consider when spearheading these initiatives, and so on. One of the MoE's most recent victories was the lobbying by the NCSC, through the DoEA, of VAT removal on LPG, wood stoves and LPG cylinders last year which was finally approved by the Ministry of Finance.

If Malawi intends to have stoves tested at outside labs, how will the appropriateness of the fuel used and representativeness of the cooking sequence be assured?

Malawi as a country does not intend to have stoves tested at outside labs. The only outside test results that will be accepted in Malawi will be for emissions testing for imported stoves as they will be required

to come with certification of test results that meet our emissions standards. Malawi does not have the capacity to test for emissions right now. There are, however, a few donor-funded projects that have sent stoves for testing outside (e.g.: EnDev sent the Chitetezo Mbaula to CREEC in Uganda to be tested using the new ISO protocols, no CCTs have been done outside the country, those are only done within country to ensure representativeness) or intend to send stoves outside to compare results there with the results obtained in-country (e.g.: MCHF intends to send a few stoves outside to be tested and have the same tests also conducted at a testing facility in Malawi for comparison purposes). When EnDev sent the Chitetezo Mbaula to Uganda, it was sent together with instructions on how to feed the stove with firewood, appropriate sizes/quantities of the firewood, etc. The stove also uses agri-residue but the test was requested with firewood use only.

Malawi has a large deposit of Kaolin at Dedza; how useful has it been to the ceramic linings of stoves produced in Malawi?

The Kaolin deposits in Dedza are suitable for high-temperature refractory bricks that get exposed to temperatures above 1,200 °C. The downside is that they also have to be fired at high temperatures, which makes the firing process wood-consuming and expensive. The kaolin was tried for fire-chambers of institutional stoves, but it is an overkill for household-stove ceramic liners. We also found that the red clay is more temperature elastic, much cheaper and found everywhere in the country. Therefore the Chitetezo Mbaula, which is made completely out of clay, not as a lining for the stove, is made from red clay and not kaolinitic white clays. There are also other stoves, eg: KCJ stoves, with ceramic lining that are made nationwide wherever there are clay deposits, including in Dedza, which also has spectacular red clay. There are several Chitetezo Mbaula stove production groups in Dedza, most of which are our best performing groups.

How different are those different stoves you have in Malawi, in terms of emission levels and efficiency? What test methods do you use for testing those stoves?

Malawi has not much different stoves than other countries. The KCJ-type stove is the baseline for charcoal. What makes the Chitetezo Mbaula different from the Kenyan Upesi stoves, from which it was originally inspired is that there has been a lot of the rocket stove principles applied to make the stove as efficient as possible: it is as high and narrow as possible to keep the fire hot but not causing excessive instability of the stove, and the door was made smaller to limit excess cold air entering the fire chamber. The pot-rests are lowered to 15 mm to ensure an optimal heat transfer into the bottom of the pot as the flue gases are forced through the small gap.

How do you carry out testing for fixed stoves?

The manufacturers of the fixed stoves come and build a stove at the testing lab. We have had 4 fixed stoves built/fixed at the lab for testing in the last round of tests conducted by MBS.

Are the stove designs and material used 8 years ago the same as the stoves being disseminated now?

Yes and no. There have been design upgrades over the years for some stoves, eg: Chitetezo Mbaula and our KCJ-type stove, while using the 'same' clay, which of course has a wide variety of properties, depending on the clay source. There have also been new materials (or material sources) introduced to some stoves. Other stoves have not changed at all.

Questions for Ethiopia:

What is your minimum performance standard for biomass stove to be called improved over the baseline stove?

The minimum requirement for biomass stove is as indicated in this table:

Type of stove	Thermal [a] efficiency %	Emissions [a]		Safety [b]	Durability [a]
		CO g/MJd	$PM_{2.5}$ mg/MJ d		
Natural draft solid biomass stove	≥20	≤7.2	≤ 321	≥ 77	< 20
Forced draft solid biomass stove	≥30	≤4.4	≤218	≥ 77	< 20
Charcoal	≥30	≤ 4 .4	≤218	≥ 77	< 20

How is the Ministry working advance the design of the stoves in Ethiopia, since the existing design has been around for many years?

Yes, we have been using some of the stoves for many years. However there are a lot of efforts by the government and private sector advancing in the design of stoves (induction Injera baking stoves, gasifier, variety of locally produced electric stove). The government welcomes any innovative cookstove technology that fits Ethiopian cooking habits and is affordable.

Can you explain more about what you mean by acceptability testing?

Acceptability testing is the qualitative assessment of a stove to measure its performance at field level and collect feedback of the stove from the households using it. The assessment reports:

- the applicability and use of the stoves in the specific locality
- the acceptance of the stove related to income and environmental aspects
- the attitude of the beneficiaries towards the use of improved stove against competitive baseline stove with relation to the issues of health, expenditure and socio-cultural aspects
- whether the use of stove will lead to an improvement of social and economic situations of the households.

Moving Forward on Clean Cooking Standards:

Updates from Malawi and Ethiopia

September 17, 2020

CLEAN COOKING ALLIANCE

ISO

EPA

Purpose of the webinar

- **Share updates and lessons** from two countries that have made progress on standards adoption and implementation since the 2019 regional dissemination workshop in Kampala
- Provide an **opportunity for exchange between countries** in similar stages of the standards adoption/ implementation process
- **As you listen, please consider:**
  - How might the experience in the presenter's country be applicable to my own efforts?
  - Which of the challenges mentioned do we have in common? How might we use similar approaches to overcome those challenges?
  - Which of their strategies to adopt and/or implement standards might we replicate? What can I do in the next month to move forward?

Outline

- Welcoming remarks
  - John Mitchell, U.S. Environmental Protection Agency
- TC 285 Updates
  - Richard Ebong, Uganda National Bureau of Standards and TC 285 Chair
- Country examples of post-workshop progress towards standards adoption and implementation:
  - Malawi
    - Khadija Mussa, EnDev Malawi
  - Ethiopia
    - Solomon Alemu, MoWIE Ethiopia and Alemayehu Zeleke, SNV Ethiopia
- Q&A / discussion

Webinar features

Welcome to the webinar! A few important notes:

- All attendees are muted (in listen-only mode).
- If you are having trouble hearing the webinar, please first check your "audio settings" at the bottom of your screen (click on the up arrow "^" next to your microphone icon to access the menu and select "audio settings").
- Q&A:
  - You can use **Q&A** feature (at the bottom of your screen) to ask questions during the webinar.
  - Your question will not appear to other attendees until it has been answered by a panelist or host.
  - Don't worry if your question isn't answered right away! **We will save most questions for the end.**

Polling Question #1:

What type of organization do you work for? (select one)

- Government Standards Bureau
- Government Agency - Other (Not Standards Bureau)
- University / Academic Institution
- Non-Governmental Organization or Network/Association
- Private Testing Lab
- Private Company (Other)
- Bilateral or multilateral donor/agency (e.g., GIZ, AFD, World Bank etc.)
- Independent
- Other

Polling Question #2:

Did you attend one of the previous workshops held in Kampala in 2019 or Kathmandu in 2018?

- Yes, I attended one of those two workshops
- My organization sent a participant, but I didn't attend directly
- No, no one from my organization attended either workshop

ISO Standards Workshops, Kathmandu, December 2018

ISO Standards Workshops, Kampala, July 2019

Recap of dissemination events

- WHO Guidelines and ISO Standards Implementation Policy Workshop and Laboratory Testing Workshop held concurrently in
  - Kathmandu, Nepal, December 10-14, 2018
    - Participants from Nepal, India, China, Cambodia, Bangladesh, Timor Leste, Mongolia, Myanmar, Laos, and Bhutan
  - Kampala, Uganda, July 22-26, 2019
    - Participants from Uganda, Malawi, Tanzania, Botswana, Kenya, Mozambique, South Africa, Nigeria, Ghana, Rwanda, and Ethiopia
- Implementation Policy Workshops included
  - Information on WHO guidelines and ISO standards
  - Mapping goals, policies, programs, stakeholders, and data needs
  - Visit to testing laboratories
  - Development of draft country action plans

ISO/TC 285 Clean cookstoves and clean cooking solutions - Standards/Projects

1. ISO 19867-1:2018 Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 1: Standard test sequence for emissions and performance, safety and durability

2. ISO/TR 19867-3:2018 Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 3: Voluntary performance targets for cookstoves based on laboratory testing

3. ISO 19869:2019 Clean cookstoves and clean cooking solutions — Field testing methods for cookstoves

4. ISO/TR 21276:2018 Clean cookstoves and clean cooking solutions — Vocabulary

ISO/TC 285 Clean cookstoves and clean cooking solutions - Updates on Nairobi Resolutions

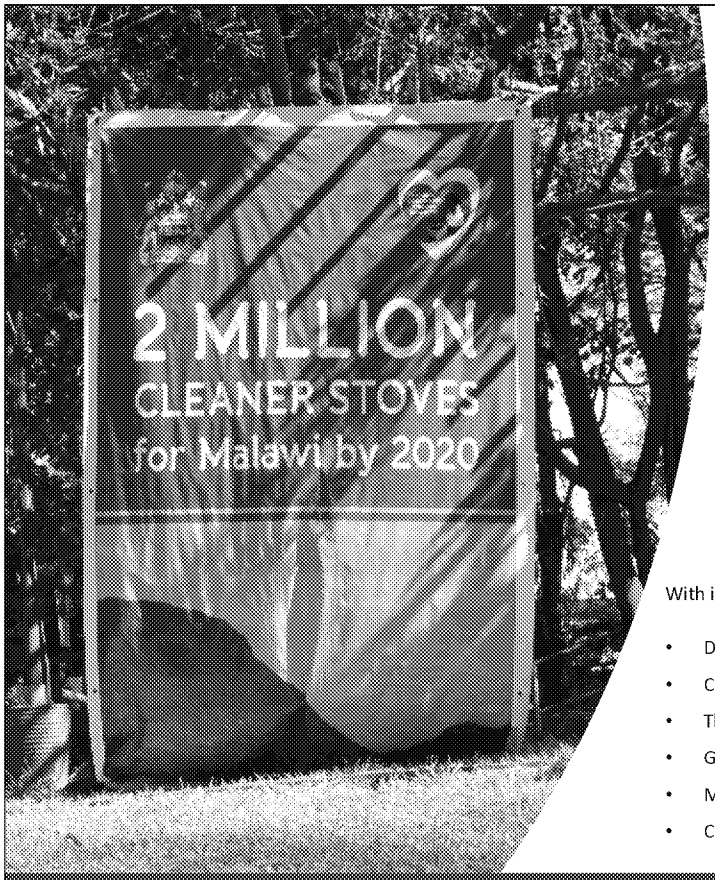
1. Resolution 28 (2019): Regarding Establishment of a Task Group on Standards Adoption and Implementation of Laboratory Testing Method – Work in progress
2. Resolution 29 (2019): Regarding Establishment of a Task Group on Standards Adoption and Implementation of Field Testing Methods – Work in progress
3. Resolution 30 (2019): Safety for Liquid and Gas Stoves Safety – Work in progress
4. Resolution 31 (2019): Regarding a New Work Item Proposal on Test Protocol for Institutional Stoves -
    1. Uganda developed NP; balloting is closing soon
    2. Uganda identified Project leader – Dr. Juliet Kyayesimira
    3. WG2 Convenor appointed – Eng. Jim Jetter (USA)

ISO/TC 285 Clean cookstoves and clean cooking solutions - Updates on Nairobi Resolutions

1. Resolution 32 (2019): Regarding a New Work Item Proposal on Test protocol for stoves for Both Cooking and Space Heating – Pending development of NWIP (Nepal)
2. Resolution 33 (2019): Progression of ISO/NP TR 19915, Clean cookstoves and clean cooking solutions – Guidelines for social impacts – at final stage
3. Resolution 34 (2019) Regarding the Reactivation of the Conceptual Framework – in progress
   1. Convenor - Mr. George Sizoomu (Uganda)
   2. Project Leader - Dr. Paul Medwell (Australia)
   3. Convenor Support - Prof. Tami Bond
4. Resolution 36 (2019): WG3 Disbandment – disbanded

Next steps on dissemination path

- Follow-up activities with participants from the Asia and East Africa Regional Policy Workshop and Laboratory Testing Workshop held concurrently
  - Remote meetings to provide updates and discuss challenges, accomplishments, and upcoming activities
  - Webinars highlighting implementation progress
  - Videos on specific aspects of testing, challenges from the field – and how those challenges are being overcome
- Pre-work with West Africa and Latin America Stakeholders in advance of in-person workshops
  - Translating lab standard and VPTs into French and Spanish
  - Developing a series of remote presentations
  - Upgrading testing laboratories



Post-workshop progress: Updates from Malawi

Khadija Sungeni Mussa

GIZ Energising Development (EnDev) Malawi

With inputs from:

- Dr. Maxon Chitawo (Mzuzu University)
- Christopher Kachinjika (Department of Energy Affairs)
- Thomas Mchipha (Ministry of Health)
- Gunseyo Dzinjalamala (Malawi Bureau of Standards)
- Mayamiko Minofu (United Purpose)
- Christa Roth (GIZ Energising Development (EnDev) Programme)

Honorable
Newton Kambala

Minister of Energy

Malawi
Government

Status as of July 2019: Lab testing for cookstoves and fuels in Malawi

Currently no certified national testing lab in Malawi

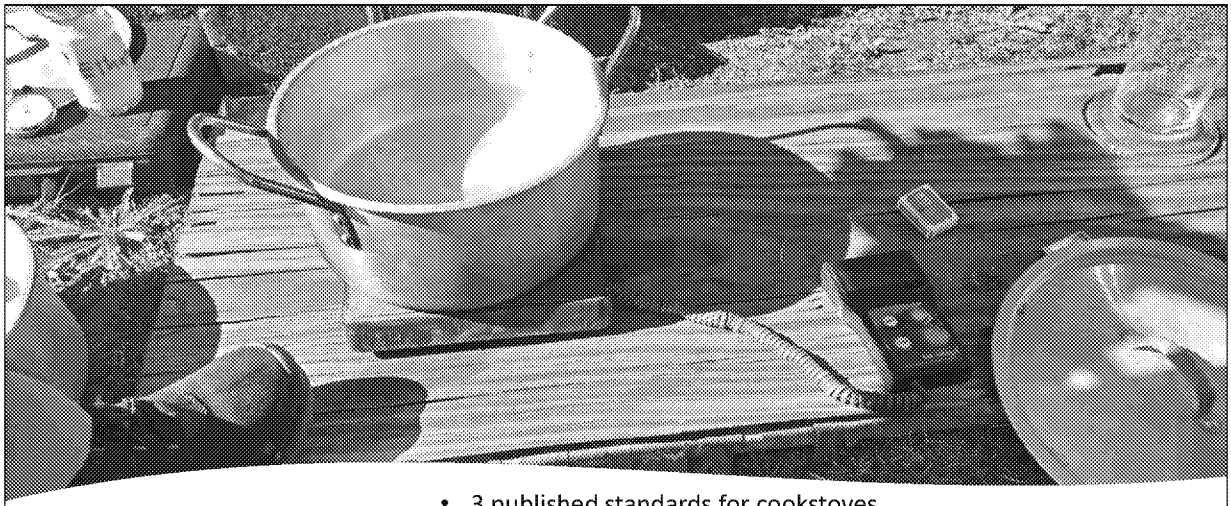
- Stove tests have been done by various entities
  - United Purpose, Malawi Bureau of Standards, LUANAR, UNIMA Polytechnic College

Cookstoves are tested for:

- Fuel use (thermal efficiency) using the Water Boiling Test (WBT).
- Endurance
- Flame stability
- Gaseous emissions (CO and CO_2, NO_2 and SO_2) with limited capacity

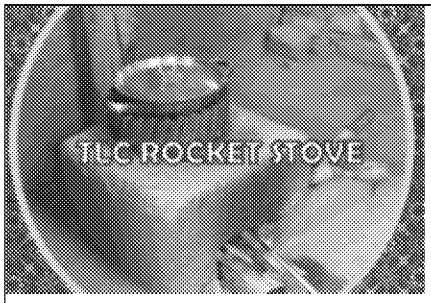
Fuels are tested for:

- Moisture content



Status as of July 2019: Standards for cookstoves and fuels

- 3 published standards for cookstoves
  - MS 155:2000, MS 157:1995 and MS 158:1995
- 1 standard on wood charcoal and charcoal briquettes
  - MS 858:2011
- 1 standard (DMS 900) for coal briquettes under development
  - There are 22 other standards dealing with coal analysis.
- **Key milestones:** bringing Malawi Energy Regulatory Authority (MERA) on board and good stakeholder participation.



Status as of July 2019 cont.

- Cookstove and fuel standards to be reviewed under the **National Standardization Strategy**.
- ISO standards in the process of being domesticated
  - (ISO 19867-1; ISO 19869; ISO 21276 and ISO/TR 19867-3)
- Convening of a National Technical Committee to adopt/adapt the ISO standards scheduled next.
  - Funds and technical support required from industry, academia and MERA.
- The adoption/adaptation process was to be completed by July 2020.
- **Major challenge:** minimal drive of the process from stakeholders.

Kampala Malawi action plans developed: short-term

Action 1: Create and/or consolidate the evidence based data

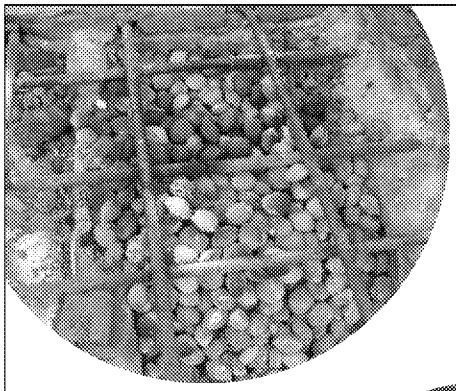
- National Cookstove Steering Committee (NCSC)

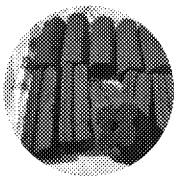
Action 2: Extract what can be included in our standards based on interest and relevance

- National Cookstove Steering Committee (NCSC)

Action 3: Identify and fill the gaps

- National Technical Committee (which already exists and is waiting on the standards' development)

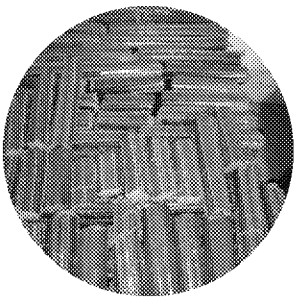




Kampala Malawi action plans: mid-term

Action 1: Include all the parameters of interest to Malawi as per ISO standards

- Malawi Bureau of Standards (MBS)

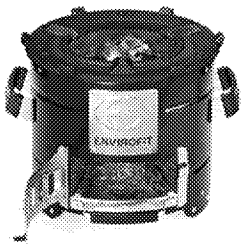


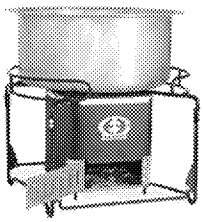
Action 2: Develop regulations on charcoal production

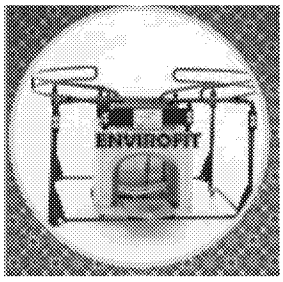
- Department of Energy Affairs

Action 3: Make use of the durability and safety protocols for our testing

- Malawi Bureau of Standards, TCRET and United Purpose







Country action plan: long-term

Action 1: Gazette the newly developed regulations

- Ministry of Natural Resources, Energy and Mining

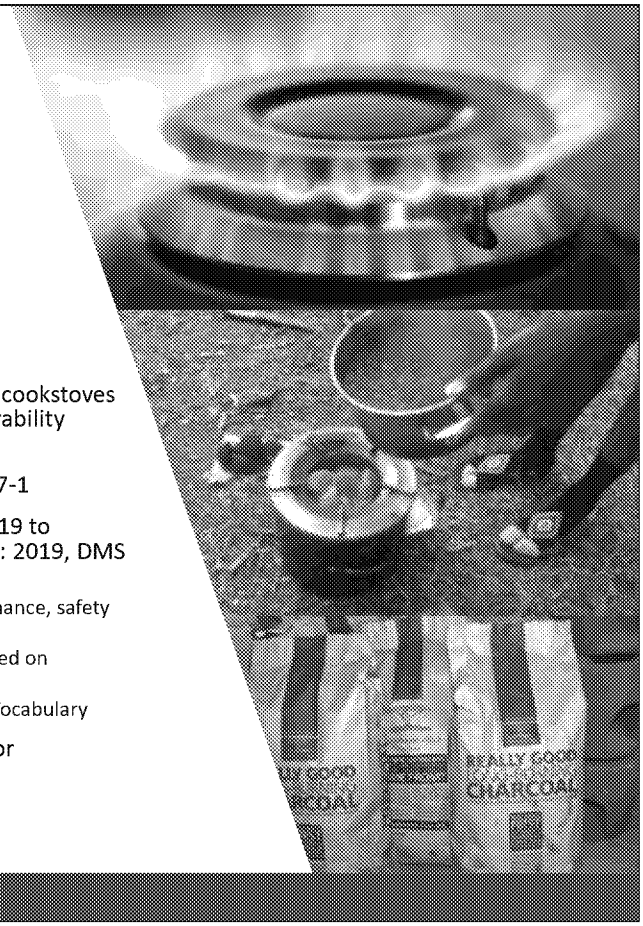
Action 2: Develop an Act to be enacted by Parliament

- Department of Energy Affairs

Action 3: Implementation of voluntary ISO domesticated standards

- Department of Energy Affairs
- Malawi Bureau of Standards

Progress since the workshop



Short-term actions:

✓ all 3 were accomplished

Mid-term Action 1 and 3 are ongoing. Process:

- ✓ NCSC buy-in obtained for Malawi's priorities for cookstoves standards: thermal (fuel) efficiency, safety & durability
- ✓ Final draft Malawi Standards on adaptation/adoption/domestication of ISO19867-1
- ✓ MBS Technical Committee met in September 2019 to discuss the Draft Malawi Standards DMS 1512-1: 2019, DMS 1512-3: 2019 and DMS 1513: 2019
  - Standard test sequence for emissions and performance, safety and durability
  - Voluntary performance targets for cookstoves based on laboratory testing
  - Clean cookstoves and clean cooking solutions — Vocabulary
- ✓ Draft standards were submitted to MBS Board for consideration
- ✓ Standards initially to be voluntary

Challenges encountered

Starting on Mid-term Action 2 and all long-term Actions delayed due to:

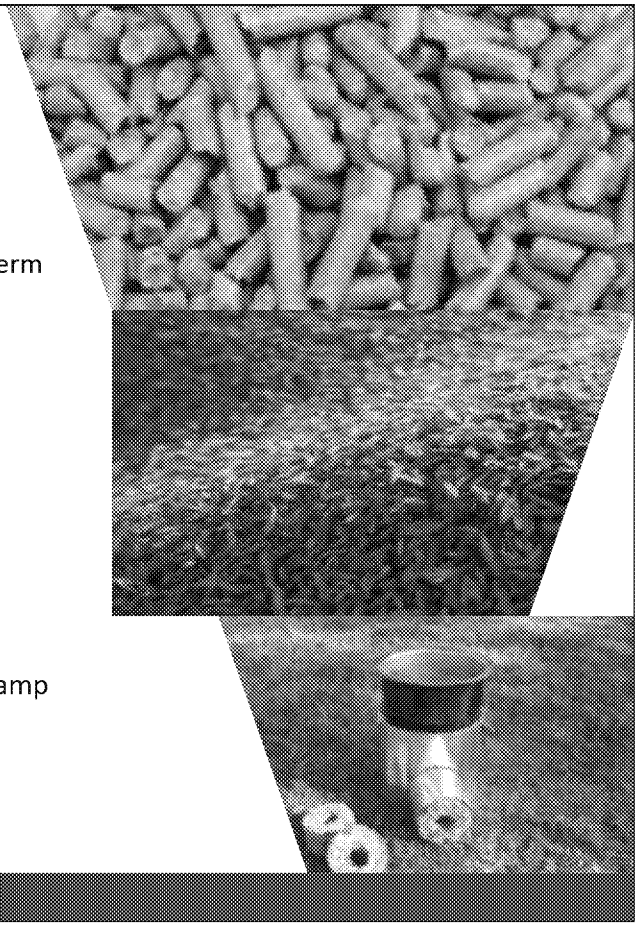
- Political situation: fresh elections and uncertainty of positions
- COVID-19 pandemic, measures and prioritization

Shifting timelines, budgets, deadlines

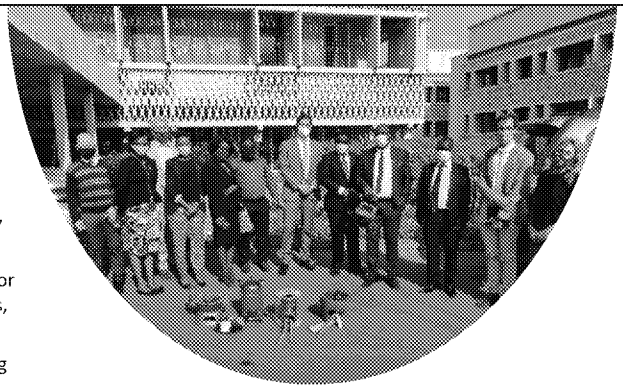
- Online meetings conducted where possible

Unable to host annual CLEANER Cooking Camp

- Set to cement buy-in from various ministries/sectors for mainstreaming clean cooking, labeling and standardization



Key achievements



2020: NCSC met with the new Minister of Energy, Hon. Newton Kambala. Updated him on:

- Current situation, challenges and recommendations for the clean cooking sector, both rural and urban (biogas, LPG, firewood, charcoal, ethanol solutions)
- Voluntary NCSC endorsement label "CLEANER Cooking for Malawi"
- Mid-term Action 2 and all long-term actions

2019: Commitment to develop and gazette biomass energy regulations by the GoM Department of Energy after presentation at Q4 NCSC meeting.

- Zero rating VAT achieved on LPG, LPG cylinders and wood cookstoves after months of lobbying by the NCSC
- Clarity needed for definition of "wood cookstoves" to include charcoal stoves plus recommend a minimum 20% thermal efficiency for firewood stoves and 30% thermal efficiency for charcoal stoves as recommended by the NCSC for new goals
- This will encourage adoption of clean cooking technologies by making them more affordable

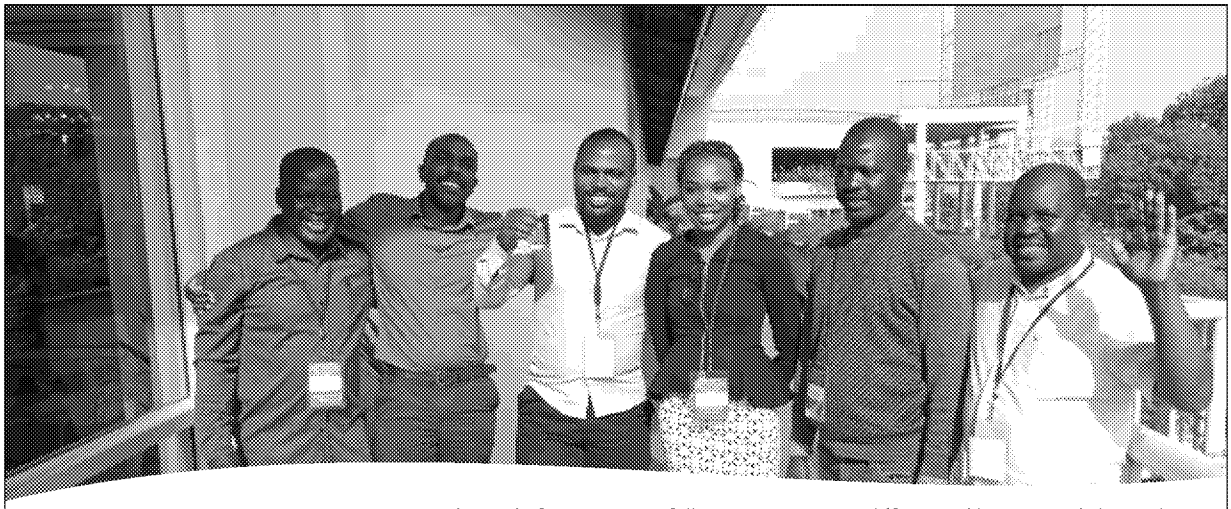
Key achievements

Race to 2 million by 2020: a little over 6,000 stoves to go!

- Majority are the entry-level firewood Chitetezo Mbaula (744,283 of which are EnDev supported, over 554,211 by others)
- Likely to surpass 2mio as some figures are known but not yet verified

Malawi National Database for Clean Cookstoves:

- Tracking and support by GIZ-EnDev through phone calls and physical verification visits
- Contains a map of producers, manufacturers and importers of fixed and portable stoves, plus production/importation figures



Plans moving forward

- Second round of stove testing following WBT protocol (firewood by MBS and charcoal by USAID and UKAid funded MCHF project)
- Efforts to develop lab capacity
  - GoM Reform Program: MBS new laboratory and complex under construction
  - Testing inexpensively in-country for Malawi priority areas
  - Imported stoves to come with certification from an accredited laboratory certifying their emissions tests
- Obtain government buy-in to take a leading role for SEforALL Action Agenda goals: 3.5mio by 2025 and 5mio by 2030
  - Solutions for rural majority population
  - Continue to campaign for shift to improved and alternative fuels for the urban sector, e.g.: LPG which the GoM is on-board with and has begun to streamline

SEforALL Action Agenda Goals

Table 12: Proposed targets for energy access through 2030

Type of energy technology	Percent of total population with access, 2016	Baseline 2016	Target 2020	Target 2025	Target 2030	Percent of rural population with access, 2030	Percent of total population with access, 2030
Electric cookers	<1.0	84,000	94,000	106,000	135,000[25]	4.8	4.0
LPG stoves	<1.0	6,800.00	15,000	34,000	54,000[26]	2.0	1.6
Efficient cook stoves	3.0	500.000	2 million	3.5 million	5 million[27]	100	100
Biogas	<1.0	50	500	1000	2,000	<1.0	<1.0

[25] Estimatel based on current electricity use by domestic customers.
[26] Estimate based on current electricity use by domestic customers.
[27] Estimate based on the Cook Stove Road Map.

Polling Question #3:

What are some of the main challenges your country faces in adopting or implementing clean cooking standards?
(select all that apply)

- Lack of information on standards adoption/adaptation processes
- Need to collect additional country-level information/data
- Competing priorities / lack of buy-in from key government stakeholders
- Private sector concerns / need for additional private sector stakeholder engagement and outreach
- Lack of testing lab capacity or equipment
- Lack of enforcement capacity
- Pandemic (COVID 19)-specific challenges
- Other
- N/A

Post-workshop progress:

Updates from Ethiopia

Presenters

Mr. Solomon Alemu

&

Mr. Alemayehu Zeleke

Organizations

Ministry of Water, Irrigation and Energy

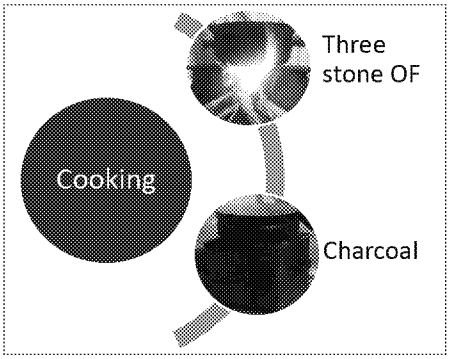
&

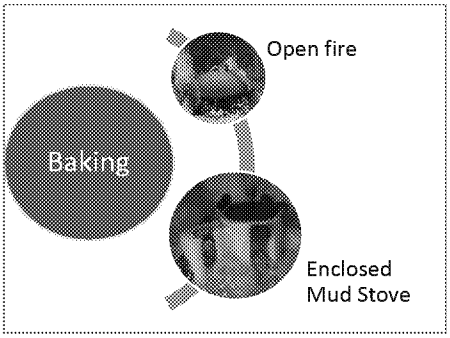
SNV-Ethiopia

Status as of July 2019: Standard

- Initiation was started in 2012
- The First Standards Developed in May 2017
  - ES 6085: 2017 Improved Biomass Cooking Stove - Performance Requirement and Test Methods for Household Biomass Cooking Stove
  - ES 6086: 2017 Improved Biomass Baking Stove-Performance Requirement and Test Methods for Household Biomass Baking Stove

(with financial support by the national UNDP-GEF assisted project)

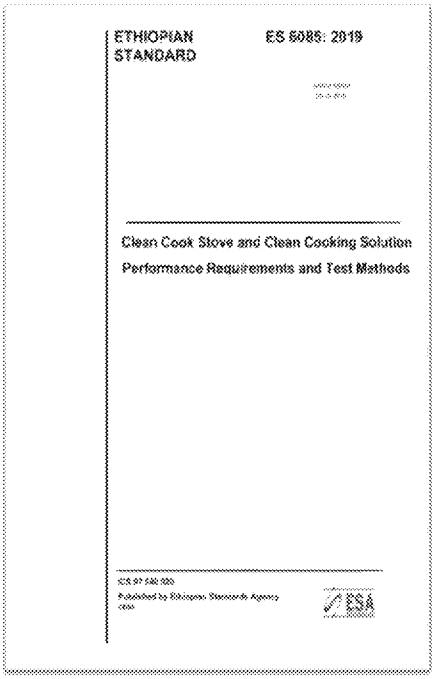




Status as of July 2019: Standard

- These two standards were revised and replaced by ES 6085:2019 “Clean Cook Stove and Clean Cooking Solution Performance Requirement and Test Methods” in line with international standard ISO 19867. This initiation and support were done by SNV-Ethiopia

- Cooking and Injera baking stove Certification Scheme has also developed in 2019 as well


ETHIOPIAN STANDARD

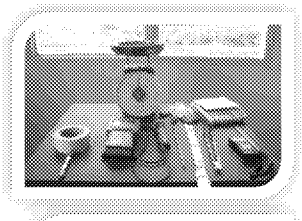
ES 6085: 2019

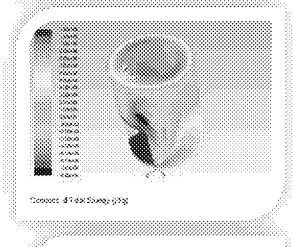
Clean Cook Stove and Clean Cooking Solution Performance Requirements and Test Methods

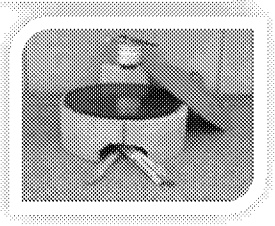
ESA

Status as of July 2019: Testing

Institution	Description
National energy lab and workshop	Testing (WBT, CCT, KPT), Safety, Emission, Product Development, Technology Evaluation, Acceptability, Training
Regional energy office and incubation centers	Testing (WBT, CCT), Acceptability, Incubation
Higher learning institution	WBT, CCT, (Emission), R&D (MSc and PhD thesis), Product Development, Training, Incubation, Testing Facilities
NGOs/bilaterals (such as GIZ and SNV)	Capacity Building, Testing Product Development, Training, Promotion, etc.



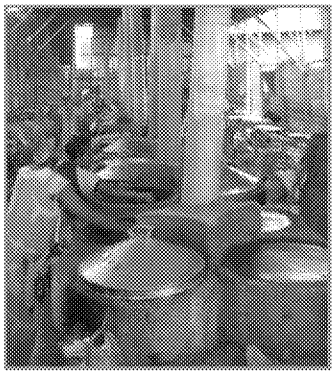




Country action plan: Short-Term Actions (within 1 year)

- **Action 1: Standard enforcement**
  - Familiarize "ES 6085:2019 Clean Cook Stove and Clean Cooking Solution Performance Requirement and Test Methods" for laboratory experts through theoretical and practical training
  - Advocacy at all level of policy makers and developing partners to enforce the standard
- **Action 2: Testing facilitates**
  - Gap assessment on the existing laboratories - expertise, equipment and spacing
  - Enhance/establish the existing testing center
  - Procurement of additional equipment and training on equipment
- **Action 3: Public awareness creation / education**
  - Operationalize the newly established National Alliance for Clean Cooking Solutions
  - Provide training for manufacturer's associations and Alliance to better understand the standard

Country action plan: Medium-Term Actions (1-2 years)



- **Action 1: Enhancing standard enforcement through certification scheme**
  - Joint collaboration b/n national cooking alliance and regional test centre such as CREEC
  - Establishing minimum threshold mechanism for support
  - Advocacy at all level of policy makers and developing partners
- **Action 2: Establish national database for clean cooking stoves to be tested**
  - Ministry of Water, Irrigation and Energy jointly with SNV
- **Action 3: Establish labeling strategy for clean cooking stoves**
  - Develop device labeling mechanism (labeling criteria)
  - Set incentive mechanism for manufacturers of clean cookstoves

Country action plan: Long-Term Actions (2-5 years)

- **Action 1: Standard**
  - Systematic review of the standard (reaffirmation and revision)
- **Action 2: Accreditation of National Testing Center**
  - Implementation of ISO 17067
- **Action 3: Monitoring and evaluation at national level**
  - Impact assessment on standard enforcement and certification and labeling

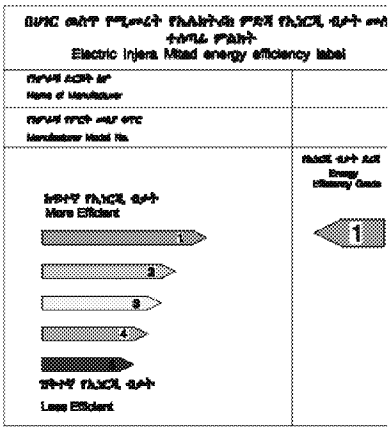
Progress since the workshop

Standard advocacy has been held for stakeholders/ development partners

- Standard launch workshop
- Presentation about the standard on different workshops

Launching of ECCA with the presence of Deputy Commissioner of Ethiopian Forest and Climate Change Commission (EFCCC)

Progress since the workshop



- Training Manual on "ES 6085:2019 Clean Cook Stove and Clean Cooking Solution Performance Requirement and Test Methods"
- Gap assessment on existing testing facilities by Technical Committee TC 101 with financial and technical support of SNV-Ethiopia
- Building of emission hood underway at AAU - Institute of Technology
- Virtual meeting conducted among TC 101 on "Clean Cooking Solution Standard, Certification & Labeling"
- Labeling programme
  - Has been started for locally produced electric injera baking stove and electric cooking stove
  - Under process for biomass stoves

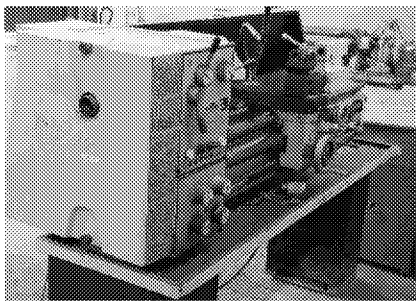
Challenges encountered

Standard

- Unable to popularize the standard (training, advocacy, and awareness creation) as required
- Unable to provide training for manufacturer's associations and alliance for better understanding of the standard

Testing

- Financial constraint to enhance/renovate the existing testing facility



Key achievements

- Gap assessment on the existing testing facility has been done by TC 101
- Establishment of the National Alliance (ECCA)

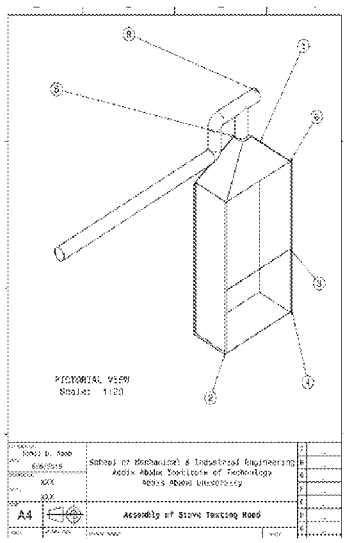
These are done thanks to:

✓ Active participation of some stakeholders and development partners

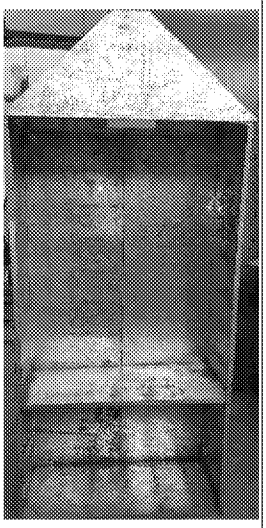
✓ Committed TC 101 members

✓ Technical and financial support from SNV-Ethiopia

Plans moving forward



- Enhance the capacity of the testing facility; add proper emission testing equipment and provide testing service
- Prepare labeling mechanism for biomass cookstoves
- Create awareness and advocate on the enforcement of the Clean Cook Stove and Clean Cooking Solution through:
  - enhancing stakeholder engagement and having common understanding through stakeholder dialogue
  - Provide training for manufacturer's associations and alliance to better understand the standard



Q&A

- To ask a question, please type in your question using the Q&A feature.

Next steps

Following the webinar…

- The presentation recording will be posted online – we will send a link to everyone who registered
- You will receive a survey with follow-up questions on today's webinar
- Next webinar/support session will be ~November or December 2020
- Please let us know if you have ideas for additional webinars/virtual support session topics that would be useful to your efforts
  - Email kgross@cleancookingalliance.org