

OXFAM
RESEARCH BACKGROUNDER

Energy and Women and Girls

Analyzing the needs, uses, and impacts of energy on women and girls in the developing world

Rebecca Rewald



CONTENTS

Oxfam’s Research Backgrounders	2
Author Information and Acknowledgments	2
Citations of this paper	3
Acronyms and Abbreviations	4
Executive Summary.....	5
Introduction	6
Methodology.....	8
Women’s Activities That Require Energy.....	9
Energy Sources Collected, Managed, and Used by Women.....	11
The Burdens of Energy Poverty on Women.....	12
Time burden and drudgery	13
Health and physical burden	14
Information and communication burden.....	16
Does Access to Improved Energy Sources Benefit Women and Girls?... 16	
Improved energy for cooking	17
Energy access, schooling, and literacy	18
The impacts of TV and radio.....	20
Microenterprises, employment, and wages.....	22
Other potential benefits of improved energy access for women	23
Will Simply Providing Access to Energy Help Women and Girls?	24
Do Low-Carbon Energy Sources Benefit Women and Girls?	26
Conclusions.....	28
Where the evidence is strong	28
Where the evidence is mixed, minimal, or unclear	29
Benefiting women requires more than just providing energy.....	30
Recommendations for Energy Policy and Advocacy.....	31
References.....	33
Research Backgrounders Series Listing	42

OXFAM'S RESEARCH BACKGROUNDEERS

Series editor: Kimberly Pfeifer

Oxfam's Research Backgrounders are designed to inform and foster discussion about topics critical to poverty reduction. The series explores a range of issues on which Oxfam works—all within the broader context of international development and humanitarian relief. The series was designed to share Oxfam's rich research with a wide audience in hopes of fostering thoughtful debate and discussion. All Backgrounders are available as downloadable PDFs on our website, oxfamamerica.org/research, and may be distributed and cited with proper attribution (please see following page).

Topics of Oxfam's Research Backgrounders are selected to support Oxfam's development objectives or key aspects of our policy work. Each Backgrounder represents an initial effort by Oxfam to inform the strategic development of our work, and each is either a literature synthesis or original research, conducted or commissioned by Oxfam America. All Backgrounders have undergone peer review.

Oxfam's Research Backgrounders are not intended as advocacy or campaign tools; nor do they constitute an expression of Oxfam policy. The views expressed are those of the authors—not necessarily those of Oxfam. Nonetheless, we believe this research constitutes a useful body of work for all readers interested in poverty reduction.

For a full list of available Backgrounders, please see the "Research Backgrounder Series Listing" section of this report.

Author information and acknowledgments

Rebecca Rewald is a Coordinator for Aid and Agriculture at Oxfam America.

The author would like to acknowledge all those involved in providing support in researching for, writing, and editing this paper. Specifically, the author would like to acknowledge Uwe Gneiting for being a patient editor and James Morrissey for providing guidance and advice on the research and writing process. The author would also like to acknowledge Sasanka Thilakasiri for sharing his expertise on energy and development and the other peer reviewers for this paper, Marc Cohen and Dorcas Robinson, for their constructive feedback. Finally, the author would like to acknowledge Gawain Kripke for commissioning this research.

Citations of this paper

Please use the following format when citing this paper:

Rewald, Rebecca, “Energy and Women and Girls: Analyzing the Needs, Uses, and Impacts of Energy on Women and Girls in the Developing World,” Oxfam Research Backgrounder series (2017): <https://www.oxfamamerica.org/explore/research-publications/energy-women-girls>

For permission to publish a larger excerpt, please email your request to permissions@oxfamamerica.org.

ACRONYMS AND ABBREVIATIONS

COPD	chronic obstructive pulmonary disease
ESMAP	Energy Sector Management Assistance Programme
HAP	household air pollution
ICRW	International Center for Research on Women
IAP	indoor air pollution
LPG	liquid petroleum gas
OECD	Organisation for Economic Co-operation and Development
SMEs	small- and medium-sized enterprises
UNDP	United Nations Development Programme
WHO	World Health Organization

EXECUTIVE SUMMARY

Energy has undoubtedly become a significant part of the development agenda, a reality reflected in the many claims made by members of the development community about the importance of energy access for improving the lives of the poor, especially women and girls. This discourse includes an implicit assumption that, because of the burdens of energy poverty, energy access itself automatically benefits women and girls. This paper tests that assumption and finds that ensuring that energy access provides benefits to women requires much more than simply providing energy.

The paper comes to its conclusion by analyzing the existing literature to look at if and how access to improved energy sources does better the lives of poor women around the world. Additionally, this paper looks briefly at what information exists on the benefits of low-carbon energy access for women in poor, rural communities. In order to explore these topics adequately, the paper begins by asking some key prerequisite questions: What are women's traditional household roles, and what energy sources and services do they rely on to perform these roles? How does a lack of access to modern energy currently affect them?

The review finds sufficient evidence to answer some of the prerequisite questions, but not all. Evidence is strong regarding most of the burdens of energy poverty on women and their energy needs. Specifically, there is abundant evidence on what types of energy women in rural communities in developing countries rely on to complete their household tasks, the most important source being biomass. There is also a significant amount of information on how women are burdened by the lack of access to improved, modern energy sources. Explicit evidence is available on the link between energy poverty and women's health burdens, use of time, lack of access to information, and other factors. When looking at the benefits of energy access for women and girls, there is evidence on the increased use of television and radio, declines in health issues resulting from smoke inhalation, and time saved when women gain access to improved energy sources.

Unfortunately, however, the information on whether women benefit when they gain access to improved energy sources is mostly mixed, minimal, or unclear. For example, it is not clear if providing electricity improves girls' school attendance or girls' and women's levels of literacy and amount of reading. Furthermore, although there is some evidence of a link between improved energy sources and increased employment and salaries for women, the literature on this is minimal and context specific. Similarly, it is unclear what role energy plays in women's microenterprises and consequently whether providing access to improved energy sources will benefit them in that area. This review also finds

that there is inadequate information on whether access to energy sources like electricity and improved cookstoves has the beneficial effect on women that is claimed by the development community, mostly because achieving the adoption of cookstoves in some communities is a challenge. Finally, even though households that have access to electricity tend to purchase televisions and radios, the evidence on whether these purchases benefit women is unclear.

The paper finds that many energy access projects fail to generate the intended beneficial impacts for women for two main reasons: (1) households engage in “fuel stacking”—that is, using traditional energy sources to save costs or to meet their preferences even when they have access to improved sources, and (2) women lack decision-making power within households. This finding indicates that energy access projects need to carefully understand the barriers to using improved energy even when it is accessible. Most important, these projects must be coupled with other development interventions that focus on women’s agency and access to resources. Lastly, literature is scarce on whether low-carbon energy sources are better, worse, or just as beneficial for women, and there is little debate on whether environmental friendliness is more or less important than other criteria like feasibility, efficiency, and low cost.

Based on these findings, this paper concludes with recommendations for the development community concerning energy advocacy, policy, and programming. These recommendations include filling the gaps in current evidence and taking steps to ensure that energy access projects truly improve the lives of women around the world.

INTRODUCTION

Although access to improved energy has been a pressing and important component of development for decades, recently governments and development entities have brought new emphasis to the issue. In 2011, United Nations Secretary-General Ban Ki-moon launched the Sustainable Energy for All initiative, which calls for businesses, civil society, and governments to collaborate to make energy access for all a reality by 2030. In 2015, improved energy access was included as the United Nations’ seventh Sustainable Development Goal, which highlighted the significance of this issue and the consensus on its importance. In 2013, US President Barack Obama launched the Power Africa Initiative, which aimed to increase access to power for people on the African continent. Another proponent of energy access is Bill Gates, who focused his portion of the Bill and Melinda Gates Foundation’s 2016 Annual Letter on energy and development. Even more recently, he launched a \$1 billion clean energy

investment fund with the goal of making clean energy more affordable than dirty energy.

The international community has also identified the need to obtain more gender-disaggregated development data and to understand the effects of development issues on women and girls. This is because society-determined gender roles mean that women and girls have different needs, responsibilities, rights, and opportunities than men and boys. Organizations now often look at scenarios and solutions with a gender lens—that is, they take end-users' gender into consideration when evaluating problems and designing solutions in order to have the greatest impact. “Gender Equality” was identified as the fifth Sustainable Development Goal by the United Nations and has become an increasing priority for development-focused entities. Additionally, many organizations focus specifically on women and girls, such as UN Women, Women for Women International, and the Global Fund for Women. The particular effects of energy access and energy poverty on women have also garnered some attention in recent years as it has become clearer that women and girls obtain, use, and are affected by energy in specific ways that are different from men and boys.

Energy access and energy poverty have been defined and measured in various ways. The International Energy Agency defines modern energy access as “reliable and affordable access by a household to clean cooking facilities, a first connection to electricity and then an increasing level of electricity consumption over time” (IEA, 2013, p. 663). In 2014, a multi-tier approach to measuring energy access was developed, which measures eight attributes of household electricity and household cooking (Bhatia and Angelou, 2014). According to the 2010 *World Energy Outlook*, energy poverty at the household level is defined by two indicators: “the lack of access to electricity and the reliance on the traditional use of biomass for cooking” (IEA, 2010, p. 237). In 2015, it was estimated that 1.2 billion people lack access to electricity worldwide and 2.7 billion people rely on biomass for cooking (IEA, 2015).

For the purposes of this paper, energy poverty is defined as the reliance on traditional energy sources, which include biomass, human and animal energy, kerosene, candles, and batteries. The opposite of energy poverty is understood as improved energy access, and improved energy sources include fossil fuels, solar energy, mechanized energy, ethanol, and liquefied petroleum gas (LPG). Improved energy sources lead to improved energy services such as lighting, cooking, heating, and communication.

This paper uses existing literature to answer the following questions:

- What activities do women and girls in developing countries perform that require energy?

- What sources of energy do women and girls currently use to perform these tasks?
- What are the burdens of these forms of energy?
- How does access to improved energy benefit women's and girls' lives?
- Does the environmental impact of the energy source (low-carbon versus high-carbon) affect how beneficial the energy source is for women and girls?

A number of important topics fall outside the scope of this study. This paper does not evaluate specific energy access policies or look at successes and failures of energy access programs and messaging more broadly. It does not make a detailed evaluation of different energy sources and distribution mechanisms. It does not discuss the technical and scientific components of energy nor the challenges to achieving universal energy access. Furthermore, this paper does not look at the role of any other potential stakeholders in energy access programs outside of women. Finally, this paper concentrates on energy poverty specifically and not the energy gap; thus, the focus is on rural communities rather than manufacturing and industrial sectors.

METHODOLOGY

Thirty-two pieces of literature were reviewed for this paper (the remaining sources in the reference list were cited for statistics or study results). The literature reviewed includes journal articles as well as “grey literature.” These sources were found through internet searches¹ as well as through reviews of the citations and bibliographies of other literature on gender and energy (“snowballing”). The focus of this review is on secondary sources because there are few studies on the impact of energy access and energy poverty, and those that do exist have a small evidence base. Additionally, many of the secondary sources adequately synthesize the existing studies. In light of these factors and the time constraints of this work, I decided that an adequate understanding of energy access and women could be garnered from synthesis reports or other literature reviews that discuss these studies. This paper also compares how different researchers present the evidence from the studies to argue if, how, and by how much access to improved energy sources does and will benefit women. The studies, along with the “grey literature,” were helpful in providing quantitative and qualitative data on energy poverty and energy access. The lack of

¹ Searched-for phrases included but were not limited to “energy and women,” “energy poverty and women,” “energy development and women,” “women and energy in developing countries,” and “women’s energy needs.”

information on the impacts of energy poverty and improved energy access is highlighted throughout this paper and addressed in the conclusion.

WOMEN'S ACTIVITIES THAT REQUIRE ENERGY

Men and women are affected differently by and have different uses for energy because of gender roles that shape their responsibilities and day-to-day activities. Although women's time use varies from country to country and is affected by a variety of factors such as socioeconomic status and urban versus rural residence, in much of the developing world women are responsible for domestic or household tasks. Some of these tasks have been categorized as unpaid care work; they often are essential to the survival of members of the household but are not remunerated (Ferrant, Pesando, and Nowacka, 2014). In order to perform this unpaid care work, women are generally responsible for gathering, managing, and providing the energy that makes this work possible. Although a wide variety of activities fall into the category of unpaid care work, this section focuses on women's required tasks that are most commonly identified in the literature as burdensome owing to a lack of access to improved energy sources. These activities are cooking, which encompasses collecting fuel and water, and reproductive and care work. In addition to unpaid care work, this section also focuses on two areas that affect women's well-being: small-scale agriculture and informal income-generating activities.

In many parts of the world, women are the primary cooks in the household, which means they are also generally responsible for collecting fuel and preparing food for cooking. Although much of the literature reviewed states that women are responsible for fetching firewood, some authors have highlighted that men are also involved in this task. Blackden and Wodon (2006) show evidence that men spend more time collecting fuelwood in certain parts of Africa. In fact, in Madagascar, men spend almost twice as much time as women doing this task (p. 49). In urban areas in Benin, it was found that men spent slightly more time collecting fuelwood in 1998 (p. 53). Clancy, Winther, Matinga, and Oparaocha (2012) also cite examples from Cooke, Köhlin, and Hyde (2008) in Ethiopia, India, Nepal, and other countries where men help collect fuelwood, although they state that women bear more of the labor costs of firewood scarcity than men (p. 13). Despite these examples, most of the literature reviewed states that collecting fuel for cooking is primarily a woman's or girl's task, and consequently, the lack of access to improved cooking fuels is seen as mostly a woman's or girl's burden. The examples of men's involvement in this task, however, are reminders

that gender norms vary from place to place, and any assumptions and generalizations may lead to ineffective projects and policies.

Although some evidence shows that men are involved in collecting fuel for the home, little of the literature reviewed discusses men's involvement in preparing food, cooking, or fetching water in energy-poor communities. Preparing food for cooking can involve gathering ingredients, drying foods, peeling and chopping, and grinding grains. Because plumbing is uncommon in rural areas, water must be fetched, often from a natural source, like a lake or a stream, which can be far from the home. All of the literature reviewed claimed that women and girls are usually responsible for these tasks.

Women are also the main caretakers in the household. Their reproductive role means that they are responsible for caring for, feeding, and monitoring children. Childcare is a significant component in ensuring children's adequate nutrition, and caring for children is a time-consuming activity for women (Black et al., 2008). For example, in Ghana, women are estimated to spend 21 percent of their time caring for children (Ghana Living Standards Survey 2005–06 as cited in Ferrant et al., 2014, p. 4). In addition to caring for children, women are often responsible for caring for the elderly or sick family members (Ferrant et al., 2014).

Outside of unpaid care work, small-scale agriculture can also be women's domain, especially in sub-Saharan Africa, where women are responsible for 50–75 percent of agricultural labor. In four sub-Saharan African countries women spent an average of almost 467 minutes a day on agricultural work—about an hour and half more than what men spend on agriculture per day (Saito, 1994, as cited in (Blackden and Wodon, 2006, p. 18). Women are also involved in 10 percent of the work of food storage and transportation, 90 percent of hoeing and weeding, and 60 percent of harvesting and marketing in sub-Saharan Africa (Quisumbing, Brown, Feldstein, Haddad, and Pena, 1995, as cited in (Blackden and Wodon, 2006, p. 18). Many families in rural communities rely on the food that women grow, but some of the harvest is also sold or traded. Without access to improved energy sources, women rely mostly on their own human energy for most of this work, which is complemented by rudimentary tools (such as hoes and plows) and sometimes animal energy (Karlsson, 2007, p. 17).

Women are also involved in income-generating activities outside the formal economy, often called “cottage industries.” These can also be categorized as microenterprises or small- and medium-sized enterprises (SMEs). In many countries where data are available, women outnumber men in the informal, non-agriculture sector (ILO, 2013, p. 11). Women often conduct these activities in their homes, combining them with household tasks because they usually require the same energy sources (Clancy and Dutta, 2005, p. 2). Examples of income-generating activities include beer brewing, basket weaving, crocheting, palm oil processing, and dressmaking; they require a variety of forms of energy, including

heat and human energy (Lambrou and Piana, 2006, p. 28). These activities can be a critical source of income for their families, but they usually provide low wages and are labor intensive (Cecelski, 2000b, p. 9).

ENERGY SOURCES COLLECTED, MANAGED, AND USED BY WOMEN

In 2015, it was estimated that 1.2 billion people lacked access to electricity (IEA, 2015). For lighting, many households that are not electrified rely on kerosene lamps, candles, and batteries (Karlsson, 2007, p. 17). In African countries that have data on energy use, 49 percent use kerosene or oil lamps as their primary lighting fuel, while 41 percent use electricity. In certain countries like Madagascar, Sierra Leone, and Uganda, more than 80 percent of the population relies primarily on kerosene or oil lamps for lighting (WHO, 2016, p. 53). Electricity is more commonly found in the eastern Mediterranean region (87 percent) (p. 55) and Southeast Asia (66 percent) (p. 56), but these figures do not highlight differences between rural and urban areas in these regions. These figures are also collected at the household level and are not sex-disaggregated.

To complete their household and income-generating duties, women in the developing world, especially in rural settings, often rely on a variety of traditional energy sources. Poor people's main source of energy for cooking is biomass, or organic matter derived from plants or animals. Examples include wood, dung, charcoal, or crop residues. Biomass is found in nature and usually has no direct monetary cost, which are the primary reasons poor households so commonly use it, but its collection can lead to environmental degradation and deforestation (Köhlin, Sills, Pattanayak, and Wilfong, 2011, p. 11). Additionally, it needs to be physically collected, and this task, as already stated, is often the responsibility of women and girls. The combustion of biomass accounts for about one-third of all energy in developing countries and is often the main source of cooking energy (Cecelski, 2000a, p. 18). Biomass, especially fuelwood, is also important for microenterprises and accounts for 20–25 percent of SME food production costs (Cecelski, 2000b, p. 9).

Currently, according to the World Health Organization (WHO), 53 percent of people in low- and middle-income countries rely on polluting fuels for cooking, which include biomass, coal, and kerosene (WHO, 2016, p. 34). Polluting fuels are used for cooking in 75 percent of households in rural communities across the world, 91 percent of rural households in Africa, and 82 percent of rural

households in the Western Pacific. In Africa, 53 percent of households in urban communities also rely on biomass (p. 36). Even in areas where electricity is more widespread, such as Latin America, many poor people still rely on fuelwood to meet their cooking and heating needs (Rath, 2005, as cited in Lambrou and Piana, 2006, p. 19). These figures are not disaggregated by sex, but because women are usually responsible for cooking and for collecting biomass, the figures have strong implications for the lives of women and girls.

To perform their tasks, women also rely heavily on their own human energy with the help of tools and animals, especially if they do not have access to other forms of energy. Lack of transportation technologies, water pumps, modern cooking fuels, electric appliances, and other tools that require energy access mean that women in poor households have to exert much more of their own energy. To fetch fuel and water, women often walk long distances and carry the fuel or water back to their homes, although they may occasionally have the help of animals for carrying large loads. The lack of access to improved energy sources also means that women must exert more of their own energy for preparing food and cooking, grinding grains, caring for children, and cleaning, among other things. Animal and human energy can also be used with mechanical power for agricultural purposes, such as tilling land (Karlsson, 2007, p. 17).

THE BURDENS OF ENERGY POVERTY ON WOMEN

Although traditional energy sources have the benefit of being free or cheap in terms of monetary value, they often burden the poor in other ways. Additionally, since women are often responsible for collecting and using these energy sources to perform their household, agricultural, and income-generating tasks, the burdens usually fall on them. Some of the burdens are direct results of energy poverty and could be eliminated with access to improved energy sources and services. In contrast, certain responsibilities become more burdensome with energy poverty but are not caused by it, and energy access would thus not eliminate these responsibilities. Nonetheless, it is important to discuss these responsibilities since there is evidence that their burdens are exacerbated by energy poverty. Some of these burdens are well understood, but certain aspects of the effects of energy poverty on women demand further research. This section discusses time burdens and drudgery, health and physical burdens, and lack of access to information.

TIME BURDEN AND DRUDGERY

Cooking, processing food, and collecting fuel and water

One of the most significant burdens of energy poverty is the time burden. Many women's tasks performed without the aid of improved energy sources, especially the collection of fuel and water, take a large amount of time. Although fuel and water collection are not the only tasks that take women significant amounts of time, they are the focus of much of the literature around energy and women. Estimates vary for how much time women and girls spend fetching fuel, but the times estimated are uniformly significant. A 2014 study of 22 African countries estimates that girls spend an average of two hours a day collecting fuel (World Bank, 2014, p. 22, as cited in WHO, 2016, p. 4). According to Cecelski (2006), time spent on fuelwood collection can range from one to six hours a day in parts of India and Nepal (p. 18). In Africa and Asia, the amount of fuel available has declined, so to find fuel women must travel ever-longer distances. This situation further increases the time burden imposed by fuel collection, leaving even less time for other tasks (Lambrou and Piana, 2006, p. 18).

When the results of 12 studies across various African countries were combined, the average household was found to spend about 134 minutes a day collecting water (Rosen and Vincent, 1999, p. 27, as cited in Karlsson, 2007, p. 17). However, these figures vary from country to country. For example, in their study in India, Barnes and Sen estimated that women spend about one hour collecting water daily (Barnes and Sen, 2004, p. 21). Cooking and processing food without improved energy can also take several hours. Barnes and Sen (2004) found that women in India spend about two hours a day processing food to make it ready for cooking (p. 4). In Nepal, women were found to spend between six and eight hours a week grinding grain by hand (Mahat, 2004, p. 16), while in one village in Mali, an average of 16 women per family were involved in grinding grains manually to feed the many members of the family (Anderson, Fracchia, Lang, and Porcaro, 2005, p. 41).

The time burden is often cited as a reason that energy poverty may be more burdensome for women than for men. After making this argument, Dutta (2003) states, "Because of their traditional responsibilities for collecting fuel and water, in many developing countries, women and girls would benefit the most from access to improved energy services" (p. 8). According to the report *Generating Opportunities: Case Studies on Energy and Women*, lack of access to improved energy services means that "women are fully occupied by their daily survival tasks and have little time or means to take on additional income-earning activities, or to work on other sorts of community development projects" (McDade and Karlsson, 2000, p. 10).

Education

The time burden is also often cited as a reason that girls' education suffers when households or communities have access only to traditional energy sources. McDade and Karlsson (2000) state, "When women are overburdened, they are more likely to keep their daughters home from school to assist with household activities, including fuel and water collection, thereby limiting opportunities for girls to move forward through education, and increasing the likelihood that their families will remain in poverty" (p. 9). Lambrou and Piana (2006) claim that children, particularly girls, are at risk of being taken out of school to help collect fuel as resources become increasingly scarce (p. 18). Clancy (2002) also definitively states that girls are kept out of school to help with wood or water collection (p. 6). The links between improved energy access and girls' education will be discussed further in a later section.

HEALTH AND PHYSICAL BURDEN

Household/indoor air pollution

Lack of access to improved energy sources also imposes a significant health burden, especially on women and girls. The health effects of household air pollution (HAP) or indoor air pollution (IAP) caused by burning biomass for cooking in the home are well documented and understood. According to WHO (2016), "Household air pollution is the single most important environmental risk factor worldwide" and is responsible for more than 4 million premature deaths across the globe (p. 16). Because women are generally responsible for cooking, they are more affected by HAP, and it is estimated that 60 percent of all premature deaths attributed to HAP occur in women and children, who are often around their mothers while they are cooking (p. 3). Additionally, the WHO states that HAP is the second most important health risk factor for women and girls globally as well as the greatest factor for women and girls in sub-Saharan Africa (p. 3). Cecelski states that it has the largest energy-related health impact on women and children (2000b, p. 3). Illnesses caused by HAP include pneumonia, stroke, ischemic heart disease, chronic obstructive pulmonary disease (COPD), and lung cancer due to poor blood circulation and large amounts of smoke and soot particles. Use of biomass for cooking also puts women at risk of burns, poisonings, cataracts, and chronic pain (WHO, 2016, p. ix). Outside of IAP, Clancy et al. note that enough research has not been done to find potential links between energy poverty and other illnesses, including HIV/AIDS and malaria (2012, p. 35).

Sexual assault and physical burdens

Two underresearched but often-mentioned links between health and energy poverty are sexual assault and the physical burdens of carrying heavy loads of

fuel and water. There is some evidence that women and girls are at risk of sexual violence when they collect fuel and water or when they are outside after dark. Though no empirical evidence on this issue could be found, Doctors Without Borders has reported treating 500 women who were raped while fetching water or wood or while working in the fields in South and West Darfur between October 2004 and February 2005 (Cecelski, 2006, p. 39). There is also some anecdotal evidence of sexual assaults of women collecting fuelwood in refugee camps in Ethiopia, Kenya, Sudan, and northern Uganda (Matinga, 2010, as cited in Clancy et al., 2012, p. 15;). And although carrying large loads of wood or water is acknowledged as a physical burden commonly faced by women, several reports point out that the physical effects of carrying these loads are not well documented (Clancy, Skutsch, and Batchelor, 2002, p. 11; Clancy et al., 2012, p. 15). However, Cecelski (2006) cites studies reporting that heavy wood or water loads have led to spinal deformations in the Congo (Ecchari and Forriol, 2002) and miscarriages in Ethiopia (Tadesse, 2002) A 1999 study in a Nepali village found a “possible association” between carrying fuelwood and uterine prolapse (Subba, 1999, p. 361). Cottage industries, like palm oil production, can also require large amounts of human energy if access to energy is limited. Cooking without machines also requires women to pound spices and grind grains by hand, which can be physically exhausting (Clancy and Dutta, 2005, p. 2).

Health services

Cecelski (2006) argues that electricity in clinics would allow for better and safer health services (p. 39). Functioning health facilities, according to WHO, should have electricity and running water in order to provide lighting, sterilization, and proper sanitation. These conditions are especially important for reducing maternal and neonatal deaths (Cecelski, 2006, p. 29). Some anecdotal evidence from health workers in electrified clinics has shown decreases in infections, fewer delays in providing services, faster blood transfusions, more successful child deliveries, and increased morale (Mills, 2012, p. 14–15). Cecelski (2006) also speculates that because women are often the ones who care for the sick but are already burdened with time-consuming tasks, lack of access to improved energy sources can have additional health consequences, especially for those who are already sick (p. 39). Women who have heavy work burdens may not have time to boil water for drinking, and contaminated water may lead to health issues, especially in children (Rabiee and Geissler, 1992, as cited in Cecelski, 2006, p. 33). They may not have proper time to rest and care for themselves while pregnant or caring for their babies, which could endanger the pregnancy or the child (Cecelski, 2006, p. 30). In another report, Cecelski argues that there is a link between energy access and women’s health, fertility, and life expectancy, apart from income (2005, p. 15). These latter examples of energy poverty–related burdens show that some women’s responsibilities, especially around care, multiply the effects of energy poverty.

INFORMATION AND COMMUNICATION BURDEN

Another burden of energy poverty is a lack of access to communication methods and information. Without electricity, it is impossible for a household to have a telephone, television, or a radio that is not powered by batteries. Since women do not have the same opportunities to leave the house or village as men often do, this means that women can often be isolated from the outside world (Cecelski, 2000b, p. 11). Without a telephone, women have a hard time staying in touch with friends and family, and without a TV or radio, they lack access to informative or entertaining programs. The potential benefits of TV and radio will be further explored in the next section.

DOES ACCESS TO IMPROVED ENERGY SOURCES BENEFIT WOMEN AND GIRLS?

Although the burdens of energy poverty on women and girls are thoroughly discussed in the literature and speculation on how access to modern energy may alleviate these burdens is prevalent, there is not enough research to draw broad conclusions on how improved energy access actually affects women in all areas. Pachauri and Rao (2013) state that empirical evidence on the causal relationship of access to improved energy and better outcomes for women is weak, despite the fact that the disadvantages of energy poverty for women are well understood (p. 205). The issue is compounded by the fact that infrastructure tends to be provided to areas that are growing quickly (in either demographic or economic terms), are wealthier, are politically favored, or are already located near other infrastructure (roads in particular). Disentangling the impacts of electrification (or the delivery of any other infrastructure) on development from these factors, which also tend to show improved development outcomes, therefore remains an experimental challenge.

Nonetheless, there is some evidence that energy access is linked to improved literacy and school attendance, women's empowerment through access to information via television and radio, increased employment outside the home and raised incomes in the formal sector, increased productivity of "cottage industries," and cooking that is safer and more time efficient. This section looks at the evidence as well as assumptions on how access to improved energy does or might alleviate some burdens of women and girls. There is, however, a mismatch in the literature between the categories discussed when looking at the burdens of energy poverty for women and when looking at how energy access potentially

benefits them. For example, there is evidence on how energy access may benefit women's ability to conduct their "cottage industries," but this evidence is not highlighted as a reason that energy poverty may be a burden for women and girls. Additionally, because evidence on some of the categories in the previous section, like health services and sexual assault, is lacking, they are not included in this section.

IMPROVED ENERGY FOR COOKING

Despite the heavy focus on electrification of rural areas, electricity is not seen as a good solution for cooking because of its high cost (Clancy et al., 2002, p. 12). In most electrified rural households, electricity is used only for lighting, television, and radio services (Dutta, 2003, p. 17). Instead of electricity, cookstoves are believed to eliminate many of the burdens of cooking with biomass. In spite of their potential benefits, promoting the adoption of cookstoves in the developing world has presented several challenges.

The World Bank classifies cookstoves into two categories: improved cooking solutions, and clean cooking solutions. Improved cookstoves can use biomass and coal but are more efficient than traditional stoves, so women can spend less time collecting biomass. Clean cookstoves rely on fossil fuels, electricity, biogas, ethanol, or solar energy (World Bank, 2014, p. 9). Currently, only 11 percent of Africans use clean cookstoves, which eliminate the need for women to collect biomass regularly (p. 12). In India, although improved cookstoves did not seem to save cooking time, they did significantly reduce the time women spent collecting fuel (Barnes and Sen, 2004, p. 35). Additionally, there is some evidence that women were able to spend less time and effort cleaning pots and pans since they were no longer covered in soot from cooking over a wood fire (Clancy et al., 2012, p. 28). In addition to saving time, clean energy cooking eliminates many of the health risks of cooking with biomass. Studies in Kenya (Bailis, Ezzati, and Kammen, 2005, as cited in Cecelski, 2006, p. 30) and Guatemala (Boy and Bruce, 2002, as cited in Cecelski, 2006, p. 30) show decreases in acute respiratory infections after improved cookstoves were used, and even more health benefits when clean fuels were used.

Even though the potential for improved or clean cookstoves to eliminate the time and health burdens of cooking with biomass are understood, it has been challenging to encourage households to adopt new cooking technologies. In many families, the cooking fire is where family gathers during the evening, allowing women to interact with their families. There is some evidence that when women use solar cookers outside, they have less influence within the family because they are separated from the other family members, who are indoors (Green, 2001, as cited in Clancy, 2002). Additionally, using solar cookers often

means that cooking must occur at midday, when the sun is brightest, but this requirement does not coincide with eating times and does not take into account women's preference for cooking indoors (Mandhlazi, 1999, as cited in Clancy, 2002, p. 7;). In *Clean and Improved Cooking in Sub-Saharan Africa*, the World Bank (2014) gives several reasons for households' limited willingness to adopt new cooking solutions. First, consumer exposure to new cooking solutions is often limited, and people are not fully aware of the benefits of new technologies. Second, even when they are aware, people often hesitate to use these technologies because of a lack of trust in the products' performance and durability, the prospect of having to adopt new cooking styles, and other behavioral and cultural factors. These reasons not only prevent people from initially adopting new cooking solutions, but also explain why people may discontinue using these cookstoves. Third, cost can be a barrier even if people are willing to adopt new cooking solutions. Clean cooking solutions have high upfront and ongoing costs, and even though improved cooking solutions are less expensive, they are still unaffordable for many poor Africans (p. 13).

In Bangladesh, it was found that women do not consider the health risks of IAP a priority; they weigh factors unrelated to health, such as cost and time, more heavily when deciding on cooking products. Thus, Mobarak, Dwivedi, Bailis, Hildemann, and Miller (2012) suggest that policymakers should focus more on providing cookstoves that address women's budgetary and time concerns, even if the primary policy concern is health and IAP (p. 10819).

In a systematic review of the literature on the adoption of modern cookstoves, Lewis and Pattanayak (2012) found that those who adopt cookstoves are often of relatively high socioeconomic status and live in urban environments (p. 643). Dutta (2003) explains that cookstove adoption programs have often been most successful when women have helped design and disseminate the products (p. 16). This is an important finding that must be considered when programs try to eliminate the time and health burdens of cooking by introducing improved and clean cookstoves.

ENERGY ACCESS, SCHOOLING, AND LITERACY

Results are mixed on whether access to improved energy, especially electricity in homes and schools, improves girls' school attendance. The United Nations Development Programme (UNDP) (2004) states that "global evidence has shown that the availability of lighting in the home increases women's literacy and education levels, and extends the working day for women for income-generating activities" (p. 12). Brazil Census Data show that girls in rural areas with access to electricity are 59 percent more likely to complete their primary education by the

time they are 18 years old (O'Dell, Peters, and Wharton, 2014, p. 7).² Cecelski (2006) also discusses several studies showing a correlation between electrification and girls' school attendance. In Mali, girls' school attendance increased and their performance improved when electricity was introduced to the villages (Brew-Hammon and Crole-Rees, 2004, as cited in Cecelski, 2006, p. 22–23). In Bangladesh, school attendance by girls increased once electric fans were used and made classrooms more comfortable (Barkat et al., 2002, as cited in Cecelski, 2006, p. 23). In Tunisia, families felt safer allowing their daughters to walk to school in the early morning once there were street lights (Cecelski, Ounali, Aissa, and Dunkerley, 2005, as cited in Clancy et al., 2012, p. 22).

Another claim is that household electricity leads children to spend more time on schoolwork at home because better lighting allows them to continue their schoolwork after dark. According to studies mentioned in Clancy et al. (2012), however, this is not always the case. In one Indian village, electrification had little impact: families without electricity reported that their children spent up to 4.2 hours each night studying, but children in electrified households only studied up to 0.3 hours more (Winther, 2014, as cited in Clancy et al., 2012, p. 22). In Zanzibar, only a small number of children were reported to spend time after sunset doing homework, even if their homes were electrified (Winther, 2008, as cited in Clancy et al., 2012, p. 22). Cecelski (2006) states that research on electricity and study time is often not disaggregated by gender (p. 22).

One study shows that access to electricity is even more important than income for women's literacy and reading time. Barnes and Sen (2004) found that 90 percent of women who read during a typical day are found in households with electricity and that virtually no reading occurs in households without electricity, regardless of income or class (p. 60). Furthermore, they found that members of a lower-income household with electricity are more likely to read than members of a higher-income household with no electricity (p. 63). This finding may have broad implications for development projects. Still, not all studies paint this same picture. Cecelski (2006) cites Barkat et al. (2002), which found that women's literacy is 22 percent higher in households in Bangladesh with electricity than in those without (p. 24), but also states that there is not enough evidence of increased literacy and reading on the part of women who live in electrified homes to make any definitive conclusions (p. 28).

Much of the other literature is also critical of attributing improved literacy, increased school attendance, and more studying time by women and girls to improved energy access. Pachauri and Rao (2013) state that "female education is found to be strongly positively associated with the choice of modern energy and technologies in all studies that include this variable,..." but "...no existing

² This sort of work is likely to suffer from entanglement, whereby the impacts of electrification are difficult to differentiate from the fact that electrified areas tend to be wealthier, politically favored, growing, or closer to other infrastructure.

studies examine the causality between education and modern energy use” (p. 207). Likewise, Danielsen (2012) argues that no definitive conclusion can be made about links between energy interventions and women’s literacy and reading time (p. 13). Many other potential factors could explain these associations (Panjwani, 2005, p. 3). It is unknown, states Cecelski (2006), whether and how women’s timesaving, due to the use of improved cooking solutions, has any effect on girls’ education (p. xiv). Moreover, research that looks at improved energy access and schooling often is not disaggregated by gender. There is some evidence that electrification has benefits for children’s schooling, but many of the data that are disaggregated between boys and girls showed mixed results (Köhlin et al. 2011, 36).

THE IMPACTS OF TV AND RADIO

One of the most common uses of electricity, after lighting, is for powering televisions and radios, which are important tools for gaining access to information. In fact, electrification of households explains a 20 percent increase in TV ownership over time (World Bank, 2008, as cited in Köhlin et al., 2011, p. 40). In rural villages in India, it was found that once households gained access to electricity, the three main uses for it were lighting, entertainment (radio and TV), and fans for cooling the home (Barnes and Sen, 2004, p. 14). In fact, more than 40 percent of homes with electricity had a television set (p. 7).

According to Panjwani (2005), “Women in electrified households do spend more time watching TV and listening to the radio. This improved access to information increases women’s knowledge, and in several studies it was found that it has resulted in empowerment of women” (p. 11). Other reports also refer to studies showing that TV access benefits women. A study in rural India showed that women who had access to cable television had “lower acceptability of spousal abuse, lower son preference, more autonomy, and greater likelihood of sending young girls to school” (Jensen and Oster, 2009, as cited in Köhlin et al., 2011, p. 40). In Bangladesh women’s awareness of gender equality issues was higher in electrified households (Halim, 2004, as cited in Cecelski, 2006, p. 26). In Sri Lanka, men and women agreed that watching TV would improve access to information and in turn improve women’s situations (Masse, 2003, as cited in Cecelski, 2006, p. 25). By watching TV, women in Tunisia were able to get information about politics and their rights, which increased their self-respect and status (Cecelski et al., 2005). Cecelski (2006), however, states that “it would be more useful to know more about...the potential for TV and media to promote family bonding and gender cooperation, as hinted by some studies” (p. xiv). A study in Zanzibar found that men were more likely to stay at home once they had a TV in their house, a situation that led to more family bonding and sometimes

even a better relationship between the husband and the wife (Winther, 2008, as cited in Clancy et al., 2012, p. 25).

Clancy et al. (2012, p. 23–24) also cite several studies on this issue and provide a detailed synthesis on the effects of access to television on women. In the Energy, Poverty, and Gender (EnPoGen) study in three Asian countries, it was found that men and women often watch TV together, which can give women a stronger position in the family (Ramani and Heijndermans, 2003). Women in Afghanistan (Standal, 2008) and Zanzibar (Winther, 2008) reported that they valued health programs on television. It is difficult to determine whether greater awareness of women's rights through TV and radio leads to decreased domestic violence, because of the sensitivity of the issue (Clancy et al., 2012, p. 25); however, there is anecdotal evidence in Afghanistan of a decrease in domestic violence after electrification (Standal, 2008).

Other reports link access to television to social and behavioral changes. Chong and La Ferrara (2009), for example, conducted a study in Brazil that linked TV viewing by women to a higher rate of divorce initiated by the wife. They found that “exposure to modern lifestyles as portrayed on TV, to emancipated women's roles, and to a critique of traditional values was associated with increases in the share of separated and divorced women across Brazil's municipal areas” (p. 14). Another study found that the more women watched television in developing countries, the more likely they were to want and have fewer children, irrespective of education level, wealth, urban residence, and age. The study was conducted in 48 developing countries, and conclusions were drawn from interviews of more than 1 million women (Westoff and Koffman, 2011).

Although there is some evidence that improved energy access leads women to watch more television and listen to more radio and that these sources of entertainment and information benefit women, not all changes can be easily attributed to access to television and radio (Clancy et al., 2012, p. 26). Moreover, access to television does not necessarily deliver uniformly positive results; there can be unintended negative consequences. For example, if television viewing results in women's feeling more empowered, men may feel resentful (p. 25). Although TV may provide access to information for both men and women, it can also create tensions, which Clancy et al. call “gender tugs of war,” within the household when gender roles are challenged by television programs that portray different cultures and household dynamics (p. 26). Also, television purchases may compete with other important purchases that could help women, such as kitchen appliances, or may interfere with children's study time (Köhlin et al., 2011, p. 40).

MICROENTERPRISES, EMPLOYMENT, AND WAGES

According to the Organisation for Economic Co-operation and Development (OECD), women who perform a large amount of unpaid care work are less likely than others to be employed in the formal sector. As a consequence, they may have to earn an income through informal self-employment (Ferrant et al., 2014, p. 7). Because women's work is often in the informal sector, female-owned microenterprises are often left out of national statistics and thus take place in an energy "policy vacuum," according to Clancy and Dutta (2005, p. 2). Although several reports argue that the role of energy in women's enterprises is not well understood (Clancy, 2002, p. 8; Clancy and Dutta, 2005, p. 2; Clancy, Oparaocha, and Roehr, 2004, p. 16; Clancy et al., 2002, p. 17), there is some evidence and many assumptions that improved energy access has direct and indirect benefits on women's income-generating activities.

Energy access can have direct benefits for the efficiency and productivity of "cottage industries" because, as noted, many of these industries are energy intensive, and specifically heat, labor, and light intensive (Clancy and Dutta, 2005, p. 1). The biomass often used in food-producing microenterprises in energy-poor communities is inefficient and has low productivity rates (Clancy, 2002, p. 8). Energy costs are said to account for between 20 and 25 percent of total inputs for food-processing SMEs (Clancy, 2002, p. 8). Beer brewing is estimated to use 25 percent of total annual wood consumption in Zambia. Modern energy can also benefit microenterprises by helping to "extend operating hours, improve working conditions, automate production, preserve products, and communicate beyond the local market" (O'Dell et al., 2014, p. 9). In Ghana, women's groups that were given access to LPG for their business reported having better-quality products than when using wood, and they were able to increase their income by meeting the quality standards required for exporting (Mensah, 2001, p. 41–42). Additionally, because it is common for women to contribute to their microenterprises alongside their household tasks, improved household energy would benefit their income-generating activities as well.

Indirectly, time saved from access to improved energy means that women may have more time to generate an income through their cottage industries. This is an argument made by several reports, including the UNDP's *Gender and Energy for Sustainable Development: A Toolkit and Resource Guide* (2004, p. 12). In some of the studies reviewed by Cecelski (2006), there was evidence that women use saved time for income-generating activities. For example, she cites Mahat (2004), which found that women in Nepal spent the evenings on handicraft work to sell once their homes were electrified (p. 20). Also, it was found that families were more likely to adopt modern technologies if they have benefits for income-generating efforts (p. 20).

Outside of the informal sector, improved energy access has been linked to employment and an increase in income for women. In rural areas of Brazil, women who work in the formal economy and have access to energy earn wages 59 percent higher than women without access to electricity. However, this is also true for males. Additionally, the difference in wages is even more drastic in urban settings, where wages for those with access to electricity are 148 to 322 percent higher (Brazil Census Data as cited in O'Dell et al., 2014, p. 7). In South Africa, a study found that rural electrification was correlated with a 9.5 percent increase in employment for females. A similar increase in female employment was found in Guatemala. In Nicaragua, women are 23 percent more likely to work outside the home if they have access to reliable lighting and cooking appliances (Dinkelman, 2011, and Grogan and Sadanand, 2013, as cited in UNIDO, n.d., p. 13). Pachauri and Rao (2013) argue, however, that even though it is well understood that energy has the potential to free up women's time, whether this leads to employment or more opportunities to earn an income is unclear. They argue that the studies in South Africa and Nicaragua are highly context specific and thus not generalizable (2013, p. 207).

There also might be opportunities to employ women directly within the energy sector as it expands, including in rural areas. In Afghanistan, female utility meter readers were more effective than males because women are not comfortable allowing men into their house to read the meters (USAID, 2010, as cited in O'Dell et al., 2014, p. 10). Additionally, since women are generally more likely to repay credit, they are well suited to be part of the energy collection system (O'Dell et al., 2014, p. 9–10). Organizations like Solar Sister provide women the opportunity to become entrepreneurs by selling solar and energy-efficient products, like solar lamps and cookstoves. A qualitative assessment of the Solar Sister business model by the International Center for Research on Women (ICRW) found many benefits, and some challenges, in women's engagement in the program, including women's new sense of autonomy and independence and their adoption of new skills and business practices (Soria, Farley, and Glinski, 2016). Cecelski (2006) also provides several examples of women's "energy enterprises" that provide a source of income in different countries (p. 20–21).

OTHER POTENTIAL BENEFITS OF IMPROVED ENERGY ACCESS FOR WOMEN

Some evidence of other benefits of energy access for women is mentioned in the reviewed literature, although not extensively. Electrified water pumps may save women and girls several hours a day by relieving them from having to travel long distances to gather water from natural sources. In Zanzibar, installing electrified water pumps increased girls' school attendance and saved women three hours a

day (Winther, 2008, as cited in Clancy et al., 2012, p. 14, 22). And although electricity is not the best solution for the cooking burdens related to energy poverty, there is some evidence that electricity may help women with cooking indirectly. In India, it is reported that electric lighting in the kitchen can help women save time by allowing them to do other tasks in the kitchen while cooking since they can see the pots from across the room. Additionally, they can cook faster with both hands because they no longer need to hold a kerosene lamp for light. It was estimated that women saved one and a half hours a day due to electricity in the kitchen (Chakrabarti and Chakrabarti, 2002, as cited in Clancy et al., 2012, p. 14). Women are also reported to save time when community grain mills operated by hand are switched to diesel-driven or electric mills. In Mali, women reported saving 2.5 hours a day on processing grains when diesel-driven mills were introduced in their village. Switching from diesel-driven mills to electric mills saved even more time; in northern Uganda, women reported spending less time waiting in lines when the mills switched from diesel to electricity (Porcaro and Takada, 2005, as cited in Clancy et al., 2012, p. 14). These are further examples of how improved energy access can reduce or eliminate the time burden and drudgery on women.

WILL SIMPLY PROVIDING ACCESS TO ENERGY HELP WOMEN?

Although there is evidence that access to improved energy benefits women in certain areas and contexts, the literature also discusses several barriers to and consequences of this access. These factors show the complexities of this issue and challenge the idea that simply providing improved energy to poor households will automatically benefit women.

Having households in developing countries transition to using solely improved energy is a complex challenge. It was once thought that households transition to modern energy following an “energy ladder” model—that is, a progressive linear adoption of newer forms of energy as households’ incomes increase (WHO, 2016, p. 26). Now, however, it is clear that household transitions to modern energy often involve “fuel stacking” (WHO, 2016)—the simultaneous use of different fuel technologies, including traditional energy, even when access to improved energy sources is available. Thus, even once they have access to cleaner solutions, women may rely on traditional forms of energy for a variety of reasons, including convenience, reliability, or affordability. A woman who has access to LPG, for example, may still on occasion use a wood-burning stove for

heat or to cook. A household that has electricity may use kerosene lamps in certain rooms to cut down on the cost of the electricity (p. 26–27). In rural India, Barnes and Sen (2004) found that even households with high incomes still use biomass because it is “free” (p. 46). “Fuel stacking” means that although access to improved energy may reduce women’s burdens related to collecting and using traditional energy sources, it will not eliminate them. It is thus imperative that governments and organizations understand the needs and constraints of women and households when planning energy access projects, otherwise women’s burdens will not be addressed.

Family decision-making dynamics may also affect whether women benefit from access to improved energy sources and services, and by how much. Although gender roles mean that women are often responsible for providing household energy, men can be the main decision makers when energy must be purchased (Dutta, 2003, p. 10); however, this is less true in female-headed households, which are becoming more prevalent in Africa as males migrate to urban areas for work (Lambrou and Piana, 2006, p. 17). Cecelski (2006) also acknowledges that “decisions on access to and control over new energy technologies remain the prerogative of men” (p. 26). In South Africa, for example, when women were asked what purchases they would make once their village was electrified, most women named electric cookers. In a nearby village that had had electricity for more than three years, however, electric cookers were one of the last appliances to be purchased by households (Mathee and de Wet, 2001, as cited in Panjwani, 2005, p. 9). A study in Zimbabwe found that women had a difficult time accessing solar cookers because “technology and its development are seen traditionally as a male preserve” (Clancy, 2002, p. 3). In addition, men and women are found to have different perceptions of the benefits of energy. According to Clancy (2002), men believe that energy is beneficial because it increases leisure time and quality of life and can improve education access for their children. Women see energy as a means to reduce their workload, improve health, and reduce expenditures (p. 3). If men do not see energy access as a way to reduce their wives’ workload and are also the ones in charge of making decisions about what energy sources are purchased and how they are used, then their energy-related decisions may not fully or always benefit the women in their households.

Similarly, energy access may reduce the burden of women’s cooking and domestic tasks, but it still means they are responsible for much of the unpaid care work for their families. For example, an electrified water pump may mean that women and girls do not have to walk as far to fetch water, but it does not mean that they share the burden of fetching water with men. Some of the literature mentions examples of changes in gender roles once energy is accessed, but Cecelski (2006) notes that these changes are not universal (p. 26). Challenging the assumption that gender roles will be changed, Clancy et al. (2012) state, “Access to modern energy appears to enable women to fulfill their

traditional roles (to their satisfaction and wellbeing) rather than bringing significant transformation in gender roles” (p. 20). Nonetheless, examples of changes in gender roles exist. In Bangladesh, men were more willing to share household chores so their wives could work outside the home (Mahat, 2004, as cited in Panjwani, 2005, p. 8), and men began to cook for themselves once their household was electrified in China and Laos (Kelkar and Nathan, 2005, as cited in Clancy et al., 2012, p. 20), South Africa (Annecke, n.d., as cited in Clancy et al., 2012, p. 20), and Zanzibar (Winther, 2008, as cited in Clancy et al., 2012, p. 20).

Finally, much of the literature on the true benefits of improved energy access for women concerns how women spend their time savings. Even though Panjwani (2005) discusses some studies showing that improved energy access leads to an increase in leisure for women (p. 5), she concludes, “By far in most studies it was seen that women first spend the time that was saved by the introduction of the energy technology on other household duties before spending it on rest or leisure, if at all” (p. 11). Danielsen (2012) argues that saved time or lighting at night does not automatically lead to more leisure for women (p. 13). Cecelski (2006) also states that if men also save time owing to more efficient energy sources, they are more likely to use this saved time for leisure, whereas women use it for other household chores or income-generating activities. She states, “On the whole, time-savings do not usually reduce the workload of women, but give them flexibility to schedule their work according to convenience” (p. 20). Similarly, Clancy et al. (2004) argue that electrification efforts that do not also address cooking needs actually increase women’s burdens by prolonging the workday: “Generally it is men, and to some extent children, who benefit most from the gains while it is women who usually bear the burden of an extended working day” (p. 9). One could argue that if women spend their time savings from access to energy on increasing their income, they may increase their bargaining power within the family. The literature, however, offered no evidence of this outcome.

DO LOW-CARBON ENERGY SOURCES BENEFIT WOMEN AND GIRLS?

There’s been an effort by the development community to synergize the climate agenda with the energy access agenda, meaning that many advocate that the energy provided for the poor can come from low-carbon energy sources in order to contribute to climate change mitigation efforts. The need to protect the environment while also encouraging development is undeniable, but one of the

most important findings from the reviewed literature is that existing documents on women and energy don't adequately discuss the role of low-carbon energy sources such as solar (photovoltaic), wind, and hydro energy on women's lives; rather, the discussion is mainly on all modern, efficient energy more generally, which can include energy produced from high-carbon energy sources like fossil fuels.

Energy generation and distribution systems can be broken down into two types: centralized energy systems and distributed energy systems. Giving the poor access to a centralized energy system usually means connecting them to an existing energy facility, commonly far from rural communities and powered primarily by fossil fuels (though this need not always be the case). Distributed sources provide energy on a smaller scale and are located closer to the point at which the energy is consumed. Both types of energy distribution mechanisms can use either low-carbon or high-carbon energy sources, but distributed sources are more amenable to the use of low-carbon energy sources. Both types of energy sources have significant advantages and disadvantages that must be considered when planning energy access projects.

The literature reviewed often ignores the distinction between the two types of energy distribution mechanisms when discussing how to better the lives of women. Reports assert the importance of electricity for poor women but often fail to discuss the source of that energy. This omission often seems due to a lack of evidence. When a report does claim that low-carbon energy sources are the key to benefiting women, it seems to be an effort to tie the climate agenda to the energy agenda rather than a claim based on empirical evidence of local and immediate impacts. Additionally, if energy sources are discussed, it is often within the context of electricity, which, as noted earlier, will likely not benefit women as much as cooking solutions, given that much of women's burden revolves around cooking with traditional fuels.

This analysis leads to two conclusions. First, if development entities wish to advocate for the dissemination of distributed or low-carbon energy sources in order to benefit women in poor, rural communities, then more research is needed on whether and how these sources will benefit women as much as or more than centralized systems or high-carbon energy sources. Solid research backing these claims will allow for more and better opportunities to tie the climate agenda to the energy agenda specifically in relation to poor, rural women.

Second, the literature reviewed does not discuss the potential trade-offs between low-carbon and high-carbon energy sources in the context of bettering the lives of poor women and girls. Some might argue that the burdens of energy poverty on women can be so grave that the imperative should be to provide the quickest, cheapest energy, regardless of whether it is environmentally friendly or not, but little of the literature presents this argument. The issue of whether feasibility,

efficiency, and low cost are more important than environmental friendliness for truly benefiting women in rural communities is hardly discussed. One piece of literature that does address this question is a 1999 World Bank document:

The very concept of “renewable energy” has been found to have its limits both operationally and conceptually and there certainly is a trade-off under current conditions between tackling "energy poverty" and "sustainable energy development.”... Restricting poor people to renewable energy sources will place severe additional burdens on them, and deny them the opportunity for productivity growth that fossil fueled technologies facilitate (ESMAP, 1999, p. 36).

Other similar claims were difficult to find, but as explained, there is some discussion of the many obstacles faced with energy projects that focus on low- or no-carbon energy sources, especially related to cookstoves. Nonetheless, the emphasis still seemed to be on providing low-carbon energy sources despite these obstacles and with disregard for other criteria.

CONCLUSIONS

WHERE THE EVIDENCE IS STRONG

In most cases, the types of energy sources women rely on in poor households that lack access to improved energy are well understood. In energy-poor households, women rely mostly on biomass and their own human energy, and sometimes on mechanical and animal energy. It is also clear that energy poverty leads to burdens related to time, drudgery, health, and access to information and communication tools. The literature on the health hazards of cooking with biomass is plentiful, and these hazards clearly affect women and girls disproportionately. Thus, the use of improved cooking solutions does lead to a decrease in HAP. Additionally, the significant time burdens women and girls face in collecting fuel and water, cooking, and processing food are evident, and they often keep girls from attending school. Lack of access to electricity means that women do not have access to information and communication tools like televisions, radios, and telephones. It has been shown that when households do get access to electricity, they often buy televisions and radios, from which women benefit. Finally, evidence shows that electrified water pumps and grain mills save women time in collecting water and grinding grains.

WHERE THE EVIDENCE IS MIXED, MINIMAL, OR UNCLEAR

Many scholars admit that research on women's and girls' energy use, needs, and benefits, including their energy poverty burdens, is lacking. Specifically, the role of energy in women's microenterprises is not well researched. Although there is sufficient evidence on the health hazards of cooking with biomass and the time burdens of collecting fuel and water, there are many gaps in research on the other health impacts of energy poverty, as well as on the link between energy poverty and sexual violence.

Most of the literature on the benefits of energy access for women is either mixed or minimal. For example, there is some indication that improved energy access leads to increased literacy and reading, but some scholars question whether these increases can be attributed to improved energy sources. In some instances electricity and the subsequent use of TV and radio have seemed to improve women's access to information (which in turn has broader impacts) and lead to social changes that empower women within the household. There is some debate, however, about how much electricity, television, and radios can be credited with these changes. Additionally, increased use of television and radios has some negative impacts. In a few cases women have used improved energy to help them boost the efficiency of their microenterprises, but there is a general consensus that how energy benefits women's income-generating activities is not well understood. In the formal economy, improved energy access has led to increased employment of women and higher salaries for them, but this occurred only in certain specific cases. Finally, the literature on energy access and women generally treats all improved energy sources the same, providing insufficient evidence to show that the development community should specifically advocate for low-carbon energy sources.

The plethora of incomplete information on this issue means that there is a real need for the development community to commit to understanding the energy needs of women and the impacts on them to ensure that energy access projects benefit them to the fullest extent. Some of the current research represents a good start, but there is still room for building up empirical evidence on energy access and women and girls.

Where research on women’s and girls’ energy use, needs, and benefits is strong or mixed, minimal, or unclear

	Strong evidence	Mixed, minimal, or unclear evidence
Energy used by women in energy-poor households	<ul style="list-style-type: none"> • biomass for cooking • human and animal energy for collecting fuel and water • human, animal, and mechanical energy for agriculture 	<ul style="list-style-type: none"> • the role of energy for small- and medium-sized enterprises and "cottage industries"
Energy poverty burdens	<ul style="list-style-type: none"> • time burden and drudgery: cooking, fetching water and biomass, processing food • time burden: girls are kept out of school • health burden: HAP from cooking with biomass • information and technology burden: inability to use TVs, radio, or telephones 	<ul style="list-style-type: none"> • health burden of carrying heavy loads of firewood • links of energy poverty to sexual violence
Benefits of access to improved energy sources	<ul style="list-style-type: none"> • electricity and TV and radio access • decrease in HAP with improved cooking solutions • time saved with access to electrified water pumps and diesel-driven or electrified mills 	<ul style="list-style-type: none"> • electricity and increased school attendance, literacy, and amount of reading • positive impacts of TV and radio access • adoption of improved cooking solutions • efficiency of small- and medium-sized enterprises and "cottage industries" • increased employment and salaries of women

BENEFITING WOMEN REQUIRES MORE THAN JUST PROVIDING ENERGY

Even if poor people have access to improved energy sources and services, there are many challenges in ensuring that they actually use them. For a variety of reasons, including cost and preference, households still use biomass for cooking even when they have access to other cooking fuels and cookstoves. HAP is a smaller concern for poor families than initially thought. Persistent gender roles and dynamics can prevent energy access from benefiting women. Women are often still responsible for household tasks and unpaid care work, and improved energy access does not eliminate many of the burdens of women’s work, especially around care, although they may become less burdensome. Moreover, men are often still the household decision makers and may not always adopt energy sources and technologies that benefit women. Finally, access to

improved energy does not always increase women's leisure time, and in some cases may reduce it.

These challenges and complexities highlight the need for energy access projects, policies, and advocacy to sit within a broader development context that aims to improve the lives of women and the poor. Energy access initiatives must be coupled with other development interventions such as access to credit and other resources, economic development, and interventions to increase women's rights, agency, and economic empowerment. Along these lines, women need to be consulted as energy access projects are planned so that their needs are properly met. Development organizations, governments, and donors cannot assume that simply providing energy access to poor families will better the lives of women.

RECOMMENDATIONS FOR ENERGY POLICY AND ADVOCACY

Despite the gaps in research and evidence and the challenges of ensuring that improved energy access will ultimately benefit women, the donor community should still advocate for increasing women's access to improved energy, while also calling for more research on the issue. Although there are a lot of unknowns, research on areas like the hazards of HAP and the time saved collecting fuel and water are topics on which advocacy organizations advocacy can point to solid evidence. Additionally, because the energy community agrees on so many of the *potential* benefits of improved energy access for women, organizations can point out these potential benefits in their advocacy as well. In addition to calling for the energy community to collect data on women, development organizations should couple their advocacy on energy access and women with other women's rights issues. Improved energy access is most beneficial to women if their status is raised and they can make decisions in the household, if they have access to resources like credit, if they are involved in helping design energy access projects, and if they have opportunities to be employed in the energy sector. These are all issues that should be part of development organizations' advocacy on energy access.

In sum, it is recommended that development entities advocate for further research on the following issues:

- the role of traditional energy in women's lives in developing countries in all areas, including household tasks, unpaid care work, and income-generating activities;

- the time/drudgery, health/physical, and information/communication burdens placed on women by a lack of energy access;
- whether and how improved energy access leads to a decrease in time/drudgery, health/physical, and information/communication burdens, further efficiency for income-generating activities, more opportunities in the formal economy, and an increase in education and literacy for women and girls;
- identification of the best energy sources for decreasing women's energy poverty burdens; and
- whether low-carbon energy sources can be as beneficial for women as some high-carbon energy sources, or even more beneficial.

They should also call for energy access programs that

- involve women in their design and execution;
- account for local cultures and contexts; and
- are combined with other development objectives like access to credit, economic growth, and women's empowerment.

Additionally, there is enough evidence for development entities to

- protest the health hazards of using biomass to cook and the time burdens of collecting biomass and water for women and girls;
- advocate for improved energy access for women and girls because they reduce the time and health burdens of using biomass to cook; and
- advocate for the potential benefits of improved energy access for women.

REFERENCES

- Anderson, B., S. Fracchia, R. Lang, and J. Porcaro. (2005). "Mali Country Case Study." In *Achieving the Millennium Development Goals: The Role of Energy Services*, 31–55. New York, NY: United Nations Development Programme.
http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/achieving-the-mdgs-the-role-of-energy-services---brazil-mali-philippines/Achieving%20the%20MDGs-The%20role%20of%20energy%20services_2005.pdf.
- Annecke, W. (n.d.). "Whose Turn Is It to Cook Tonight? Changing Gender Relations in a South African Township." *Gender as a Key Variable in Energy Interventions*. UK Department for International Development (DFID).
- Bailis, R., M. Ezzati, and D. Kammen. (2005). "Mortality and Greenhouse Gas Impacts of Biomass and Petroleum Energy Futures in Africa." *Science* (208) 5718: 98.
<http://science.sciencemag.org/content/308/5718/98.full?sid=ea9ebedb-fdd8-4ee3-9b58-4a9eb1686311>
- Bailis, R., P. Dwivedi, L. Hildemann, and G. Miller. (2012). "Low Demand for Nontraditional Cookstove Technologies." *Proceedings of the National Academy of Sciences* (109) 27: 10818–10820.
<http://www.pnas.org/content/109/27/10815.short>
- Barkat, A., S. H. Khan, M. Rahman, S. Zaman, A. Poddar, S. Halim, N. N. Ratna, et al. (2002). *Economic and Social Impact Evaluation Study of the Rural Electrification Program in Bangladesh*. Dhaka: Human Development Research Centre, NRECA International, and US Agency for International Development.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.469.671&rep=rep1&type=pdf>.
- Barnes, D. F., and M. Sen. (2004). *The Impact of Energy on Women's Lives in Rural India*. Washington, DC: Joint UNDP/World Bank Energy Sector Management Assistance Program.
<https://www.esmap.org/sites/esmap.org/files/The%20Impact%20of%20Energy%20on%20Women's%20Lives%20in%20Rural%20India.pdf>.
- Bhatia, M., and N. Angelou. (2014). "Capturing the Multi-Dimensionality of Energy Access." *Livewire* 2014/16 (World Bank Group). http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/02/27/090224b082b6d2b4/2_0/Rendered/PDF/Capturing0the00ity0of0energy0access.pdf.

- Black, R. E., L. H. Allen, Z. A. Bhutta, L. E. Caulfield, M. de Onis, M. Ezzati, et al. (2008). "Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences." *Lancet* 371 (9608): 243–260.
- Blackden, C. M., and Q. Wodon. (2006). *Gender, Time Use, and Poverty in Sub-Saharan Africa*. World Bank Working Paper No. 73. Washington, DC: World Bank.
http://siteresources.worldbank.org/INTAFRREGTOPGENDER/Resources/gender_time_use_pov.pdf
- Boy, E., and N. Bruce. (2002). "Birth Weight and Exposure to Kitchen Wood Smoke during Pregnancy in Guatemala." *Environmental Health Perspectives* 110 (1): 109–14.
- Brew-Hammon, A., and A. Crole-Rees. (2004). *Reducing Rural Poverty through Increased Access to Energy Service: A Review of the Multifunctional Platform Project in Mali*. Bamako, Mali: United Nations Development Programme.
http://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/reducing_rural_povertythroughincreasedaccesstoenergyservicesmppi.html.
- Cecelski, E. (2000a). "Enabling Equitable Access to Rural Electrification: Current Thinking and Major Activities in Energy, Poverty, and Gender." Briefing Paper. Washington, DC: World Bank.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.457.8776&rep=rep1&type=pdf>
- . (2000b). *The Role of Women in Sustainable Energy Development*. Golden, CO: National Renewable Energy Laboratory.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.508.3364&rep=rep1&type=pdf>.
- . (2005). "Energy, Development and Gender: Global Correlations and Causality." Leusden, Netherlands: Collaborative Research Group on Gender and Energy (CRGGE).
http://r4d.dfid.gov.uk/pdf/outputs/energy/r8346-2005_cecelski.pdf.
- . (2006). "From the Millennium Development Goals Towards a Gender-Sensitive Energy Policy Research and Practice: Empirical Evidence and Case Studies." Synthesis Report. Leusden, Netherlands: ENERGIA/DfID Collaborative Research Group on Gender and Energy (CRGGE).
<http://www.energia.org/cms/wp-content/uploads/2015/06/49-From-the-millennium-development-goals-towards-a-gender-sensitive-energy-policy-research-and-practice.pdf>.

- Cecelski, E., A. Ounali, M. Aissa, and J. Dunkerley. (2005). "Rural Electrification in Tunisia: National Commitment, Efficient Implementation, and Sound Finances." Washington, DC: Joint UNDP/World Bank Energy Sector Management Assistance Program.
<https://openknowledge.worldbank.org/bitstream/handle/10986/18065/ESM307.pdf?sequence=1&isAllowed=y>.
- Chakrabarti, S., and S. Chakrabarti. (2002). "Rural Electrification Programme with Solar Energy in Remote Region: A Case Study in an Island." *Energy Policy* (30) 1: 33–42. [https://doi.org/10.1016/S0301-4215\(01\)00057-X](https://doi.org/10.1016/S0301-4215(01)00057-X)
- Chong, A., and E. La Ferrara. (2009). "Television and Divorce: Evidence from Brazilian Novelas." Washington, DC: Inter-America Development Bank.
<https://publications.iadb.org/bitstream/handle/11319/1641/Television%20and%20Divorce%3a%20Evidence%20from%20Brazilian%20Novelas.pdf;jsessionid=F65B81E4F0F771539AD106C612E8AF23?sequence=1>.
- Clancy, J. (2002). "Household Energy and Gender: An Introduction." Briefing paper, Sparknet. <http://doc.utwente.nl/59060/1/Clancy02blowing.pdf>.
- Clancy, J., and S. Dutta. (2005). "Women and Productive Uses of Energy: Some Light on a Shadowy Area." Paper presented at the United Nations Development Programme Meeting on Productive Uses of Renewable Energy, Bangkok, Thailand, May 9–11. <http://www.energia.org/cms/wp-content/uploads/2015/06/43-Women-and-productive-use-of-energy.pdf>.
- Clancy, J., S. Oparaocha, and U. Roehr. (2004). "Gender Equity and Renewable Energies." Thematic Background Paper. International Conference for Renewable Energies, Bonn 2004.
<http://www.ren21.net/Portals/0/documents/irecs/renew2004/Gender%20Equity%20and%20Renewable%20Energies.pdf>.
- Clancy, J., M. Skutsch, and S. Batchelor. (2002). "The Gender-Energy-Poverty Nexus: Finding the Energy to Address Gender Concerns in Development." DFID Project CNTR998521. London: UK Department for International Development (DFID).
<http://doc.utwente.nl/59061/1/Clancy99gender.pdf>.
- Clancy, J., T. Winther, M. Matinga, and S. Oparaocha. (2012). "Gender Equity in Access to and Benefits from Modern Energy and Improved Energy Technologies." World Development Report Background Paper. ETC/ENERGIA in association Nord/Sør-konsulentene.
http://doc.utwente.nl/79143/1/WDR_Norad_ENERGIA_Main_Paper.pdf.
- Cooke, P., G. Kohlin, and W. Hyde. (2008). "Fuelwood, Forests, and Community Management: Evidence from Household Studies." *Environment and Development Economics* 13 (1): 103–135.
[doi:10.1017/S1355770X0700397X](https://doi.org/10.1017/S1355770X0700397X)

- Danielsen, K. (2012). "Gender Equality, Women's Rights and Access to Energy Services." Copenhagen: Ministry of Foreign Affairs of Denmark.
http://www.kit.nl/gender/wp-content/uploads/publications/1975_Gender%20Rights%20and%20Energy%20Report%20final.pdf.
- Dinkelman, T. (2011). "The Effects of Rural Electrification on Employment: New Evidence from South Africa." *American Economic Review* 101 (7): 3078–3108.
- Dutta, S. (2003). "Mainstreaming Gender in Energy Planning and Policies." Background Paper for Expert Group Meeting, UNESCAP Project on Capacity Building on Integration of Energy and Rural Development Planning.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.1532&rep=rep1&type=pdf>.
- Echarri, J., and F. Forriol. (2002). "Effect of Axial Load on the Cervical Spine: A Study of Congolese Woodbearers." *International Orthopaedics* 26 (3): 141–144. <http://doi.org/10.1007/s00264-002-0336-6>
- ESMAP (Energy Sector Management Assistance Programme). (1999). "A Review of the Renewable Energy Activities of the UNDP/World Bank Energy Sector Management Assistance Programme 1993–1998." Report 223/99. https://www.esmap.org/sites/esmap.org/files/FR223-99_GBL_.pdf.
- Ferrant, G., L. M. Pesando, and K. Nowacka. (2014). *Unpaid Care Work: The Missing Link in the Analysis of Gender Gaps in Labour Outcomes*. Paris: OECD Development Centre.
https://www.oecd.org/dev/development-gender/Unpaid_care_work.pdf.
- Ghana Statistical Service. (2008). *Ghana Living Standards Survey: Report of the Fifth Round (GLSS 5)*. Accra.
http://www.statsghana.gov.gh/docfiles/glss5_report.pdf
- Green, M. G. (2001). "Solar Cookers as a Mechanism for Women's Empowerment." ISES World Solar Congress, Adelaide, Australia, December.
- Grogan, L., and A. Sadanand. (2013). "Rural Electrification and Employment in Poor Countries: Evidence from Nicaragua." *World Development* 43: 252–65.
- Halim, S. (2004). "Ensuring Women's Role in Rural Electrification Programs." *Energia News* 7 (1): 17.
- IEA (International Energy Agency). (2010). *World Energy Outlook 2010*. Paris.
<http://www.worldenergyoutlook.org/media/weo2010.pdf>.

- . (2013). *World Energy Outlook 2013*. Paris.
<http://www.iea.org/publications/freepublications/publication/WEO2013.pdf>
- . (2015). *World Energy Outlook 2015*. Paris.
<https://www.iea.org/Textbase/npsum/WEO2015SUM.pdf>.
- ILO (International Labour Office). (2013). *Women and Men in the Informal Economy: A Statistical Picture*. Geneva.
http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_234413.pdf
- Jensen, R., and E. Oster. (2009). "The Power of Cable TV: Cable Television and Women's Status in India." *Quarterly Journal of Economics* 124 (3): 1057–1094.
- Karlsson, G., ed. (2007). *Where Energy Is Women's Business: National and Regional Reports from Africa, Asia, Latin America, and the Pacific*. Leusden, Netherlands: ENERGIA. http://www.energia.org/cms/wp-content/uploads/2015/04/06.-karlsson_csdbook_lores.pdf
- Kelkar, G., and D. Nathan. (2005). "Gender Relations and the Energy Transition in Rural Asia." Collaborative Research Group on Gender and Energy (CRGGE), Project on Gender as Key Variable in Energy Interventions. http://r4d.dfid.gov.uk/PDF/Outputs/Energy/R8346_finrep_kelkar.pdf.
- Köhlin, G., E. O. Sills, S. K. Pattanayak, and C. Wilfong. (2011). "Energy, Gender and Development: What Are the Linkages? Where Is the Evidence?" Social Development Working Paper No. 125. Background paper for the World Development Report 2012. Washington, DC: World Bank.
http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/09/06/000386194_20110906014421/Rendered/PDF/644100WP0Energ000public00BOX361536B.pdf.
- Lambrou, Y., and G. Piana. (2006). *Energy and Gender in Rural Sustainable Development*. Rome: Food and Agriculture Organization of the United Nations. <ftp://ftp.fao.org/docrep/fao/010/ai021e/ai021e00.pdf>.
- Lewis, J. J., and S. K. Pattanayak. (2012). "Who Adopts Improved Fuels and Cookstoves? A Systematic Review." *Environmental Health Perspectives* 120: 637–645.
- Mahat, I. (2004). "Electrification through Micro-Hydro Plants in Rural Nepal: A Gendered Perspective." *Energia News* 7 (1): 15–16.
- Mandhlazi, W. (1999). "A Reflection on the Impact of Renewable Energy Projects on Gender." *SAREIN News Flash* (June).
- Masse, R. (2003). "Impacts of Rural Electrification on Poverty and Gender in Sri Lanka." Labastide-Murat, France: Marcheage et Gestion de

l'Environnement (MARGE).

- Mathee, A., and T. de Wet. (2001). "Rural Electrification in South Africa: Implications for the Health and Quality of Life of Women." *Energia News* 4 (4): 20–22.
- Matinga, M. N. (2010). "We Grow Up with It: An Ethnographic Study of the Experiences, Perceptions, and Responses to the Health Impacts of Energy Acquisition and Use in Rural South Africa." Ph.D. dissertation, University of Twente, Enschede, Netherlands. http://doc.utwente.nl/75414/1/thesis_M_Matinga.pdf.
- McCall, M. (2001). "Beer Brewing Should Be a Hotter Issue." *Boiling Point*, no. 47: 23–25.
- McDade, S., and G. Karlsson, eds. (2000). *Generating Opportunities: Case Studies on Energy and Women*. New York: United Nations Development Programme. http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/generating-opportunities-case-studies-on-energy-and-women/GeneratingOpportunities_2001.pdf
- Mensah, S. A. (2001). "Energy for Rural Women's Enterprises." In *Generating Opportunities: Case Studies on Energy and Women*, 36–43. New York: United Nations Development Programme. http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/generating-opportunities-case-studies-on-energy-and-women/GeneratingOpportunities_2001.pdf.
- Mills, E. (2012). *Health Impacts of Fuel-Based Lighting*. Technical Report #10. Berkeley, CA: Lumina Project, Lawrence Berkeley National Laboratory, University of California. <http://light.lbl.gov/pubs/tr/Lumina-TR10-health-impacts.pdf>.
- Mobarak, A. M., P. Dwivedi, R. Bailis, L. Hildemann, and G. Miller. (2012). "Low Demand for Nontraditional Cookstove Technologies." *Proceedings of the National Academy of Sciences* 109 (27): 10815–10820.
- O'Dell, K., S. Peters, and K. Wharton. (2014). *Women, Energy, and Economic Empowerment: Applying a Gender Lens to Amplify the Impact of Energy Access*. Deloitte University Press. <https://dupress.deloitte.com/dup-us-en/topics/social-impact/women-empowerment-energy-access.html>.
- Pachauri, S., and N. D. Rao. (2013). "Gender Impacts and Determinants of Energy Poverty: Are We Asking the Right Questions?" *Current Opinion in Environmental Sustainability* 5 (2): 205–215. doi:10.1016/j.cosust.2013.04.006.

- Panjwani, A. (2005). "Energy as a Key Variable in Promoting Gender Equality and Empowering Women: A Gender and Energy Perspective on MDG #3." London: UK Department for International Development (DFID). http://r4d.dfid.gov.uk/PDF/Outputs/Energy/R8346_mdg_goal3.pdf.
- Porcaro, J., and M. Takada, eds. (2005). *Achieving the Millennium Development Goals: The Role of Energy Services: Case Studies from Mali, Brazil, and the Philippines*. New York: United Nations Development Programme. http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/achieving-the-mdgs-the-role-of-energy-services---brazil-mali-philippines/Achieving%20the%20MDGs-The%20role%20of%20energy%20services_2005.pdf
- Quisumbing, A., L. R. Brown, H. Sims Feldstein, L. Haddad, and C. Pena. (1995). *Women: The Key to Food Security*. Food Policy Report. Washington, DC: International Food Policy Research Institute. <https://core.ac.uk/download/pdf/6289051.pdf>
- Rabiee, F., and C. Geissler. (1992). "The Impact of Maternal Workload on Child Nutrition in Rural Iran." *Food and Nutrition Bulletin* 14 (1): 43–48.
- Ramani, K. V., and E. Heijndermans. (2003). *Energy, Poverty and Gender: A Synthesis*. Washington, DC: World Bank. https://www.esmap.org/sites/esmap.org/files/Rpt_GBL_EnergyPovertyGender.pdf.
- Rath, A. (2005). "Energy Women and Rural Poverty: A Review Focusing on Latin America." Ottawa: Policy Research International Inc. https://agrireregionieuropa.univpm.it/sites/are.econ.univpm.it/files/materiale/2007/publications_050921_amitav.pdf
- Rosen, S., and J. R. Vincent. (1999). "Household Water Resources and Rural Productivity in Sub-Saharan Africa: A Review of the Evidence." Cambridge, MA: Harvard Institute for International Development. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.461.6534&rep=rep1&type=pdf>
- Saito, K. (1994). *Raising the Productivity of Women Farmers in Sub-Saharan Africa*. World Bank Discussion Paper No. 230. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/812221468741666904/pdf/multi-page.pdf>
- Soria, L., K. Farley, and A. Glinski. (2016). "'With Solar Sister, Forward We Go': A Qualitative Assessment Exploring How Solar Sister Brings Light, Hope, and Opportunity to Women in Africa." Washington, DC: International Center for Research on Women. <https://www.icrw.org/wp-content/uploads/2016/10/Solar-Sister-Qualitative-Assessment.pdf>.

- Standal, K. (2008). "Giving Light and Hope in Rural Afghanistan: The Impact of Norwegian Church Aid's Barefoot Approach on Women Beneficiaries." Master's thesis, University of Oslo, Norway.
https://www.duo.uio.no/bitstream/handle/10852/16072/Master_Karina_Standal.pdf?sequence=1&isAllowed=y.
- Subba, Suman. (1999). "Women, Woodfuel, and Health in Adamtar Village, Nepal." *Gender, Technology, and Development* (3) 3: 361–377.
<http://journals.sagepub.com.proxygw.wrlc.org/doi/abs/10.1177/097185249900300302>
- Tadesse, T. (2002). "Empowering Women in Ethiopia." *Choices*, 12–13.
- UNDP (United Nations Development Programme). (2004). *Gender and Energy for Sustainable Development: A Toolkit and Resource Guide*.
<http://doc.utwente.nl/49799/1/Clancy04gender.pdf>.
- UNIDO (United Nations Industrial Development Organization). (n.d.). *Sustainable Energy for All: The Gender Dimensions*. Vienna.
http://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Women_and_Youth/GUIDANCENOTE_FINAL_WEB.pdf
- USAID (US Agency for International Development). (2010). "Female Meter Reader Raises Revenues." February 9. <https://www.usaid.gov/results-data/success-stories/female-meter-reader-raises-revenues>.
- Westoff, C. F., and D. A. Koffman. (2011). "The Association of Television and Radio with Reproductive Behavior." *Population and Development Review* 37 (4): 749–759.
- WHO (World Health Organization). (2016). *Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and Wellbeing of Women and Children*. Geneva.
http://apps.who.int/iris/bitstream/10665/204717/1/9789241565233_eng.pdf.
- Winther, T. (2008). *The Impact of Electricity: Development, Desires, and Dilemmas*. Oxford, UK: Berghahn Books.
- Winther, T. (2014). "The Introduction of Electricity in Sundarban Islands: Conserving or Transforming Gender Relations?" In *Women, Gender and Everyday Social Transformation in India*, K. Nielson and A Waldrop, eds., 47-61. London, UK: Anthem Press.
- World Bank. (2008). *The Welfare Impacts of Rural Electrification: A Reassessment of the Costs and Benefits*. Washington, DC.

———. (2014). *Clean and Improved Cooking in Sub-Saharan Africa: A Landscape Report*. Report No. 98664. Washington, DC: World Bank Group, Africa Renewable Energy Access Program (AFREA), and Energy Sector Management Assistance Program (ESMAP). http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/08/18/090224b08307b414/4_0/Rendered/PDF/Clean0and0impr000a0landscape0report.pdf.

RESEARCH BACKGROUNDER

SERIES LISTING

["Making Investments in Poor Farmers Pay: A Review of Evidence and Sample of Options for Marginal Areas,"](#) by Melinda Smale and Emily Alpert (2009).

["Turning the Tables: Global Trends in Public Agricultural Investments,"](#) by Melinda Smale, Kelly Hauser, and Nienke Beintema, with Emily Alpert (2009).

["Risk and Risk Transfer in Agriculture: Facilitating Food Security and Poor Farmer Participation,"](#) by Leander Schneider (2010).

["From the Ground Up: Strategies for Global Community-based Disaster Risk Reduction,"](#) by Kelly Hauser (2010).

["Impact of Climate Change on Response Providers and Socially Vulnerable Communities in the US,"](#) by John Cooper and Jasmine Waddell (2010).

["Climate Change and Violent Conflict: A Critical Literature Review,"](#) by Ellen Messer (2010).

["Under Pressure: Reducing Disaster Risk and Enhancing US Emergency Response Capacity in an Era of Climate Change,"](#) by Marc Cohen, Kelly Hauser, Ellen Messer, and M. Cristina Tirado (2011).

["Impact of Garment and Textile Trade Preferences on Livelihoods in Cambodia,"](#) by Sophal Chan and Sothea Oum (2011).

["In Need of a Better WASH: Water, Sanitation, and Hygiene Policy Issues in Post-earthquake Haiti,"](#) by Figaro Joseph (2011).

["Local Capacity in Humanitarian Response: Vision or Mirage?,"](#) by Michael Delaney and Jacobo Ocharan (2012).

["Systems, Power and Agency in Market-based Approaches to Poverty,"](#) by Chris Jochnick (2012).

["Measuring Economic Progress and Well-Being: How to move beyond GDP?,"](#) by Heloisa Marone (2012).

["Land Rights, Land Tenure, and Urban Recovery: Rebuilding Post-Earthquake Port-au-Prince and Léogâne,"](#) by Harley F. Etienne (2012).

["Haiti Rice Value Chain Assessment: Rapid Diagnosis and Implications for Program Design,"](#) by David C. Wilcock and Franco Jean-Pierre (2012).

["From Controversy to Consensus: Lessons Learned from Government and Company Consultations with Indigenous Organizations in Peru and Bolivia,"](#) edited by Emily Greenspan (2012).

["Community Consent Index: Oil, Gas, and Mining Company Public Positions on Free, Prior, and Informed Consent \(FPIC\),"](#) by Marianne Voss and Emily Greenspan (2012).

["Harvesting Data: What Can 10 Years of Official Development Assistance Data Tell Us About US International Agricultural Development?,"](#) by Kelly Hauser (2012).

["Summary of reports on mining and development in the province of Espinar, Peru,"](#) by Gerardo Castillo Guzmán (2013).

[“US Investment in Large-scale Land Acquisitions in Low- and Middle-Income Countries,”](#) by Joshua Humphreys, Ann Solomon, and Emmanuel Tumusiime (2013).

[“Local Institutions, External Interventions, and Adaptations to Climate Variability: The case of the Borana pastoralists in southern Ethiopia,”](#) by Dejene Negassa Debsu (2013).

[“Local Institutions, External Interventions, and Adaptations to Climate Variability: The case of southern Mali,”](#) by Rebecca Joy Howard (2013).

[“The Power of Oil Palm: Land grabbing and impacts associated with the expansion of oil palm crops in Guatemala: The case of the Palmas del Ixcan Company,”](#) by Arantxa Guarena and Ricardo Zepeda (2013).

[“Human Rights and Social Conflict in Oil, Gas, and Mining Industries: Policy recommendations for national human rights institutions,”](#) by Ben Collins and Lesley Fleischman (2013).

[“The Rice Value Chain in Haiti: Policy proposal,”](#) by Carlos Furche (2013).

[“Housing Delivery and Housing Finance in Haiti: Operationalizing the national housing policy,”](#) by Duong Huynh, et al. (2013).

[“Development Assistance on Local Adaptive Capacity to Climate Change: Insights from Senegal,”](#) by Henri M. Lo and Emmanuel Tumusiime (2013).

[“Agriculture Change, Land, and Violence in Protracted Political Crisis: An examination of Darfur,”](#) by Abdal Monium K. Osman, Helen Young, Robert F. Houser, and Jennifer C. Coates (2013).

[“Sustainable and inclusive Investments in Agriculture: Lessons on the Feed the Future Initiative in Tanzania,”](#) by Emmanuel Tumusiime and Demund Matotay (2014).

[“Feed the Future Investment in Haiti: Implications for sustainable food security and poverty reduction,”](#) by Danielle Fuller Wimbush and Cardyn Fil-Aime (2014).

[“Delivering Aid in contested Spaces: Afghanistan,”](#) by Erin Blankenship (2014).

[“The Drivers of Economic Inequality: A Primer,”](#) by Nick Galasso (2014).

[“Ready for gold? Assessing Haiti’s governance and regulatory capacity for large-scale mining,”](#) by Scott Sellwood and Stuart Levit (2015).

[“Global Reach of the US Financial Sector,”](#) by Stephanie Fontana (2015).

[“Climate change, equity and stranded assets,”](#) by Simon Caney (2016).

[“Gender and Social Accountability: Ensuring women’s inclusion in citizen-led accountability programming relating to extractive industries,”](#) by Sarah Bradshaw with Brian Linneker and Lisa Overton (2016).

[“Transformative and Feminist Leadership for Women’s Rights,”](#) by Shawna Wakefield (2017).

[“The energy challenge in sub-Saharan Africa: A guide for advocates and policy makers: Part 1: Generating energy for sustainable and equitable development,”](#) by Nkiruka Avila, Juan Pablo Carvallo, Brittany Shaw, and Daniel M. Kammen (2017).

[“The energy challenge in sub-Saharan Africa: A guide for advocates and policy makers: Part 2: Addressing energy poverty,”](#) by James Morrissey (2017).

[“Political Rigging: A primer on political capture and influence in the 21st century,”](#) by Janine R. Wedel, Nazia Hussain, and Dana Archer Dolan (2017).

[“Energy and Women and Girls: Analyzing the needs, uses, and impacts of energy on women and girls in the developing world,”](#) by Rebecca Rewald (2017).

Forty percent of the people on our planet—more than 2.5 billion—now live in poverty, struggling to survive on less than \$2 a day. Oxfam America is an international relief and development organization working to change that. Together with individuals and local groups in more than 90 countries, Oxfam saves lives, helps people overcome poverty, and fights for social justice.

To join our efforts or learn more, go to www.oxfamamerica.org.



OXFAM
America

HEADQUARTERS

226 CAUSEWAY STREET, 5TH FLOOR
BOSTON, MA 02114-2206
(800) 77-OXFAM

POLICY & ADVOCACY OFFICE

1101 17TH STREET, NW, SUITE 1300
WASHINGTON, DC 20036
(202) 496-1180

www.oxfamamerica.org