Renewable Energy Resources for Women Empowerment in Nigeria

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Abstract: Energy is a basic necessity for human activity, and economic and social development. Yet global strategies on how to meet this basic needs for world's rapidly growing population are solely lacking. Lack of energy services is directly correlated with key elements of poverty, including low education levels, restriction of opportunity to subsistence activity, and conflict. Women are the specific focus here, since they generally have the responsibility for providing household energy and use for almost all economic activities. Secure access to energy services is a key component of alleviating poverty, and an indispensable element of sustainable human development and contribute to reducing vulnerability and empowering women. Modern forms of energy are considered a necessary input for economic development and the elimination inequalities which prevent them from influencing policies and interventions which affect their lives and which also impede overall growth and development. Thus, this paper, focusing on women discusses the energy-poverty situation and the various areas of energy poverty manifestations. It discusses why women need renewable energy and how to move them out of energy-poverty situation. It concludes with the way forward.
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1. Introduction

Poverty is one of the world's most fundamental issues, and urgently needs to be addressed. Moving people out of poverty forms a cornerstone of much international development policy. The way poverty is conceptualized has changed in recent years. Initially it was defined very much in economic terms; people with an income of less than $1 a day are considered to be living in extreme poverty. However, as research into poverty has shown that there are more dimensions of poverty than low cash incomes. When people we regard as "poor" describe their own situation, they consider that their well-being is inadequate, for example, they feel a lack of access to sufficient levels of food, water, clothing, shelter, sanitation, healthcare, and education. The change in conceptualization of poverty has lead to new ways of addressing moving people out of poverty. Although, there is still an emphasis on income generation through increasing the opportunities for the poor to participate in markets, there has been a broadening of strategies to enable the empowerment of poor people. Empowerment aims to address the inequalities, including gender inequalities, which prevent people from influencing policies and interventions which affect their lives. Increasing the security of poor people by addressing the factors which create their vulnerability has become a part of international development thinking (Clancy, 2003).

Energy is recognized one of the most essential inputs for sustaining people's livelihoods. At the most basic level, energy provides cooked food, boiled water and warmth. However, energy has never been widely accepted within development circles as a basic need, as have water and food. It has long been established that poor people mostly use biomass as their energy carrier and that in many areas there is an increasing shortage in supply, which adds to the burden of the women whose responsibility it is to collect. However, despite the fact that around two billion people still use biomass fuels (World Bank, 1996), and the fact that these are also the two million poorest people on earth, there has been little attempt until recently to analyze the energy-poverty nexus in depth.

Towards the end of the 1990s, there had been some discussion about providing energy services for the poor, for example, the World Bank's Rural Energy and Development: Improving Energy Supplies for Two Billion People. However, it is during the preparations leading up to the World Summit on Sustainable Development in 2002, that a shift towards a more explicit recognition of the role of energy in the fight against poverty began to emerge. For example, UNDP began to advocate the adoption of a new global target for energy as a prerequisite to fulfilling other international development targets of the Millennium Goals adopted by the UN General Assembly in 2001. The target aimed to halve the proportion of people without access

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to clean and affordable fuels and electricity by 2015. The UK's Department for International Cooperation (DFID) released "Energy for the Poor" which set out its vision for the role of energy services for helping the poor move out of poverty and how access to energy for the people can be facilitated. The World Bank's Asia Alternative Energy Programme (ASTAE) recently undertook a study to identify and quantify as far as possible the potential benefits of energy in general, and of electricity in particular, to the poor (Heijnderrnans, 2002). While modern forms of energy are a necessary input for economic development and the elimination of poverty, improved access to energy alone is not an input for development.

2. Manifestations of energy poverty

The use of biomass and poor people seem inexorably linked, It is likely that biomass will remain the fuel of necessity for the poor for many years to come (Barnett, 2000). What are the repercussions of this? The fuel quality is low, and when burnt gives off quantities of smoke and particulates that are recognized as having negative effects on health. Several hours a day spent in collecting fuel means that this time cannot be used for other livelihood activities. Although nearly every household in rural areas will use some biomass as an energy carrier, poor households will spend more time searching than those in higher income groups (Reddy, 2000). Wealthier households will also purchase other higher quality fuels, which will be used for a greater variety of end-uses than in poor households. In urban areas, poor people have to purchase cooking fuels, and they spend a larger proportion of their income than higher income households on fuels (ESMAP, 1999). Typically, a poor urban family may spend 20% of its income on fuels (Barnes, 1995). In rural areas, poor households will generally restrict fuel purchases to lighting uses (candles and kerosene). Energy has an equity dimension: poor households use less energy than wealthier ones in absolute terms. Less water is boiled for drinking and other hygiene purposes, increasing the likelihood of water-borne diseases, Illness reduces the ability of poor people to improve their livelihoods and increases their vulnerability, not only preventing adults from working effectively but also negatively effecting children's learning by keeping them from school.

Wealthier people are able to exercise some choice in their energy carrier and many opt for the cleaner and more efficient "modern" energy carriers of electricity or gas including LPG or biogas, although the use of energy carriers is complex. Many better off households use mixtures of modern and traditional fuels, each matched to a specific end purpose, often for reasons not linked to price (for example, taste). Modern energy carriers do not have the negative health and time effects associated with biomass. Wealthier people are also able to afford the appliances that make use of these modern energy carriers. In situations where wealthier households are reliant on biomass fuels, they are able to purchase more fuel-efficient stoves. In doing so they may be saving a great deal of money per unit of energy consumed. Unfortunately, poor people are often unable to make such investments, opting for lower first cost options, rather than lower life cycle costs, because of lack of capital1 (Reddy and Reddy, 1994). The consequences for the poor are that precious cash resources are used on low quality fuels, which are then used at low efficiency, reducing their ability to accumulate the financial resources they need to invest in strategies for improving their livelihoods.

As understanding has grown about how different income groups use energy and the types of energy they use, it has been possible to identify an energy dimension to poverty: energy poverty. Energy poverty has been defined as the absence of sufficient choice in accessing adequate, affordable, reliable, high quality, safe and environmentally benign energy services to support economic and human development (Reddy, 2000). Energy poverty interacts with other manifestations of poverty. In order to develop sustainable interventions it is important to explore the issues that surround energy poverty, including the gender aspects. The need to incorporate a poverty dimension into their work would be challenging for many in the energy sector since the new "buzz words" of poverty reductions strategies, empowerment, security and opportunity are not the normal vocabulary of the energy professional or bureaucrat.

3. The gender dimension of the energy-poverty nexus

The energy-poverty nexus has distinct gender characteristics. Within households, where there are adult men and women, the gendered division of labour generally allocates to women the responsibility for household energy provision related to their spheres of influence in the household, in particular activities centred round the kitchen. They are often supported in this work by girls and sometimes boys, who can be kept out of school thereby damaging their own future livelihood choices. Men become involved in places where large quantities and pieces of wood need to transported over long distances.

Women's access to decision-making within the household and community is restricted, limiting their ability to influence processes and resource allocation on many issues including

energy. Women and men have different perceptions about the benefits of energy, for example, a research study on the gender related impact of micro-hydro in Sri Lanka, found that men in the area under study saw the benefits of electricity in terms of leisure, quality of life, and education for their children; while women saw electricity as providing the means for reducing their workload, improving health, and reducing expenditure (Dhanapala (1995) quoted in Barnet, 2000).

Of the approximately 1.3 billion people living in poverty, it is estimated that 70% are women, many of whom live in female-headed households in rural areas. Since women generally have less access to resources and decision-making than men, many poor female-headed households can be expected to be living in extreme energy poverty, it is not only the supply of energy which will be constrained, but also the important services for the household which will be affected, such as clean water provision. Their lack of resources makes them vulnerable to changes outside of their control e.g. drought.

Poor men and women do not necessarily become poor in the same ways, for example, a man might loose his job, and a woman, who has always depended on her husband for financial support, may become a widow, forcing her to start looking for a paying job later in her life, which she might be ill equipped to do so. Men and women have different ways of adopting strategies for addressing their poverty, men are more easily able to migrate while women stay put managing the household and creating informal sector business they can run from home. Therefore, the energy strategies that are intended to assist people to move out of poverty must take these gender aspects into account.

4. Why Women Need Renewable Energy

Rural women face a crisis of biomass energy and of time and human energy, both to meet basic human needs and to earn livelihoods. Both urban and rural women must find means to meet their family id enterprise energy needs in the energy transition to more modem, commercial fuels as well. Energy efficiency and especially pricing and availability of alternative fuels continue to be a concern to women in both modernizing and developed countries, as women are primarily responsible for cooking and household management in all societies.

4.1 Biomass Cooking Energy Crisis: Fuel Scarcity, Health and Safety

Women's role in biomass cooking, the major use of energy in the household energy sector, is well- known. More than 2 billion people globally have been estimated to depend on biomass to meet their basic energy needs (UNDP 1997). Biomass fuels comprise 80% of household fuel consumption in poor developing countries, used mainly for cooking and heating. As the major users of traditional biomass energy resources, women have practical interests and expertise about how different fuels bum, efficient fire management, fuel-saving techniques, and the advantages and disadvantages of different fuels and stoves (Intermediate Technology Development Group [ITDG] 1992; International Labour Organization [ILO] 1987).

Rural women (and their children1 are the primary collectors of wood and residue fuels for household use. They often produce biomass fuels in their own home gardens and manage and protect common lands to maximize sustainable production of a variety of forestry products (Food and Agriculture Organization (FAO 1987). Although deforestation is generally due to market forces (such as urban and industrial fuel demands, agricultural clearing, and overgrazing), it directly affects the effort and time required for women to harvest biomass fuels.

Rough estimates of the proportion of rural women affected by fuel scarcity (based on estimates by the FAO of the percentage of household energy provided by fuel wood) are 60% in Africa, nearly 80% in Asia and nearly 40% in Latin America and the Caribbean (UNDP 1995). Time spent in fuel collection in fuel-scarce areas can range from 1 hour to 5 hours per household per day. Other effects documented include reduced water heating and washing, and decreased time and fuel used for cooking, the whole at times even resulting in decreased female time devoted to agricultural work and food production and negative impacts on nutritional and health status (Cecelski 1987; Brouwer 1989).

Health and safety are major concerns of women in their use of biomass fuels. Smoke reduction and improved safety for children are often the two most important reasons cited by women for adopting improved stoves and fuels. In South African urban townships, the prevention of accidental kerosene poisoning of children, and the prevention of devastating housing fires caused by kerosene cooking and lighting, are important motivations given by both women and men for desiring household electrification (Mehlwana and Qase 1996).

4.2 Human Energy Crisis: Women's Invisible Time and Effort

Women's long working hours in both domestic and economic activities (11hours to 14 hours per day) have been documented in nearly every country. Of the total burden of work, women carry on average 53% in developing

countries and 51% in industrial countries (United (UN) 1995).

Compared to men, women in rural areas of developing countries spend long hours working in survival activities such as firewood collection, water hauling, food processing, and cooking. Women's energy and time scarcity impinges on the provision of these basic services. The proportion of rural women affected by water scarcity, for example, is estimated at 55% in Africa, 32% in Asia, and 45% in Latin America, with the median time for collecting water in the dry season at 1.6 hours per day (UN 1995).

Human energy is essential to survival in the rural production system. Much of this human energy is unpaid family labor provided by women. Because it is unpaid, it does not enter the market system. Because it is metabolic energy and difficult to measure, it does not enter the conventional energy system, which consists in this view of oil, natural gas, coal, hydropower, nuclear, wind, solar, biogas, and geothermal energy and does not account for the muscle power provided by human beings and animals performing the same tasks. Because they work longer hours than men and a larger proportion of their work falls outside the market, women are not credited for their true contributions when metabolic energy is excluded from energy analysis.

Women's time spent on these survival tasks is largely invisible in current methods of reporting energy patterns and statistics. For example, while the energy used by an electric pump that transports drinking water can be easily measured and reported, the human energy expended by a woman carrying water goes unmeasured, unmonetized, and unrecorded in energy statistics. Although the energy expended for a water-mill grinding grain is accounted for in industrial energy balances, the calorific efforts of women doing the same task with mortar and pestle are not. Trucks transporting crops consume fossil fuels that are traded and valued through market mechanisms; the energy of women head loading the same maize to market in baskets is excluded from quantified energy balances.

4.3 Energy for Microenterprises: Livelihoods and Income

Both rural and urban women need adequate energy supplies for their small- and medium-scale enterprises and home industries. Many of these informal sector activities are highly fuel-intensive, and their viability and costs are affected by energy prices and availabilities. Examples of energy-intensive Microenterprises usually operated by women include food-processing industries and kiln-using manufacturing activities. Their enterprises also encompass numerous service-sector activities. Because fuel is a significant cost factor, there is a commercial motivation to improve the efficiency of the entire process.

Like women's unpaid labor in the household production system, women's informal sector enterprises are often invisible in energy accounts. Yet the energy consumed by these industries, not only in human labor but in fuel, is not insignificant. On average, small industries probably use 10% to 50% of total wood consumption in rural areas and in biomass-using urban areas, as well (BEST 1988).

Many biomass- and energy-based small industries have been severely affected by rising energy costs, fuel shortages, and deforestation. In the industries mentioned above, energy is a significant cost factor. Wood-fuel is estimated to account for 25% of production costs of dolo (local drink) beer in Burkina Faso, 30% of bread baking costs in Kenya and Peru, and about 20-25% of food processing production costs generally (BEST 1988). Food processing was identified in an urban energy study in Dar es Salaam, Tanzania, as the least efficient energy user in the urban informal sector (Hosier 1994). Although some producers are able to substitute more efficient modem fuels, there is evidence that fuel wood scarcities and rising costs pose a constraint on production.

4.4 Energy for the Modern Sector: Fuel Substitution, Efficiency, and Transport.

While women's role in traditional biomass cooking has been widely acknowledged, there has been a tendency to believe that women's role in energy use ends with the transition to modem, commercial energy such as kerosene, gas, and electricity, or renewable sources.

On the contrary, women still need efficient energy, because women still play the key role in household energy use in modern and modernizing societies. Women are still responsible for cooking with modem fuels, and they make critical decisions about fuel substitution and the purchase of stoves and other appliances, based on their fuel preferences and budget constraints. As modem lifestyles become more rushed, women need more cooking and energy options to aid their work. These choices are of course relevant to programs that improve energy efficiency.

Perhaps even more important, renewable energy and energy efficiency programs need to involve women because women influence their households' direct and indirect energy consumption, and educate and shape their children's future energy conservation and

consumption habits. Women decide on or influence:

- The use of lighting, heating and air conditioning, hot water and electrical appliances, including the choice of time of use, and, therefore, peak use.
- Household purchases of goods and services, which may be more or less energy-intensive or "wasteful", e.g., packaging.
- Household management habits, such as recycling and composting.
- The use of household transport and choices about the use of private automobiles, bicycles, or public transport.

Women walk and take public transport more frequently than men. In many countries, there are large differences between men and women in automobile ownership and access as well as in possession of drivers licenses. Women tend to make a number of shorter and more complex daily trips for shopping, schools, part-time employment, and volunteer work. Current urban transport systems are not only energy-intensive, but can often restrict the mobility of those who do not use them (e.g., pedestrians, cyclists, and users of public transport) (Spitzner 1993; Sloman 1993). Cultural limitations on women's use of transportation may reinforce these restrictions. One energy efficiency effort that has sought to address women's urban transport needs is the mini-van taxi program of the Mid-Rand Transport Association in South Africa. Private mini-van taxis provide the main source of cheap, rapid public transport in urban areas in South Africa, but are plagued with problems of safety, inadequate service, and violence related to competing lines. These problems especially affect women, who, when traveling with children or moving around each day to a different work site, must change taxis numerous times or take long detours to avoid violence.

Reducing women's drudgery is a frequently cited objective of rural electrification, and women have sometimes been cited as the prime beneficiaries of rural electrification, since they spend more time in the home and hence may use improved lighting and other appliances more. Electric irons, for example, are widely enjoyed for their cleanliness, safety and ease of use. Health benefits from replacing kerosene lighting and coal- or biomass-fired cooking with a cleaner electric source should also be considered. Much is known about the very serious health effects of cooking with biomass fuels. But in the case of rural electrification, a more important interest would be in the health effects of kerosene fumes from lamps, since this is the main replacement effect. Safety of kerosene lamps and charcoal-fueled ironing, and of storing kerosene, especially for children, is another consideration.

Cooking with electricity has received attention in micro-hydro development in China and Nepal, and electric cooking has been spontaneously adopted by rural as well as urban women in a number of Asian countries (electric rice cookers) and in South Africa, despite its inefficiencies and costs. Development of low-cost and low-wattage electric cookers would make this time-saving option more accessible.

Electrification could benefit women in other areas (Cecelski 1996). Electrification of rice mills and other grain and food processing facilities - the most common rural industries to electrify-may also reduce women's workload in the home. Additional income opportunities from home-based industry work in the evenings with improved lighting could also benefit women and children. Electrification of community water supplies, schools and health clinics, as well as better security from street lighting and improved lighting for reading at home could benefit women and children disproportionately, But these benefits depend on coordination of the provision of this infrastructure with electrification and its maintenance.

5. Household Energy: Reducing Vulnerability And Increasing Empowerment

"Households and individuals adopt livelihood strategies to enable them to live and enjoy the kind of life they value. The strategies poor households and individuals adopt are ones to improve their present situation and to reach a position where they can accumulate assets. These assets can be material, (land, money, jewellery) or non-material (good health, skills, membership of farmers cooperative). Having a stock of assets means that people are able to survive difficult periods, such as drought or loss of a job, and they are less vulnerable to significant ecological, economic, social or political changes which are largely outside of their control. Using this type of analysis identifies poor households as those with a low stock of assets and consequently they are vulnerable to events over which they have little influence. Helping people move out of poverty includes helping them build their assets as well as reducing their vulnerability through enabling poor people to have more control over their own lives, in other words, empowering them2.

How can household energy contribute to reducing poor people's vulnerability and increasing their empowerment? Since household energy is primarily women's responsibility, they will be the direct beneficiaries in any improvements in availability or diversification in choice of energy carrier. Although discussions on household energy tend to focus on women, men

can be indirect beneficiaries of access to modern energy forms (for example, faster prepared meals). Men can also play an important role because they are very influential in determining the outcomes of any interventions and where and by whom the benefits to the household will be felt.

What benefits to women will arise out of addressing household energy issues? Table 1 illustrates how different forms of energy can be seen as contributing to women's practical, productive and strategic needs. Energy carriers are material assets. Therefore having access to sufficient amounts of good quality energy will contribute to reducing a household's vulnerability. There is no doubt that energy plays a major role in meeting women's practical and reproductive needs (such as cooking, food processing, water hauling). In households that buy cooking fuels, the introduction of more efficient stoves can make a significant saving to household energy bills and thereby contribute to poverty alleviation. A programme promoting fuel efficient stoves in Madagascar is reported as bringing annual fuel savings equivalent to the minimum monthly salary (approximately US$ 24) to households which adopt the stoves. This level of savings should have a significant impact in low-income households and may be of the order that households can begin to accumulate assets. However, there is no indication as to where the monetary benefits have accrued within the household. Information about who benefits and how is needed to determine whether or not there is equity in distribution of benefits.

Table 1 Possibilities for improving the position of women through energy

	Women's needs		
Energy form	Practical	Productive	Strategic
Electricity	- Pumping water: reducing need to haul and carry - Mills for grinding - Lighting improves working conditions at home.	- Increase possibility of activities during evening hours. - Provide refrigeration for food production and sale. -Power for specialized enterprises such as hairdressing and internet cafes.	-Make streets safe allowing participation in other activities (e.g. evening classes and women's group meetings). - Open horizons through radio, TV and internet
Improved biomass (supply and conversion technology)	- Improved health through better stoves - Less time and effort in gathering and carrying firewood.	-More time for productive activities. -Lower cost of process heat for income generating activities	-Control of natural forests in community forestry management frameworks.
Mechanical	-Milling and grinding - Transport and portering of water and crops	- Increases variety of enterprises.	- Transport: Allowing access to commercial and social/political opportunities

Increasing cash income within the household is seen as an important factor in reducing poor households' vulnerability. Energy can contributing to enabling women to improve their earnings in two ways: either by helping free up women's time or by powering their enterprises. Women's time devoted to household work and survival activities occupies a major part of the day (Cecelski (2000) cites 5 hours per day in Burkina Faso for firewood collection, water hauling, food processing and cooking, while another four hours is devoted to other essential activities, such as agriculture.) This lack of time is a major barrier to participation in other

activities (not only income generation). Increasing access to energy or more energy efficient technologies can help free up women's time. This time can then be used for income generating activities or the development of skills to increase the range or profitability of women's enterprises. However, it cannot automatically be assumed that women will invest their newfound 'extra time' in production activities. A study in Sri Lanka found that when women reported on how they used the time saving electricity had brought to their lives, 29% said they used it for extra housework while less than 5% reported using the time for productive activities (Masse and Samaranayake, 2002). If improvement in wellbeing is an acceptable objective of development, then there should be no objection to "increase in free time" being used for rest-something women seem to be very short of.

Box 1: Energy in livelihood strategies: improving the position of women

Energy availability that creates opportunities (increased income/more sustainable use of natural resources)

- Community-level sustainable management of forests can provide income through organized firewood production and sale.
- Energy entrepreneurship as a secondary activity for community service and income generation.
- Improved technologies for charcoal production can boost sustainability and incomes.
- Availability of mechanical and process heat technologies can be a stimulus to the start up of various small-scale enterprises (sawing, food processing etc.).
- Electricity may enable the start up or expansion of small-scale service enterprises such as hairdressing, photocopying and Internet cafes.

Energy scarcity as a constraint (which if removed, can bolster other activities, reduce vulnerability, improve food security, increase wellbeing)

- Lack of transport for moving harvest products. to storage and to market may be a disincentive to produce (increases vulnerability, and reduces food security).
- Lack of electricity may hold back development of services in rural areas (both public and private).
- Poor cooking technology results in unnecessary ill health for women and children reducing their productivity (and threatening wellbeing).
- Lack of cheap, easily available, fuel forces women to spend large amounts of time gathering fuel, and restricts the boiling of water and in some cases the adequate cooking of food resulting in ill health (threatens wellbeing, increases vulnerability) as well as limiting time available for other enterprises.

Many of women's income generating activities are often run from the household. Therefore, addressing household energy issues should also take this into account. Box 1 gives some examples of how energy can act as an opportunity or a constraint on women's productive activities. However, the role of energy in the sustainability of women 's enterprises is not well understood. The types of activities women are involved in tend to be highly fuel intensive, such as food processing, hence, their viability and costs are affected by energy prices and availability. Alternatively, women's income generation can also involve significant inputs of their own energy, for example, oil seed processing. Iii food processing enterprises, it has been estimated that energy costs are 20 - 25% of the total inputs. Food processing was identified in a study of the informal urban sector in Dar es Salaam, Tanzania as the least efficient energy user in (Hosier, 1994). Running income generating activities from the household, enables women to combine productive tasks with reproductive tasks, such as childcare. This is one of the reasons women like to have electric light, it enables them to work from home. Rural women in Tunisia cited having electricity in their homes, meant not having to leave for work in towns as maids (Chaieb and Ounalli, 2001). This could be interpreted that working from home empowered them to be their own bosses, as well as removing the need to work outside of their own, familiar environment and culture, However, a number of researchers have expressed reservations that if electric light extends working hours into the evening, this adds to women's already long working day (Clancy, 2000).

Addressing strategic needs contributes to women's empowerment. Household energy in the form of electricity seems to have been particularly significant in this respect, for example, lighting to enable evening study for mothers and daughters. Women have also been found to benefit from access to television. For example, in Tunisia, watching television enabled women to become more aware of political events and to have a greater knowledge of world events than their husbands. Through this knowledge, they have gained confidence to speak out and take up leadership roles (Chaieb and Ounalli, 2001).

Table 2 Summarizes the role household energy can play in livelihood outcomes and the particular significance for women. This table shows that with a narrow definition of household

energy as synonymous with stoves and biomass energy, contributions to improved wellbeing are possible. If the broader definition of household energy, encompassing all end-uses within the household, is used then considerably more benefits can be gained from improved energy services. Women do stand to gain from such improvements, primarily in practical and productive terms but there are also opportunities for empowering women through meeting strategic needs. Often these latter benefits are gained indirectly through giving women more "free time" from drudgery related to practical and productive tasks to use for their personal benefit.

Table 2. Livelihood outcomes as consequence of improved energy services and their consequence for women

Outcome		Key issues for women
1. More Income	▪ Income from the sale of energy services ▪ Income from energy related productivity gains ▪ Income from energy related expansion of supply options and quality (for example, doing things that are impossible without inanimate energy) ▪ income from extending the working day through improved lighting. ▪ Improved income from better access to fuel based transport.	▪ Improved status in household energy ▪ Empowerment
2. Increased well-being	▪ Improved household and street lighting ▪ Reduction of indoor air pollution (improved fuels or improved stoves) ▪ Reduced burden from fuel collection and processing Reduced drudgery by replacing human animate energy with inanimate energy ▪ Increased education as a result of better lighting in schools ▪ Better health from health services that have access to improved lighting, cold chain storage, and communication ▪ Improved access to information through radio, television and other information Technology. ▪ Sense of inclusion in the modern electrified world.	▪ Reduction of time consuming tasks (including fuel and water collection, milling, grinding, food preparation, and other reproductive tasks). ▪ Access to the outside world through radio and other information and communication technology. ▪ Better light for reading and other night time tasks.
3. Reduced vulnerability	▪ More secure water supply from pumped irrigation ▪ Better security lighting ▪ More secure fuel supplies ▪ Production based on a wider range of raw materials	▪ Safer night time environment due to improved lighting ▪ Reduced indoor air pollution ▪ Less frequent pregnancy (high correlation of electric light with reduction in birth rates)
4. Improved Food Security	▪ More secure water supply from pumped irrigation ▪ Better security lighting ▪ More secure fuel supplies ▪ Production based on a wider range of raw materials.	▪ Reduced stress (able to feed family ▪ Better health due to better and more food

Ramani, (2003)

5. Gender and Renewable Energy: The Way Forward

This paper has shown that women are not a special interest group in renewable energy, they are the mainstream users and often

producers of energy. Without their involvement, renewable energy projects risk being inappropriate, and failing. Women are the main users of household energy in developing and industrial countries; they influence or make many family purchases related to energy; they are experienced entrepreneurs in energy-related enterprises; and women's organizations are effective promoters of new technologies and active lobbyists for environmentally benign energy sources.

Renewable energy manufacturers that do not pay attention to women's needs will be missing a huge potential market. Energy policymakers who ignore women's needs will be failing to make use of a powerful force for renewable energy development. Energy researchers who leave women out of energy research and analysis will be failing to understand a large part of energy consumption and production. Donors who do not support gender-sensitive energy assistance will be overlooking one of their prim y target groups.

Much work remains to be done. For example, an economic framework for including human energy and health externalities would greatly facilitate including women's activities in the energy sector. More detailed case studies of the results of including or not including women in renewable energy projects would be of enormous use in convincing policymakers and practitioners, as well as in training. The disaggregation of data by gender should be standard practice in all renewable projects offering immediate insights to those directly involved in implementation, and also in monitoring of impacts and benefits.

A growing group of women and men, ranging from grassroots women and extensionists to researchers to policymakers and donors, believe that gender is important enough to warrant special attention in renewable energy. At the same time they know that a gender perspective represents but one piece of the complex equation that can lead to successful renewable energy projects and enterprises-not a sufficient piece alone to assure success, but a necessary piece for success.

Conclusion

There is no doubt that energy plays a major role in meeting women's practical and reproductive needs (such as cooking, food processing and water hauling), but it can also be seen as a component necessary to meet their productive and strategic needs (lighting to enable evening study, power for women's economic enterprises development and so on). Strategic planning is thus needed to available women opportunity for secure access to clean and safe energy. This can be done through incorporation of women in decision-making for design and planning of suitable energy services, awareness creation, technical training, capacity building promotion support and micro-enterprises development training.

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