

ENABLING EQUITABLE ACCESS TO RURAL ELECTRIFICATION:

CURRENT THINKING ON ENERGY, POVERTY AND GENDER

by

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Briefing Paper
Asia Alternative Energy Policy and Project Development Support:
Emphasis on Poverty Alleviation and Women
Asia Alternative Energy Unit
The World Bank, Washington, DC
January 2000, Revised July 2002

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Preface

The intersection of energy, poverty alleviation and gender is a key issue that a number of energy programs and bi-lateral donors are eager to address. Because of pressure to meet the dual objectives of environmental/climate change and poverty alleviation, energy programs are being designed without proven models, and models are being sought urgently. Adding to knowledge in this area could improve energy projects' contribution to poverty and gender objectives in a wide audience.

Only limited conceptual or empirical work is available specifically on this intersection, particularly as regards renewable energy. A number of studies address energy and development issues, but treat gender only peripherally if at all or as a separate rather than integrated topic. A gender and energy literature is developing. And much relevant study and experience is available in related areas from which guidelines and best practices can be drawn: energy and development, rural electrification/development, renewable energy best practices, micro-finance and small-scale enterprises, energy/poverty research, gender and poverty, and gender and energy work; as well as from other related sectors such as water & sanitation, social forestry, and household energy.

This briefing paper summarizes current thinking on energy, poverty and gender. A particular focus is given on rural electrification with renewable energy, based on ASTAE's comparative advantage historically. Nonetheless it should be kept in mind that this is only a narrow slice of the reality of rural energy poverty, and this is noted where appropriate.

Energy, poverty and gender relationships are explored in the first section. Sustainable energy development and poverty thinking is described, the energy-poverty-gender nexus analyzed, and current efforts in energy and gender are reviewed. New thinking on poverty is described in section 2, together with some implications for the energy sector. Some promising approaches to widening access by the poor generally to rural electrification are summarized, based on recent studies, in section 3, and key empirical questions identified concerning energy-poverty linkages.

Section 4 focuses the attention of rural electrification programs on four key issues for poor rural women: gender-disaggregated data and analysis; wood energy, cooking and health; gender-specific electricity needs; and equal access to credit and other resources for micro-enterprises. In conclusion, the important needs are to disaggregate by gender in the project cycle, document existing experiences, encourage multidisciplinary dialog, and develop new approaches in energy, poverty and gender.

The bibliography lists key sources, even when it has not been possible to adequately review them all in this report. This review is indeed still far from complete in analyzing the vast literatures and project experiences on energy, on poverty, and on gender that relate to this topic.

A companion report on major institutional actors and their activities has also been prepared.¹ This report is available at www.energja.org and will be maintained and updated regularly so long as resources permit.

This paper was prepared in a relatively short period as the basis for a brainstorming meeting in January 2000 for a Dutch-supported project entitled *Asia Alternative Energy Policy and Project Development Support: Emphasis on Poverty Alleviation and Women*, being launched by the Asia Alternative Energy Unit Asia Technical Unit for Alternative Energy (ASTAE). It could not have been prepared in such a short time without a number of critical inputs on short notice from key experts and organizations working in these areas. These are listed in Annex 1 at the end of this report, and are sincerely thanked.

The paper has been somewhat updated and revised in July 2002 to take account of some recent developments. In particular, the author is grateful for comments and suggestions on the first version by Andrew Barnett, Joy Clancy and Margaret Skutsch, and for the support of Enno Heijndermans in ASTAE, together with the very useful comments of three anonymous reviewers.

This paper should be seen as an initial exploration of this diverse literature and projects, and seeks only to raise some possibly important issues for further conceptual teasing out and development. Clearly this will require a multi-disciplinary input and a team approach.

E. Cecelski

¹ Anja Koerhuis and Elizabeth Cecelski, *MAJOR ACTORS IN ENERGY, POVERTY AND GENDER: Activities, Contacts & Web Links*

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EXECUTIVE SUMMARY

Gender and poverty challenges in widening access to electricity access in rural areas are arising in the context of renewed interest in rural electrification, especially through renewable energy, as a tool both for sustainable energy development and for greater equity in rural areas. Poverty reduction and gender equality are now integral goals for all major development institutions. Energy assistance programs are seeking models and approaches to respond to these mandates.

This paper reviews current thinking on energy, poverty and gender, with a focus on rural electrification and renewable energy, as an initial attempt to conceptualize linkages and needs in this area.

Energy, poverty and gender

Sustainable energy development (SED) has been defined as sustainability in financial, social and environmental terms. Renewable energy and energy efficiency are usually characterized as "win-win" options in SED, meeting the objectives both of environmental improvement and poverty alleviation (with financing being the principal challenge).

Recent thinking emphasizes that *choice* in energy options is critical to meeting the needs of poor people, and that a variety of strategies and trade-offs will be necessary, including fossil fuels. Despite many efforts, rural energy poverty is still widespread. New approaches emphasize an explicit poverty focus, decentralization and participation, and the integration of energy efforts with other development sectors. Gender issues are not prominent however.

Energy has been pushed higher on the sustainable development agenda by recent UN meetings, and is being linked to the Millennium Development Goals adopted by the UN General Assembly.

Over the last two decades, gender issues have attained increased prominence in the debate on sustainable energy development. International programs, such as ENERGIA, UNDP, NREL and Winrock, have helped to bring critical issues of gender equality and efficiency to the table (see companion report). Policy researchers and development practitioners have begun building a body of evidence and experience that links attention to gender in energy policy and projects to equitable, efficient and sustainable outcomes in development. A number of energy programs are starting to pay closer attention to gender and are launching important initiatives (e.g. ESMAP, UNDP/EAP).

Despite these developments, the importance of bringing a gender perspective to energy policy analysis and design is still not widely understood, nor have the lessons for development been fully integrated by donors or national policy makers. While many are sympathetic, gender is still commonly viewed predominantly as a political agenda and given this, not central to questions of energy efficiency or project effectiveness.

Current efforts on gender and energy focus on:

- building up a body of evidence and experience (conceptual, methodological, and case studies) linking attention to gender in energy policy and projects to equitable, efficient and sustainable outcomes in energy and development;
- advocacy in national and international arenas on the importance of bringing a gender perspective to policy analysis and design;
- capacity building, advice and assistance to energy programs, policy and projects in integrating a gender perspective; and
- creating networks and institutions at the national, regional and international levels to support these efforts at the practical and political level.

There is a growing literature on energy and gender. Gender is also appearing increasingly in the mainstream energy publications mentioned earlier, though often as a separate topic not integrated with strategies and solutions. The focus in the literature is mainly on poor rural women, on wood energy, and on micro household and project level analysis. Project experience is also becoming available, though much is not yet documented. Some especially relevant initiatives and reports are described in the companion report to this paper.

New thinking on poverty: some energy implications

New thinking on poverty broadens the definition of poverty to include Empowerment, Security and Opportunity. Important aspects include (a) learning from the poor, which shapes understanding and strategies; and (b) recognizing the importance of inter-sectoral policy instrument interactions. In the energy sector, inter-sectoral linkages are well-recognized as critical to ensuring impacts of e.g. rural electrification interventions.

But the perspectives of Empowerment, Security and Opportunity have not been part of the normal professional or bureaucratic concerns of many of those involved in energy policy and practice. Linkages of energy strategies with this framework have been little explored. Energy is not widely recognized as a "basic need" in development circles, and working relationships between macro-economists/engineers, and other social scientists, have been slow to develop in the energy sector (in contrast to other sectors such as health and agriculture).

Different "ways of thinking" are partly responsible: Poverty and gender thinking prioritizes people, while energy thinking often prioritizes other objectives such as efficiency, or environment. The few attempts to view energy primarily through a poverty optic are quite startling in challenging us to alter our perspective.

Rural electrification, rural development and poverty

There is no doubt that rural electrification typically benefits the non-poor more than the poor. In fact, like many other new technologies, it can increase inequities in rural areas. Nonetheless, there are clearly means by which access can be widened and the poor can more likely benefit. A number of recent studies point to "success factors" in widening access. A number of projects have applied these to target the poor, and in some cases women, and some documentation is becoming available. Given the rapid pace of developments in e.g. solar home system experience, there are many experiments that may offer new lessons even since the last review in 1995.

Some promising directions for analysis and application are:

- appropriate tariff and connection policies, including, for decentralized systems, credit and leasing;
- the role of subsidies, and the impacts of restructuring of the power sector on subsidies and access.
- demand analysis, including using gender-disaggregated analysis;
- financing/institutional mechanisms, including micro-credit, RESCOs, community/NGO-based approaches, and private participation in small-scale infrastructure provision;
- productive uses of electricity, especially uses that may only be possible with decentralized systems; and
- institutional coordination of complementary infrastructure.

Two key issues emerge from current thinking on rural electrification (or indeed energy generally) and the poor:

- (1) What is the relationship between specific energy strategies and *poverty reduction* (as opposed to merely *widening access*)? Though anecdotal evidence is available, there are very few empirical studies that convincingly demonstrate a linkage, as there are in other sectors (e.g. health).
- (2) What is the effect on the poor of privatization and market reform in the power sector? Experience in this area is relatively new.

Some key gender issues in rural electrification programs

Unfortunately, many past studies of social impacts of energy interventions have failed to address gender issues or have addressed them only perfunctorily. Most likely gender will not automatically be included as a variable for analysis without a specific mandate.

Four of the key energy issues for poor rural women, that demand the attention of rural electrification programs, include:

- *data needs and analysis* - disaggregation of energy use, supply and impacts by gender, in order to provide a better basis for applying well-known field methods and analytic tools for incorporating gender in project design and implementation, as well as at the micro- and macro- policy levels;
- *wood energy, cooking and health* - seeking integrated approaches and various solutions (including fossil fuels and perhaps electric cooking) that recognize the central importance of wood energy and cooking for poor women, and health implications;
- *women's specific electricity needs* in water pumping, agricultural processing, security, work productivity, and health - addressing these in the framework of sectoral development initiatives; and
- *equal access to credit, extension, training* to assure energy and electricity supplies for women's domestic tasks as well as their micro-enterprise activities.

Findings and needs

The findings above indicate the following needs:

- to routinely disaggregate energy use, supply and impacts by gender, at all stages of the rural electrification project cycle;
- to document existing experiences in order to provide (a) empirical evidence of strong linkages between energy, poverty reduction and gender; and (b) examples of "best practices," models and approaches;
- to encourage a dialog and interaction between "ways of thinking" in energy, poverty and gender, as well as to create capacity to work in this interdisciplinary area;
- to develop new approaches to integrating energy (including decentralized supply options) with other development sectors.

Given the recent burst of interest and activities in this area, and the limited existing capacities available (experts and organizations, especially in the South), any initiatives will be well-advised to focus on capacity-building and to interact closely with other programs and establish partnerships with the various organizations now interested in energy, poverty reduction and gender equality.

1. Energy, poverty and gender

The energy dimension of poverty - energy poverty - may be defined as the absence of sufficient choice in accessing adequate, affordable, reliable, quality, safe and environmentally benign energy services to support economic and human development.

- World Energy Assessment 2000

1.1 Sustainable energy and poverty

The definition of sustainable energy today has broadened from the primarily economic development focus in the 1970s, to concerns with environmental sustainability in the 1980s and financial sustainability in the 1990s, and finally to the current inclusion of social sustainability, equity and poverty in the past few years, in line with current development debates. While sustainable energy still carries the connotation of renewable energy and energy efficiency as proposed by its early advocates, it has broadened to include sustainable use of fossil fuels and electricity.²

The United Nations Conference on Environment and Development (UNCED) in Rio in 1992 drew international attention to linkages between environment and economic development. It placed energy concerns mainly in the context of climate change, however. Agenda 21 focused on renewable energy and energy efficiency, primarily as means for protection of the atmosphere. Not until 1997, at the UN General Assembly Special Session (UNGASS) to review progress five years after Rio, were the essential linkages between energy and socio-economic development presented in an integrated fashion (UNDP, 1997), and a chapter specifically on energy was adopted in the Program for further implementation of Agenda 21.

In April 2001, UNDP began advocating the adoption of a new global target, the achievement of which would be a prerequisite to fulfilling the other International Development targets of the Millennium Goals adopted by the UN General Assembly in January 2001: helping to halve the proportion of people without access to clean and affordable fuels and electricity by 2015. Rural electrification, and liquid or gaseous fuels for cooking, are the two main strategies advocated by UNDP to accomplish this goal.

In the spring of 2001, energy was at the top of the agenda when the UN Commission for Sustainable Development met in its ninth session (CSD-9), and energy was identified at CSD-10 as one of the key themes to be discussed at the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa, in August 2002.

² Renewable energy and energy efficiency are usually characterized as "win-win" options in SED, meeting the objectives both of environmental improvement and poverty alleviation (with economics being the principal challenge). It is increasingly clear however that this is unlikely to be true in every case. The situation is considerably more complicated. Any technology when applied in a field situation represents gains and losses for different groups. More likely, there are "win-win" situations, "win-lose" situations, and "trade-offs" between environmental objectives and poverty reduction, to use a framework proposed by Munasinghe (1995)². As a recent review of renewable energy activities in ESMAP (1999) points out, restricting support to renewable energy for SED could deny poor people the opportunity for productivity growth that fossil fuelled technologies facilitate (ESMAP, 1999).

Current thinking on energy and poverty is concisely summarized in *Box 1*. This consensus is broadly in line with major recent reports by UNDP (1997 and 2000), the World Energy Council and FAO (1999), the Stockholm Environment Institute (1999) and the World Bank's own *Rural Energy and Development: Improving Energy Supplies for Two Billion People* (1996).

Box 1. Current thinking on energy and poverty

The current state of informed opinion concerning energy and poverty has been summarized by many agencies and a new consensus has emerged:

- *Approximately two billion people do not have access to "modern" forms of energy such as electricity, and liquid fuels.*
- *"Modern" forms of energy are a necessary input for economic development and the elimination of poverty. The substitution of inanimate energy for human energy has proven to be an essential element in removing drudgery, and increasing well-being.*
- *But improved forms of energy are not sufficient conditions for development. Many 'complementary inputs' are also required including "end-use" technology to convert energy into useful outputs such as illumination, milling, pumping, transport, communications.*
- *Conventional modern forms of energy (fossil fuels, and electricity) will remain the fuel of first choice for many poor people for many years to come, while traditional biomass fuels will remain the main fuel of necessity.*
- *Biomass fuels are not always "renewable" as sometimes they are harvested renewably and sometimes "mined" destructively.*
- *Poor people need energy for many tasks (lighting, cooking, mechanical power, heating and cooling, communication) and they require multiple fuels (electricity is not enough).*
- *Women and children usually form the majority of poor people in any community; and women are usually major users and suppliers of energy resources in marginalized communities.*
- *Poor people already pay cash for improved energy services particularly for the convenience of electric lighting and radios. Beyond this, the additional income to pay for modern energy services will usually be associated with investment in sustainable (profitable) and productive energy end use activities.*
- *The fuels and technology traditionally available to poor people results in very low energy conversion efficiency. However this efficiency can be improved both domestically and in commercial and institutional uses through changes in technology.*
- *The energy supply sectors of many developing countries are in the process of being restructured to attract private capital. This poses both a threat and an opportunity for poor people. As energy supplies are delivered on a more commercial basis, their availability to poor people may reduce. However "un-packaging" energy supply systems opens up opportunities for the private sector to supply energy services to poor people who would do not have access under current arrangements.*
- *Funds from tax revenues, aid agencies and charities are unlikely to be able to provide energy services directly to any but the smallest fraction of poor people. This means that market mechanisms will have to provide the finance for improved energy services, but their extent and effectiveness will have to be massively expanded to meet current unmet needs and the needs of growing populations.*
- *The State has a vital role to play in providing the "enabling environment" that is necessary for the private sector to supply improved energy services to poor people. Subsidies (including aid) may well be essential, but they need to be applied with great care so that they may make markets rather than destroy them.*

- Barnett, 1999

The reports mentioned above all offer, in varying detail, a number of examples and models of successful approaches to widening access to energy in developing countries.

It is immediately apparent nonetheless that, while women are recognized in these reports as users and suppliers of traditional energy, and some important efforts have been made both in the UN and the World Bank to focus on women's energy needs, gender-differentiation does not play a prominent role in most of the current thinking on strategies, policies and implementation mentioned above, with differences between the needs and interests of women and men largely subsumed under "poor people."

1.2 The energy-poverty-gender nexus³

Gender analysis of poverty is not so much about whether women suffer more from poverty than men, but rather about how gender differentiates the social processes leading to poverty, and the escape routes out of destitution. An understanding of the causal processes leading to poverty has important policy implications: it raises questions about whether it can be assumed, as is often done, that the kinds of policies that can strengthen the position of poor men will have much the same impact on poor women.

-Razavi, 1998

Poverty means, among other things, limited access to energy sources. The poor use energy and other scarce resources to eke out livelihood strategies. Poverty influences and determines energy choices of households. It is also one element that can enhance or detract from survival strategies of the poor. And rural energy poverty has a gender bias.

There is a growing literature on energy and gender (see e.g. the bibliography to this paper). Annotated bibliographies on 1) gender and energy and 2) gender and energy in Africa are currently being finalized.⁴ Gender is also appearing increasingly in the mainstream energy publications mentioned earlier, though often as a separate topic not integrated with strategies and solutions. The focus in the literature is mainly on (a) poor rural women, (b) wood energy and health, and (c) the micro-economic and project level.

Project experience is also becoming available, though much is not yet documented. Some especially relevant initiatives and reports are described in the companion report to this paper.

Some "gendered" findings of past research on energy demand of the rural poor are:

- Energy is needed for household uses, such as cooking, lighting, space heating and other appliances; for agricultural uses, such as tilling, irrigation and post-harvest processing; and for rural industry uses such as milling and mechanical energy and process heat. Energy is also an input to water supply, communications, commerce, health, education and transportation in rural areas. Much of this energy use and production is by women.
- Higher income people generally use more efficient and more convenient sources of energy such as gas and electricity, while poor people use less efficient and less convenient sources such as fuel wood and human energy. Multiple fuel use is common at all income levels nonetheless and the "fuel ladder" is perhaps more accurately replaced by a "fuel pyramid" of multiple fuels for different purposes and at

³ Sections 1.2 and 1.3 are based mainly on Cecelski, 1998.

⁴ These will be available at <http://www.energia.org/>

different times. Poor people have fewer energy options than do rich people and they often pay more for them both absolutely (paying higher unit prices) and relatively (as a percentage of their income) than do the non-poor. Poor women nonetheless highly value and need multiple energy options to help manage their daily work and time.

- The main use of inanimate energy in rural areas is for cooking and heating. Biomass is the primary fuel used and will continue to be so for the foreseeable future. The major source of energy in rural areas is human labor, used for both survival activities and production. This dependence on biomass and human energy is an important factor in rural poverty, and it is not measured either in national accounts or in energy balances. Women's (and children's) role in this energy use system is well known. Negative effects on poor women of energy scarcity have been well-documented. Health is a primary concern here.⁵
- The presence of a large number of female-headed households in many developing countries, as well as women's primary responsibility for energy procurement and management (and the invisibility of these tasks in national energy accounts) gives this energy poverty a particular gender bias. The risk of poverty is greater for women, with about one-third of rural households in developing countries being female-headed.⁶
- Neither public nor private energy infrastructure provision are gender-neutral. Women use energy and electricity differently than men, because of their different household and productive activities. For example, decisions on how/where electricity and electricity services (such as information & communication technology packages) are provided to households and communities influence women's ability to take advantage of these services.
- Women's micro-enterprises (an important factor in household income as well as in women's welfare and empowerment) are heat-intensive (food processing); labor intensive; and/or light-intensive (intensive-intensive home industries with work in evenings). Lack of adequate energy supplies - and other coordinated support - for these activities affects women's ability to operate these micro-enterprises profitably and safely. Conversely, the provision of affordable energy can be a key factor in enabling rural enterprises.

1.3 Current efforts in gender and energy

Over the last two decades, gender issues have attained increased prominence in the debate on sustainable energy development. International programs, such as ENERGIA, an International Network on Gender and Sustainable Energy; ESMAP, through its Gender Facility; UNDP, in its Sustainable Energy and Environment for Development Unit; the Energy and Development Research Center (EDRC) in South Africa; and

⁵ Shell Foundation funding of work on indoor air pollution and health, and an ESMAP project in India, including a recent TERI/World Bank regional meeting on Indoor Air Pollution, Household Energy and Health (New Delhi, 10-12 May 2002), have considerably raised the profile of this topic recently. See www.worldbank.org/cleanair

⁶ Some recent studies question whether female-headed households are necessarily poorer than male-headed ones, while acknowledging that differences in power, nutrition, health, and time allocation may be more important indicators of differences in well-being along gender lines.

Winrock International's energy program, are helping to bring critical issues of gender equality and efficiency to the table. The Energy, Poverty and Gender (EnPoGen) project of ASTAE, has been engaged since early 2000 in documenting these relationships in three case study countries (China, Indonesia, and Sri Lanka), and in developing both quantitative and qualitative methodologies for incorporating poverty and gender in rural electrification projects, through a case study in a GEF project in Cambodia. Policy researchers and development practitioners have begun building a body of evidence and experience that links attention to gender in energy policy and projects to equitable, efficient and sustainable outcomes in development.⁷

Despite these promising developments, however, the importance of bringing a gender perspective to energy policy analysis and design is still not widely understood, nor have the lessons for development been fully integrated by donors or national policy makers. While many are sympathetic, gender is still commonly viewed predominantly as a political agenda and given this, not central to questions of efficiency or project effectiveness.

Current efforts on gender and energy focus on:

- building up a body of evidence and experience linking attention to gender in energy policy and projects to equitable, efficient and sustainable outcomes in energy and development;
- advocacy in national and international arenas on the importance of bringing a gender perspective to policy analysis and design;
- capacity building and assistance to energy programs, policy and projects in integrating a gender perspective; and
- creating networks and institutions at the national, regional and international levels to support these efforts.

⁷ A companion EnPoGen report to this paper is available on *Major Activities in Energy, Poverty and Gender*, detailing current activities and actors in energy, poverty and gender. This data base will be posted at www.energia.org and, resources permitting, maintained and updated regularly.

2. New thinking on poverty: some energy implications

The constraints that energy poverty imposes on a development strategy are still invisible in the mainstream development debate. The ways in which energy needs are met has enormous implications for low-income households, but the householders themselves, unlike policy-makers, do not separate the urgent need for land, water, housing, energy services, education, health, transport and employment in a sectoral way.

- EDRC, *Rural Electrification in South Africa, 1998*

2.1 Definitions of poverty

The definition of poverty has expanded over the past two decades, from a focus on command over market-produced goods (income), to a recognition of the importance of public goods and common property resources (the entitlements approach) and the inclusion of other dimensions such as health and literacy in "sustainable livelihoods."

Perhaps most significantly, much poverty thinking has moved from defining poverty by the wants and needs of professionals, to defining deprivation and poverty by the wants and needs of the poor. Methodologies for learning from the poor have become more rigorous, and learning from the poor has expanded the definition of poverty further, to reflect a concern with vulnerability and risk, and with powerlessness and voice.

Combining such qualitative findings with quantitative information about poverty, and the use of participatory approaches, has been shown empirically to improve poverty outcomes and project success. For example Isham, Narayan and Pritchett (1994) have shown that economic rates of return to World Bank projects were statistically significantly associated with the degree of participation of beneficiaries in the design and implementation of projects.

2.2 *The World Development Report 2000/1*

The *Approach and Outline to the WDR* (theme: *Attacking Poverty*) identified three common features in successes in poverty reduction:

- 1) **Empowerment:** empowering the poor by addressing inequalities which prevent them from influencing policies and interventions which affect their lives, and which also impede overall growth and development (including gender inequalities);
- 2) **Security:** addressing risk and vulnerability which characterize the realities of the lives of poor people and of poor nations; and
- 3) **Opportunity:** sustained economic expansion and human development in the medium term in which the poor participate.

This trilogy is proposed as an optic to view, and to assess, different packages put forward in the context of the Comprehensive Development Framework (CDF), in terms of poverty reduction impact.

In their background paper for the *World Development Report 2000/1*, Kanbur and Squire (1999) summarize contemporary thinking on reducing poverty and come to two broad conclusions:

- Many aspects of poverty are closely correlated - income, health, etc. - so broadening the definition of poverty does not change significantly aggregate measures of poverty. But the broader definitions allow "a better characterization of poverty and the terrible hardships burdening the poor, and therefore increase our understanding of poverty and the poor." This contributes to strategy. Understanding poverty better permits better design and implementation of programs to help people escape poverty.
- More policy instruments become relevant to fighting poverty when the definition of poverty is broadened. "The various aspects of poverty interact in important ways, such that policies do more than simply add up...-the impact of appropriately designed combinations will be greater than the sum of the individual parts." Careful integration of sectoral policies is therefore called for.

2.3 Implications for the energy sector

Little or no mention is made of rural energy poverty in current thinking on poverty - with the exception of occasional references to strengthening of infrastructure and public services to the poor.⁸ Energy is perhaps not yet fully recognized as an "aspect of poverty" whose policies are relevant to fighting poverty.

Broadening the definition of poverty beyond income to other sectors could well include rural energy poverty though. Emphasis in poverty reduction thinking on recognizing and integrating the interactions among various sectoral policies is highly consistent with experience in the energy sector where, e.g. the synergetic effects of complementary development infrastructure such as rural electrification, health clinics, schools and markets have often been noted in the literature.

On the energy side, the perspectives of Empowerment, Security and Opportunity have not been part of the normal professional or bureaucratic concerns of many of those involved in energy policy and practice. Linkages of energy strategies with this framework have been little explored. Rather, attention has often concentrated on technology choice, the efficiency and management of energy use and production, and the much perceived and emphasized dangers of environmental damage and climate change.

As Clancy (1999) points out, rural energy has never been widely accepted in development circles as a basic need like water and food. Energy sector macro-economists and technologists (unlike their counterparts in the water and agricultural sectors, see e.g. UNDP/WBSSP 1999) have on the whole not developed working relationships with (non-economist) social scientists over the years, acknowledging the importance of the social dimension. One factor may be the "arms-length" working nature of the energy sector - while health, forestry, agriculture and water sectors function through extension workers who work closely with communities and people on a continuing basis, energy agencies work on a macro or project basis, perhaps reducing opportunities for social awareness.

⁸ e.g. in any of the preparatory fora and documents for the WDR, although apparently some inputs on energy were later made (D. Barnes, personal communication).

Meanwhile, donors have by and large limited "energy" assistance to electric power plants, leaving oil and gas to the private sector, and fuel wood to be handled by forestry departments (Andrew Barnett, personal communication).

The World Bank, in its recent work in the energy sector, has placed considerable emphasis on the policies and tools that would need to be used by developing country governments concerned with tackling poverty, in thinking about their role in the energy sector. The energy chapter of the draft Poverty Reduction Sourcebook, posted in April 2001, adopted the new thinking on poverty in the World Bank (see 3.1), and suggested five energy development goals and indicators:

- expand access to improved energy services (to contribute to the poverty alleviation outcome of increased income);
- improve energy supply reliability and
- ensure fiscal sustainability associated with energy supply and use (both to contribute to increasing capability)
- improve energy sector governance and regulation (to improve security) and
- reduce health and environmental costs associated with energy supply and use (to increase empowerment).

The ESMAP Energy and Development Report 2000 on *Energy Services for the World's Poor* focused on three areas:

- what energy policies and projects will be most successful - and cost-effective - in knocking down barriers preventing low-income households and communities from gaining access to modern energy and services? (arguing that a knowledge of energy demand of the poor is necessary to determine this);
- Has energy market reform helped or harmed the poor? - and what methodologies can help determine this?
- What institutional tools (market structure and ownership, regulation, and pricing) can open opportunities for "pro-poor" innovation.

The few attempts to view energy primarily through a poverty optic are quite startling in challenging us to alter our perspective. At *Village Power '98*, for example, in the midst of macro-economic presentations on rural energy in various regions by senior officials, Mieko Nishimizu, World Bank Vice-President for South Asia, recited a day in the life of a poor Nepali woman, illustrating the linkages of energy to her poverty from the woman's own point of view. In South Africa, an innovative EDRC study has investigated "ways of knowing" in rural development and rural electrification policies, by fictionalizing a real woman as a window through which to imagine the life of the rural poor, context, energy needs, and decision making power in and outside the household. The questions that Crawford-Cousins poses (and in her paper, answers) about Mrs. Mohlamonyane are shown in *Box 2*.

Box 2: Rural electrification, poverty reduction and gender: Relevant issues in South Africa from "Mrs. Mohlamonyane's" perspective

- Which of Mrs. Mohlamonyane's household energy needs could and should be met by electricity in order to significantly change her experience of her life as "difficult"? What level of service should she receive? Are current-limited supplies or solar systems more appropriate for Mrs. Mohlamonyane's home?
- How much should (or could) Mrs. Mohlamonyane pay for electricity? Should she pay a flat monthly rate or use a prepayment meter? Might electrification intensify Mrs. Mohlamonyane's economic marginality?
- Will Mrs. Mohlamonyane, who is acutely aware of her fuel needs, be able or want to cook with electricity? The current-limited supply option will get electricity to more people. Should Mrs. Mohlamonyane be offered the choice to cook electrically, if not now, then in the future?
- For Mrs. Mohlamonyane to use the electricity supplied to her dwelling, she needs appliances. Will she be able to buy appropriate, affordable, safe and efficient electric appliances? Are such appliances accessible to rural people? Does Mrs. Mohlamonyane have access to a regular cash income which allows her to safely enter Hire Purchase agreements, or to maintain membership in a "stokvel" over time?
- Will the electrification of Mrs. Mohlamonyane's house substantially improve her physical and mental health and the health of her children? Will electrification have an effect on her physical safety, her self esteem, or her status as a woman at household, community or national level?
- Will electrification improve Mrs. Mohlamonyane's access to formal and informal education? Will it improve her children's access to educational opportunities?
- Will lighting, educational television and radio programmes effectively improve the health of the Mohlamonyane household? Perhaps by access to mass media in health education?
- Will rural electrification affect the use of Mrs. Mohlamonyane's domestic space? Domestic violence?
- Who controls which resource flows within Mrs. Mohlamonyane's household?
- What is rural development for Mrs. Mohlamonyane? How will electrification of her dwelling contribute to the improvement of Mrs. Mohlamonyane's livelihood? Will it increase Mrs. Mohlamonyane's access to cash income?
- Will electrification by making possible the use of appliances and machinery such as refrigerators and deep freezers, sewing machines and welders, enhance Mrs. Mohlamonyane's rural income?
- Will it provide opportunities for Mrs. Mohlamonyane to increase her agricultural production and to market her surplus for cash, or to move into commercial agricultural production?
- If Mrs. Mohlamonyane's time is so constrained by her unpaid employment in pursuing her livelihood, does household electrification represent an opportunity for labor saving and thus time saving? Will the electrification of her dwelling mean that Mrs. Mohlamonyane will "save" the time she currently "spends" on fetching and carrying wood and that she will "invest" this time in "more productive" activities, thus obliquely or directly addressing the question of her extreme poverty and immiseration?
- Will electrification of her home make Mrs. Mohlamonyane a "more modern" person?
- Are Mrs. Mohlamonyane and the other members of her domestic unit less likely to become migrant workers in the squatter settlements of the urban areas if their household is electrified? Is rural electrification a long term social investment in rural stability?

-Crawford-Cousins, C., 1998, *A question of power: the electrification of rural households*

These give a flavor for a change in perspective which is now an important element of poverty thinking.

3. Rural electrification, rural development and poverty⁹

In the normal processes of development, most of the gains go to the rich and less poor. The question we confront...is how the poorer can capture more of these potentials and gain more from these opportunities....[For example,...] For putting poor people first, especially resource-poor farmers, field evidence [from lift irrigation in India] points to electricity pricing and supply as powerful instruments.

- Chambers et al 1989

3.1 Rural electrification and the poor: Key issues

Many studies have concluded that rural electrification benefits higher income populations more than lower income ones (Jechoutek, 1992; Foley, 1992; Munasinghe, 1987; Barnes, 1988; Cecelski, 1990). Although privatization and market approaches used in e.g. solar home systems promotion may appear at first glance to be the culprit, in fact similar findings are true for public grid extension programs. "The explanation is straightforward: only those with sufficient resources for the initial investment in the connection and the energy-using equipment will be in a position to benefit from electricity (as from any energy supply)" (Jechoutek, 1992). In fact, surprising as it may seem, rural electrification technologies, like other technologies, can even increase inequities between rich and poor and between men and women in rural areas.

What Khennas and Barnett (2000 draft) point out for micro-hydro is equally applicable to photovoltaic home electrification or other renewables electrification programs with environmental objectives that imply a rapid increase in the volume of sales:

[T]here are hard choices to be made in the allocation of resources. Micro hydro investments that are primarily intended to increase the adoption of micro hydro are likely to need to be financially viable and will therefore be located where sales to the grid are possible (and profitable) or where there are concentrations of effective demand (or there are so-called "anchor customers" who can pay for the bulk of the power supplied). Whereas programs that are intended primarily to increase the "access" of specific groups of people to improved energy supplies are likely to be located where resource-poor live and this will frequently be in more remote areas (that will not be reached by the central grid for some time, if ever), where all other options will also be expensive but where micro hydro is the least cost.

Poor households do value highly and benefit from electrification, when they have access to electricity in their homes. Improved public services (such as in health and education) likely have indirect positive benefits for the poor too; these rely very much on development of complementary infrastructure and services together with electrification. Spin-off effects on wage employment of increased output (e.g. due to mechanization or irrigation), may also be considerable, but these depend on the overall growth dynamic in a region, not only on electrification.

Two key issues for research with operational implications emerge from current thinking on rural electrification (or indeed, energy generally) and the poor:

- (1) What is the relationship between specific energy strategies and *poverty reduction* (as opposed to merely widening access)?

⁹ This section focuses on rural electrification, due to ASTAE's focus in this area.

There are *very few* empirical studies that convincingly demonstrate a linkage. A recent quantitative study sponsored by DFID, encouragingly, concludes that micro-hydro "is a relatively efficient method of poverty reduction, in terms of costs per person moved across the poverty line. [And]..micro-hydro is also able to reach a number of the extremely poor...through the channel of wage employment...and linkage activities." (Moseley and Fulford, 1999). Similar methodologies could usefully be applied to other energy interventions - with care taken to "engender" the analysis (unfortunately, the above micro-hydro study, like many other social impact studies in the energy sector, fails to include gender issues in its scope).

(2) What is the impact on the poor of privatization - the widespread structural and market reform ongoing in the power sector?

Restructuring of the electricity sector and power sector reform are likely to reduce the possibility of cross-subsidies in grid electrification, unless service territories contain both urban and rural areas. Utilities may limit coverage to regions and households that will be profitable. The poorest households may need some regulatory protection in this scenario, such as low access charges, lifeline rates and low cost wiring (Barnes, 1998).

So far, there do not seem to be any empirical studies available on the effects of power sector reform on the poor. (ESMAP has initiated a literature review on energy markets reform and the poor which may throw some light.) A CIDA-sponsored socioeconomic study including gender on power sector reform in the Indian state of Kerala is underway (Lele, 1999), one of the first to measure the impacts on the poor and women of macro-economic energy policies. A similar impact methodology could be used to evaluate other macro energy interventions in terms of poverty and gender impacts

There is no doubt that rural electrification *can* be a powerful instrument for putting poor people first, as illustrated in *Box 3*.

This example is given not to advocate for flat rates or a particular policy in one country, but to point out that specific analysis and policies (that may even be counter-intuitive) can be necessary to benefit the poor. "Win-win" situations, that is, in this case, sustainability in terms of commercial viability as well as equity, are not automatic and trade-offs may be necessary. Field studies and sensitive, poverty-oriented analysis are necessary to identify appropriate actions.

Box 3. Electricity pricing and supply as powerful instruments for putting poor people first: The case of private lift irrigation in India

Private initiative which has developed 96-98 per cent of the LI area has given inequitable direct access to irrigation water, but landless people and resource-poor farmers have variously benefited through increased labor demand and wages, opportunities to buy water and appreciation of land values. For putting poor people first, especially resource-poor farmers, field evidence points to electricity pricing and supply as powerful instruments.

On pricing, pro-rata charging is bad for resource-poor farmers, with high water prices and arbitrary, exploitative and monopolistic water-selling, while flat tariffs are good, with low water prices, buyers' water markets, and a more dependable service from sellers. For equitable development of groundwater, flat rates offer several crucial advantages.

Resistance to flat tariffs, however, may persist or increase on account of two apprehensions, namely that flat rates will a) impair the viability of State electricity boards, and (b) reduce the efficiency of water and power use. These apprehensions are important though not necessarily valid. Flat rates set at appropriate levels should not undermine viability of the electricity boards; on the contrary, they should strengthen it. On supply, the management of electricity supply can increase productivity and equity, and more so with flat than pro-rata tariffs, with quality, including timeliness, predictability and convenience, substituting for quantity.

-Chambers et al 1989

3.2 Widening access to rural electrification: "Success factors"

The literature suggests that there *are* clearly means by which access can be widened and the poor can more likely benefit. In general, these are measures that provide the poor with more *choice* and more *voice* in acquiring and using electricity.¹⁰ There is some experience now with a number of strategies in rural electrification that specifically target the poor, and, in several cases, women. Such strategies for widening access could be examined, based on field investigations and case studies, for their actual impacts, not only on access but on poverty reduction and gender equality. Some possible directions for analysis are given below.

Tariff and connection policies

Tariff and connection policies are key to reduce upfront costs. One success factor in widening access to grid rural electrification in several case study countries, according to a recent best practices study by ESMAP, was reducing initial connection charges, or spreading them over several years by rolling into the tariff (Barnes & Foley, draft, 1998). A study on the urban energy transition (Barnes et al) suggests that one sensible energy assistance program for the poor is block rate tariff structures along with connection charges rolled into the overall price that the public pays for electricity, reducing barriers

¹⁰ Some of the more important recent studies that point to "success factors" for wider access to electricity in rural areas include:

- a best practices study of photovoltaic household electrification by ASTAE itself (Cabraal, et al, 1995) with case studies in Indonesia, Sri Lanka, the Dominican Republic and the Philippines;
- a report by NRECA on new designs for rural electrification, based on private-sector experiences in Nepal (Inversin, 1994);
- a report on low-cost electricity installation for the former ODA (Smith, 1995);
- a comprehensive research project on the role of electricity in the integrated provision of energy to rural areas of South Africa (EDRC, 1998).
- cross-national household energy research on the urban energy transition, energy and poverty (Barnes et al 1998); and
- a best practices study of rural electrification (Barnes & Foley, draft 1998) with case studies in Thailand, Costa Rica, Ireland, Laos...;
- a best practices study on micro hydro electrification programs (Barnett & Khennas, 2000 draft).

to entry. Lifeline tariffs have been positively reviewed, but real calculations on cross subsidies are needed (Margaret Skutsch, personal communication).

Metering systems which enable the poor to pay in small quantities, such as the pre-paid cards used in South Africa, are a promising approach, especially as costs for these decrease. Decentralized systems have tried to solve the problem of upfront costs through credit, leasing and subsidies.

Subsidies

Subsidies have been justified by the fact that access to adequate energy supplies is critical to livelihood strategies of the poor; there are in fact many reasons for subsidies to renewable energy (Barnett & Khennas, 2000 draft) The problem with this approach is that subsidies may not be sustainable. It is well known that energy subsidies do not always benefit the poor but rather better-off households. However, Barnes et al in their comparative urban household study found that broad-based subsidies for transition fuels do appear to help the poor, by reducing their energy expenditures and capping traditional fuels prices. Given limited resources for subsidies, Mathur (1998) advocates targeting subsidies to households who would prioritize "modern" energy if their incomes increased. These could, in theory at least, include poor households but are more likely to be higher income.

To be financially sustainable, must efforts though simply ignore the poor, and aim at higher-income households who can afford the new technologies? Should marketing aim at higher income households who cannot only afford the initial costs, but can afford to take on the risk of trying out new technologies? These households can be provided with credit. Some poor households will still be able to finance and benefit from renewable energy technologies through cash purchase (gifts, remittances, savings schemes). When the technology is proven and costs drop, systems may eventually become affordable for the poorest.

However this approach not only contributes little in the short term to poverty alleviation; it runs the risk of even intensifying inequalities between rich and poor, as has often occurred in new technology introduction e.g. the Green Revolution in Asia.

Infrastructure coordination

The need for complementary infrastructure such as roads, markets, buildings, equipment and skilled staff - often not provided in tandem with electricity - in order to achieve economic benefits from electrification, has frequently been emphasized. Detailed studies of health, education, and small and medium enterprise sectors in a recent policy research review of the development rationale for rural electrification in South Africa confirm that rural development benefits of rural electrification in that country will be limited without such institutional coordination (EDRC, 1998). Some evidence even suggests that provision of infrastructure in a complementary fashion provides not just additional, but exponential benefits, due to the synergies available (Barnes, 2000 draft).

Demand analysis

Ranking or prioritizing areas or types of households, through detailed surveys and demand analysis, is an alternative when institutional coordination of infrastructure provision is daunting. Households/areas already possessing the potential to use electricity (more densely populated, growth areas) are then targeted first, enhancing financial viability. This was found to be a success factor by the Barnes & Foley (1998) study.

There is considerable experience of demand analysis in the electricity sector, though this has not often focused on women's needs specifically. The extensive experience with demand surveys in the household energy and water & sanitation sectors, which have more typically used gender-disaggregation in research and analysis, may be more helpful in drawing lessons in this regard.

Financing mechanisms

Credit in various forms for purchase or use of renewable energy technologies is used in order to overcome the market constraint of high capital costs and limited financing for renewables. However, the most optimistic credit scenario for e.g. solar home systems (SHS) assume that 50 to 75 per cent of rural households will be able to afford SHS without subsidies, even with liberal credit programs and leasing in place. That still leaves 25 to 50 per cent of unconnected rural households - most likely the poorest section - without electricity.

Micro-credit programs have been active in renewable energy recently, and some have experience with lending to women (Grameen Shakti, IREDA, ENSIGN, Vietnam Women's Union). Others are initiating activities (Uganda PV project with Uganda Women's Bank). Many resources exist on micro-credit programs experience generally, e.g. the World Bank's own program on Sustainable Banking for the Poor (SBP), from which lessons can be drawn.

Community/NGO approaches have been demonstrated to be effective in local capacity building and development of micro level institutions, and integration of energy programs with the overall development process (Putti, 1998). But they are often perceived as risky, time-consuming and input-intensive, and usually only reach a fraction of the people in need. Community-based rural electrification initiatives in Laos and Nepal however seem to have wider replication abilities. The Nepal REDP has had a particular gender focus and now has several years of successful experience.

Fostering private participation in small-scale infrastructure is a relatively new approach advocated to meet the needs of the poor in a commercially viable way. Details of the approach are available in deLucia (1998); and an overview of this approach (and case studies, among others, on photovoltaic electricity in Brazil and hydropower micro turbines household and small and medium enterprise electrification in Nepal) are forthcoming in a special issue of *Natural Resources Forum* on "Small-Scale Natural Resources and Related Infrastructure Development." In relation to equity in such electricity provision, deLucia points out that:

- small-scale private suppliers are already active, e.g. electricity customers provide reseller service to neighbors, merchants in bazaars, mini-grids, etc.;

- small-scale infrastructure provision has both forward and backward linkages to *local* capital markets, suppliers, etc. and hence local development benefits;
- private suppliers are more customer-driven than public ones, and can tailor the level of supply to customer demands better, e.g. basic service for poor customers, higher-level service for higher-income;
- this approach provides greater access and is also financially sustainable; and
- while such differentiation has its drawbacks, it allows overcoming the most glaring inequity namely the inequity between those with access to services (often subsidized) and those without.

Box 4. Targeting low-income households: Necessary dimensions of a credit financing guarantee scheme with institutional and organizational support for household biogas plants in Nepal

1. *An area/village/community where there is: (a) a significant number of lower income households who might be potential biogas investors/users if the collateral problem is overcome; and (b) easy access to water supplies so the additional water requirements of a biogas plant does not become a heavy burden on the household, especially women and children.*
2. *An activist NGO or other entity working in the area and in particular with poorer households, preferably with previous experience both in biogas and in community/group savings or lending.*
3. *One or preferably more than one biogas plant suppliers, preferably willing to give "agent fees" to an NGO which provides new biogas plant customers.*
4. *A relatively convenient branch office of a participating bank.*

-deLucia, 1998

NGOs and community-based initiatives can also be partners in this approach. Some necessary dimensions of a credit financing guarantee scheme are given in *Box 4*, based on experience in Nepal with a pilot scheme with institutional and organizational support for household biogas plants in Nepal, that expands the reach of the existing biogas programs to lower income households. In this scheme, the collateral requirements of local banks are being satisfied by a form of substitute collateral and guarantee fees.

Productive uses of electricity

Are productive uses of electricity the key to benefits for the poor? Does decentralized electrification offer some specific advantages not obtainable with grid electrification in increasing productivity in rural areas? Cecelski (1996) argues that some such benefits of decentralized electrification may be under-counted. Some of these benefits may be especially important for women, who often work at home in informal production. An FAO study (2000) of the impact of solar photovoltaic systems on rural development argues the need to go "beyond the light bulb" to have an impact on income generation.

Solar-powered lighting has been effective in pest control in southern India and solar refrigeration has permitted increased marketing of fish in Indonesia for example (Kadyscewski, 1998). Wind-generated electricity is the basis for women's micro-enterprise (popsicle-making) on a remote island in Indonesia (Winrock, 1999) and micro-hydro generation allows grain-grinding enterprises to flourish in Nepal. The majority of benefits from solar systems financed by Grameen Shakti in Bangladesh appear to come from the use of lighting to extend working hours, whether in manufacturing (saw mill,

carpenter), services (TV/radio repair shop, barbershop), or home industry (basket making, net weaving, tailoring). Other benefits of improved lighting in these small enterprises were better efficiency and quality of work, better working environment, and a more attractive and secure environment for customers (Barua, 1998).

Several UNDP/GEF projects recently designed in Asia have focused on income-generating uses of renewable energy, in order to demonstrate strong linkages with UNDP's mandate of poverty alleviation and gender equality as well as to support national development priorities in these areas. For example, a recent project designed in Palawan, Philippines, sets up a fee-for-service renewable energy service company (RESCO), supported by a Renewable Energy Development Center based in a business center, to help identify opportunities for economic productive uses of renewable energy services. Other similarly-oriented projects have been designed for Fiji, Mongolia, China, India, Thailand and the Philippines. (Xiaodong Wang, personal communications)

The evidence from grid electrification is mixed, however. Dynamic rural growth areas appear to grow following electrification, while stagnant areas continue to stagnate. Irrigation typically produces increases in output, but this could as well be realized with diesel pumps as electric. An interesting question for decentralized renewable energy supplies is whether by their nature they may encourage economic growth in remote areas where other energy sources are not an option. Anecdotal examples apart, there has been little examination of poverty and gender impacts of such efforts.

4. Some key gender issues for rural electrification programs¹¹

Inter-linkages between gender and poverty will influence the scaling up strategies adopted for rural electrification. Measures to expand access of the poor to electricity, while commendable, are unlikely to be successful in meeting the energy needs of poor rural women without an explicit gender focus. This is not to say that gender should be the only focus - race/ethnic group, income, and other factors are often equally important. But it appears likely that the kinds of policies and asset interventions that can strengthen the position of poor men, will not necessarily automatically have the same impact on poor women. This is because the social processes leading to (energy) poverty - and hence the escape routes out of (energy) poverty - are differentiated by gender (Razavi, 1998).

Current thinking on four key energy issues for poor rural women are described below, in relation to rural electrification programs:

- *data needs and analysis* - disaggregation of energy use, supply and impacts by gender, in order to provide a better basis for applying well-known field methods and analytic tools for incorporating gender in project design and implementation, as well as at the macro policy levels;
- *wood energy, cooking and health* - seeking integrated approaches and various solutions (including fossil fuels and perhaps electric cooking) that recognize the importance of wood energy and cooking, especially for poor women, and health implications;
- *women's specific electricity needs* in water pumping, agricultural processing, security, work productivity, and health - addressing these in the framework of sectoral development initiatives; and
- *equal access to credit, extension, training* to assure energy supplies for women's domestic tasks as well as their micro-enterprise and agricultural activities.

5.1 Data needs: Disaggregation and analysis by gender

Lack of statistics about how, why and how much energy is used by men, women and children is not the reason but an indication that attention is not paid.

-Parikh, 1995

There is no shortage of field methods and analytic tools for incorporating gender as an important factor in the design and implementation of energy projects, as Skutsch (1998) points out. In order to make use of these tools, however, basic information is needed about the differential activities, roles, preferences, constraints, participation, and access by women and by men. Women engage in different activities than men, and they use energy differently than men - for example they often have different preferences for home lighting connection points.

For example, are women or men the customers? If the customers are women, do they have access to cash income that will allow them to purchase the energy system? What

¹¹ This section emphasizes rural electrification due to ASTAE's focus in this area.

do they need electricity and energy for? Who controls the income and who makes the decision in the household to purchase energy appliances?

Concerning finance, what is the share of loan portfolios made up of women and what share is men? What are the repayment rates for women and for men? We know that women have an excellent credit record in micro-credit schemes generally; is the same true for renewable energy financing? What have been the impacts of various institutional and promotional approaches on women - in terms of actual benefits, not just the number of installations?

Few studies have been made of the impacts on women of renewable energy interventions (see e.g. Dhanapala, 1995 for a rare example), and these have been hampered by lack of disaggregated data. Disaggregating information by gender about needs, preferences, income and expenditures, decision making, access to credit and information in market surveys; disaggregating information about benefits and impacts in monitoring and evaluation studies; disaggregating information about staffing and employment in progress reports; all of these would improve the data on which projects are based, and very likely the benefits to women.

It is at times astonishing, in fact, that even many otherwise excellent socio-economic analyses of the energy sector, while discussing cooking and other rural energy uses, continue to use such terms as "the villagers," "the community," "customers," and "the poor", as if the gender of these actors made no difference to the processes or strategies discussed.

Box 5 illustrates a gender- and poverty-sensitive management tool for assessing end-user needs and monitoring and evaluating the social development-related impacts of World Bank rural energy projects, with a focus on poverty and gender implications. This tool is being developed under ASTAE's Energy, Poverty and Gender project.

Lack of data is also one reason why gender issues have not been adequately addressed in *macro-level* policies such as energy investment, imports and pricing (although it also can be argued that lack of data is the result, not the cause of this neglect). Most attention has been at the micro-level in terms of technological interventions such as cook stoves, biogas, solar cookers, wood plantations, etc. (Parikh, 1995) Kerosene and gas import and pricing policies in particular affect energy availability for cooking. Electrification pricing and connection policies similarly affect energy availability for lighting and other tasks. Tools for engendering macro-economic planning and management in national budgets are available, that could be applied in the energy sector (see e.g. Esim, 1998).

**Box 5: User-Centered Framework for Monitoring and Evaluating Rural Electrification Projects
(ASTAE EnPoGen/Winrock/ESMAP/ENERGIA)**

The EnPoGen project methodology can be used for productive uses and any energy source as well. This is part of a World Bank ASTAE/EnPoGen (Energy, Poverty & Gender) and ESMAP initiative to generate valuable, replicable good practices for application in future World Bank rural electrification projects. The objective is to develop a management tool for assessing end-user needs and monitoring and evaluating the social development-related impacts of World Bank rural energy projects, with a focus on poverty and gender implications. The resulting framework will be implemented and tested in the World Bank/GEF Cambodia renewable Rural Electrification (RRE) Project (start-up scheduled for late 2002).

The approach integrates complementary participatory community assessment and social impact survey methodologies. A feedback loop provides information for community members, service providers, project planners and implementers, and policy makers, and feed information from participatory assessments to surveys and vice versa. It is useful not only for post-project evaluation, but also for project design and on-going project implementation and assessment.

The approach builds upon two existing World Bank methodologies:

- The Methodology for Participatory Assessments (MPA) developed by the IRC International Water and Sanitation Centre and the World Bank's Water and Sanitation Program.*
- The Benefit Assessment and Valuation Methodology (BAVM) developed by ESMAP for the Rural Electrification and Development in the Philippines Project.*

While the MPA is highly participatory, poverty-focused and gender-sensitive, and able to highlight the community's self-defined needs, it was adapted for use in rural electrification projects and made applicable to stand-alone energy systems. While the BAVM is applicable in an electricity project context and able to measure social impacts in monetary terms useful to Bank energy projects, it was revised to take into account gender considerations, and adapted to be used for ongoing project monitoring, in addition to evaluation.

Source: Johanna Gregory, Powerpoint presentation prepared for the GEF/FAO Workshop on Productive Uses of Renewable Energy. FAO. Rome. 18-20 June 2002.

5.2 Wood energy, cooking and health

The purpose of an integrated approach would be to maximize the effect of rural electrification, while recognizing its limited potential in current conditions to meet what are arguably the most important of all - thermal - needs, and thus paying attention to the provision of biomass and hydro-carbon fuels to provide the later.

-EDRC, 1998

Cooking is women's most important energy need in terms of time and effort. Biomass continues to be the main source of cooking energy in developing countries, accounting for about one-third of all energy and nearly 90% in some countries. Cooking is a very large share of household energy consumption, and the largest single rural energy use in low-income countries. Cooking and heating with biomass and fossil fuels may contribute to carbon dioxide emissions, and in some areas to deforestation and soil erosion.

This means that, unless cooking needs are addressed, positive impacts on carbon dioxide emissions, on deforestation, and on women's health and time will be fairly marginal.¹²

Health risks of indoor biofuel cooking are now well-known. In fact the World Bank has classed indoor air pollution in LDC's among the four most critical global environmental problems. The largest direct impacts seem to be respiratory infections in children and chronic lung disease in non-smoking women. This is one of the few energy-development linkages that has been well-documented empirically. Other health impacts of biomass use include those due to gathering heavy loads of biomass in distant and sometimes dangerous areas. Indirect health impacts from lack of fuel for proper cooking (malnutrition) and boiling water (diarrhea and parasites) may be significant, although difficult to document. (based on K. Smith in UNDP, 1997)

Three main solutions have been proposed, aimed both at addressing these health problems and at easing pressure on rural biomass resources and forests (Wim Hulscher, personal communication):

- (i) switch to kerosene and LPG (of particular interest perhaps from the health sector point of view, since this could be accomplished on a wide scale through macro-economic pricing policies);
- (ii) improve current woodstoves (of particular interest to environmental concerns, since greenhouse gas emissions would be reduced);
- (iii) introduce solar cookers/ovens, biogas, or electricity for cooking.

Box 6: Linking cooking energy with the Millennium Development Goals

Some findings of the TERI/World Bank Regional Workshop on Indoor Air Pollution, Household Energy, and Health, New Delhi, 8-10 June 2002:

- *Indoor air pollution (IAP) is estimated to kill 2 million women and children every year: about 500,000 deaths of women and children in India, about the same in China, the other million in other developing countries.*
- *WHO will soon rank the sustained household exposure to burning solid fuels as the fourth or fifth highest global risk to health after malnutrition, bad water and sanitation, and HIV/AIDS.*
- *The Millennium Goals for reducing infant mortality under five cannot be met without addressing IAP. Women, gender etc obviously have a major role to play.*
- *Women of all developing countries spend anywhere between 2 to 9 hours each day collecting fuel and fodder and cooking. A study in Uttarachal, India found miscarriages to be five times the national average at 30 percent, and linked it to heavy load-bearing during pregnancy. In Nepal, women suffer a high incidence of uterine prolapse that is in all likelihood linked to carrying heavy loads of wood soon after childbirth. Men of the developing world spend about 10 times less on such daily drudgery. Since biomass fuels are used mostly by lower-income groups, and women do most of the cooking, health is a significant issue in energy, poverty reduction and gender.*

What is the potential for electric cooking? Electricity is not usually advocated for cooking; it is thermodynamically inefficient and expensive for cooking. Nonetheless, electricity is already used for cooking in rural areas of some countries, where women are moving into paid employment and appreciate speed and convenience of cooking. Cooking with electricity is even being encouraged in some areas with excess hydro capacity. Development of low-cost, low-wattage thermal appliances such as burners, kettles and irons is being pursued in Nepal. But clearly the majority of cooking needs cannot be met by electricity.

Some electricity providers, recognizing the need for cooking energy, are seeking to address cooking needs with other fuels while offering electricity for lighting (South Africa, India). Cooperation of utilities with biomass energy and improved stove programs is another strategy.

5.4 Addressing women's electricity needs¹³

One of the main problems for the women of [marginalized urban shantytowns of] Tacna [Peru] was the absence of electricity in their homes, for several reasons: they wanted to make the most of the evening to speed up their textile work; they needed to feel secure in their homes; they needed to facilitate the task of caring for their children; they needed to make the night less dark; they needed to light the streets that they and their families used.

- Yturregui, 1998¹⁴

Rural electrification and technology research need to specifically address women's needs for saving-saving, for time-saving, for improved health, for security, and for income. Women use electricity differently than men, and they have different electricity needs.

Analysis of rural energy end-use patterns typically does not distinguish between women's and men's energy uses. In fact, some of these may be quite different, depending upon gender-specific roles and activities. Many rural energy end use tables do not even include some of women's most critical end uses, such as drinking water pumping, food processing, fuel collection and crop transport, and transplanting and weeding in agriculture. This is of course because these household tasks are presently accomplished mainly with human energy, which is not included in energy balances.

Electricity use by rural women, especially poor rural women, is currently low. But clearly, electricity can help meet some of women's high priority energy needs, such as:

- *Reducing labor in water collection by energizing water pumping.* Drinking water pumping is nearly always the highest priority for women, unless clean water is already available. There is a vast experience of planning and maintenance of

¹³ Based mainly on Cecelski, 1999 draft.

¹⁴ Interestingly, with no prospect of electrification in sight, this women's group, with UNIFEM support, decided to cope by improving the mecha chua, a traditional handmade candle. The women added mechanisms for faster lighting; making the kerosene fumes safer; making better wicks; making it more stable on the wall; saving fuel by using water; preventing accidents from happening when the lamp is on; and even making it more artistic and attractive with colorful decoration. The women manufacture the lamps themselves with plans to market in other marginalized areas of the city as an income-producing activity.

drinking water installations by local women's organizations that can be drawn on here (van Wijk-Sijbesma, 1998). The use of off-grid electricity to improve availability of clean water would have a high value to households in terms of health and quality of life, and a particularly positive impact on women's time and saving-saving, and possibly their employment and confidence-building through drinking water projects.

- *Saving labor and time in cooking where feasible*, e.g. with excess output from small hydro, perhaps with low-wattage, low-cost appliances, as discussed above.
- *Saving women's time and labor in agricultural processing* such as grain grinding, rice hulling and oil extraction. Post-harvest food processing is one of the most drudgerous and tedious of rural women's tasks. Electrification of rice mills and other grain, oil and food processing facilities can thus reduce women's workload in the home. Indeed, these are typically the first rural industries to electrify after grid extension. Benefits arise from the time and effort saved in processing, or from costs saved when a diesel mill electrifies, if these costs are passed on to consumers.¹⁵
- *Improving security and women's ability to participate* in community and school activities at night, with street and community services lighting. Safety is a major concern of women and often of men, too, that can be addressed by electric lighting. Electric lighting is believed to reduce both crime and fires, for which women are often blamed and even hunted down for witchcraft in parts of Africa.
- *Making women's domestic work easier and improving the productivity of women's income-earning work* through home and commercial lighting, refrigeration and key appliances like blenders and irons - with connection points, naturally, in the places around the house where women work. Lighting, the most common household use of electricity is unquestionably highly valued by households. But their effects on quality of life and development have been little studied. Anecdotal evidence suggests that the entertainment benefits of electricity are most appreciated by men, since women are usually too busy to partake of them. But lighting can enable the extension of working hours of both women and men, in both domestic and income-earning activities, for better and for worse; and
- *Enhancing women's and family social capital*, whether health (water purification, lighting and refrigeration in clinics, and perhaps in innovative ways like solar-operated fans to remove smoke from kitchens) or education (reading and homework). There is some evidence that women's leisure time (reading, radio, TV) increases with electrification (though the reasons for this are unclear) (Barnes, 2000draft), and this could contribute to health and social capital. Providing clean water by energizing water pumping could also contribute to health.

¹⁵ Post-harvest food processing activities are also a major source of employment for poor women, however, and increasing the efficiency of production processes can result in control being taken over by men, with women losing employment, as happened with the mechanization of rice hulling in Indonesia and Bangladesh. The impact of electrification of post-harvest processing on women's labor may also be limited because many of women's food processing tasks - such as fish smoking, baking and beer brewing - require thermal energy and thus rely on biomass. Others may be more appropriately improved through better hand, animal or mechanical means.

Box 7: Rural Electrification Benefits Women's Health, Income and Status in Tunisia

In Tunisia, the longstanding (mainly grid) rural electrification program appears to have achieved significant benefits for women, by explicitly integrating rural electrification in a national rural development policy in support of education, health, and gender equality. A 2001 study on user perceptions of benefits illuminated a number of positive linkages – according to users - between rural electrification and education, health, and the quality of life. Women and girls in particular appear to have benefited from improved access to education, health services (especially reproductive health), information from TV, and economic opportunities.

See Annex 2 for more details.

Ensuring these benefits from electrification for women will depend not only on provision of complementary infrastructure and inter-sectoral coordination, but on specific attention to women's needs and capacities in accessing credit, extension and training.

5.5 Micro-enterprise support through equal access to credit, extension, training

Women already have a track record of functioning as effective entrepreneurs in visibly successful organizations and networks (like Grameen, SEWA, etc.). The challenge is to transform them and their organizations into energy entrepreneurs.

- Batliwala and Reddy, 1996

Institutional factors such as access to credit, extension and training are already recognized by renewable energy experts as the principal constraints to renewable energy promotion. All of these constraints are exacerbated for women. So specific approaches are needed to reach women.

One of the key areas for enabling women's participation in improved energy equipment is credit and finance. Credit is already a focus of efforts to scale up rural electricity access. Yet women do not have the same access to credit as men do, receiving about 10 percent of credit from formal institutions. Women need access to credit and other promotional strategies in order to benefit from renewable energy: to purchase household appliances or obtain connections, to improve energy efficiency in their micro-enterprises, and perhaps as energy entrepreneurs. The latter two are especially important, because women use additional income from their enterprises for food, school fees, clothes and other basic needs for their households.

Box 8: Financing Energy Services & Income-Generating Opportunities for the Poor (ENSIGN)

The ENSIGN project was implemented in 8 countries in Asia in a UNDP-financed project by the Asia-Pacific Development Center. Energy-linked micro-enterprise portfolios were developed through micro-credit banks and institutions in each country. In urban areas, connecting to the grid and more efficient appliances were most important; while in rural areas, renewable energy, coal briquettes, and diesel fuels were preferred. In both rural and urban contexts, process heat and motive power were more crucial to income-generation than lighting. The ENSIGN Revolving Fund offered 36% of total loan funds, national financing institutions 50%, and borrowers equity 14%. Interest rates were 15-20%, somewhat below market rates, with repayment periods of 2-6 years. Both individuals and communities were financed, with average increase in income of 124% (higher for the community projects).

Myriad activities were financed: Garment making, embroidery, felt & leather good manufacturing, copper welding, utensils manufacturing, baking, cold storage, rubber stamp making, beauty salon, grain grinding, threshing, fish drying & powdering, soybean processing, rice husk cook stove, spice drying, beedi wrapping, cinnamon peeling, rice processing...

Some lessons from the ENSIGN project were:

- *though this was not planned, the vast majority of borrowers were women, who proved enterprising, innovative and creditworthy. Significant benefits for women, in addition to income impacts, were time savings and enhanced self-confidence from improved ability to support household income and greater control over self-generated finances.*
- *Need to account for transaction costs of intermediaries. There is need for a "Business Facilitator", possibly NGOs, in future replication efforts.*
- *Borrowers for ENSIGN-type loans are not usually the bottom poor; however, bottom poor often were employed as labor in the pilot projects.*

Source: K.V. Ramani, "Energy As an Instrument of Women's Economic Empowerment,"
ENERGIA News April 2002.

A study by Women's World Banking identified a number of financing programs that have been successful in providing micro-credit to women: poverty-focused programs within commercial banks; poverty lending banks; non-governmental organizations; and affiliate network institutions. The average loan size is in some cases in the right order of magnitude for solar home systems, for example. And the repayment rates are quite high, mostly in the high 90s percentiles.

Numerous resources are available on micro-credit programs including gender aspects, such as the Sustainable Banking for the Poor (SBP) program in the World Bank. Some of the factors that make these credit programs accessible to women include:

- Access to credit, not subsidies;
- Small loans with frequent and flexible repayment schedules;
- Alternative collateral requirements;
- Low transaction costs to the client (in money and time);
- An informal banking atmosphere where women are respected;
- Simple loan application procedures to accommodate illiteracy; and
- The use of information channels accessible to women.

Little is documented about women's access to credit in renewable energy programs, although ongoing experiences by IREDA, ENSIGN, the Uganda Women's Bank, Grameen Shakti, and the Vietnam Women's Union may soon offer some lessons. Some ENSIGN experience is described in *Box 8* above.

Although credit can play an important role for women, still, credit is not a panacea for access to electricity by poor women. The effective use of micro-credit requires complementary resources - land, skills, capital - which many poor women lack. Scaling up rural electricity thus confronts the same issues not only of poverty alleviation, but of women's empowerment, as a necessary condition for real development.

5. Findings and needs

This paper has reviewed current thinking on energy, poverty and gender, with a focus on rural electrification and renewable energy, as an initial attempt to conceptualize linkages and needs in this area. Some findings of the review include:

- ❖ Gender and poverty challenges in energy access are arising in the context of renewed interest in rural electrification, especially renewable energy, as a tool both for sustainable energy development and for greater equity in rural areas. Poverty reduction and gender equality are now integral goals for all major development institutions. Energy programs are seeking models and approaches to respond to these mandates.
- ❖ Gender issues have attained increased prominence in the debate on sustainable energy development over the last two decades. A number of energy programs are starting to pay closer attention to gender and are launching important initiatives, encouraged by the development of national and international networks on gender and energy.
- ❖ Despite these developments, the importance of bringing a gender perspective to energy policy analysis and design is still not widely understood, nor have the lessons for development been fully integrated by donors or national policy makers.
- ❖ Current efforts on gender and energy focus on:
 - building up a body of evidence and experience (conceptual, methodological, and case studies) linking attention to gender in energy policy and projects to equitable, efficient and sustainable outcomes in energy and development;
 - advocacy in national and international arenas on the importance of bringing a gender perspective to policy analysis and design;
 - capacity building and assistance to energy programs, policy and projects in integrating a gender perspective; and
 - creating networks and institutions at the national, regional and international levels to support these efforts at the practical and political level.
- ❖ Thinking and interest in gender and energy has also advanced recently, and a number of renewable energy programs have had experience with targeting women. Most of these have not yet been well-documented. The growing literature on energy and gender focuses mainly on poor rural women, on wood energy, and on micro-level (household and project) analysis.
- ❖ In current thinking on energy and poverty, renewable energy and energy efficiency must find their places in integrated approaches that provide the poor with more *choice* and more *voice* in the energy sector.
- ❖ Energy is not a significant element in current thinking in social development. Working relationships between energy macro-economists/engineers, and (non-economist) social development experts have been slow to develop. For donors, "energy" has focused on power plants, not fuel wood used by the poor

- ❖ One reason for this may be the lack of empirical evidence demonstrating strong linkages of energy interventions, including renewable energy ones, to impacts and benefits for the poor (in contrast with some other sectors like health and water where quantitative analysis of these linkages is well advanced).
- ❖ Another reason may be the very different discourses or "ways of thinking" in the energy sector and on poverty and gender. Poverty and gender thinking prioritizes people, while energy thinking often prioritizes other objectives such as efficiency or environment. Both have their place, but points of common interest and thinking have to be sought.
- ❖ Considerable experience now exists on strategies to widen access to rural electrification, including for decentralized programs, that could be reviewed now. E.g., solar home system experiences were last analyzed in 1995; given the rapid pace of developments in this area, there are many experiments that may offer new lessons. Several "best practices" studies suggest a number of effective policies for improving energy access by the poor.
- ❖ Promising approaches to increasing equity in rural electrification programs include:
 - appropriate tariff and connection policies, including, for decentralized systems, credit and leasing;
 - the role of subsidies, and the impacts of restructuring of the power sector on subsidies and access.
 - demand analysis, including using gender-disaggregated analysis;
 - financing/institutional mechanisms, including micro-credit, RESCOs, community/NGO-based approaches, and private participation in small-scale infrastructure provision;
 - productive uses of electricity, especially uses that may only be possible with decentralized systems; and
 - institutional coordination of complementary infrastructure.
- ❖ Two research questions with operational implications that arise are:
 - (1) What is the relationship between specific energy strategies and *poverty reduction* (as opposed to merely *widening access*)? Though anecdotal evidence is available, there are very few empirical studies that convincingly demonstrate a linkage, as there are in other sectors (e.g. health).
 - (2) What is the effect on the poor of privatization and market reform in the power sector? Experience in this area is relatively new.

Gender issues have rarely been addressed more than perfunctorily in socio-economic assessments in rural electrification programs or indeed in the energy sector generally, however, and more than likely this will not happen without a specific mandate and approach.

- ❖ Four gender issues that rural electrification programs should focus on are:
 - *data needs and analysis* - disaggregation of energy use, supply and impacts by gender, in order to provide a better basis for applying well-known field methods

and analytic tools for incorporating gender in project design and implementation, as well as at the micro- and macro- policy levels;

- *wood energy, cooking and health* - seeking integrated approaches and various solutions (including fossil fuels and perhaps electric cooking) that recognize the importance of these;
- *women's specific electricity needs* in water pumping, agricultural processing, security, work productivity, and health - addressing these in the framework of sectoral development initiatives; and
- *equal access to credit, extension, training* to assure electricity supplies for women's domestic tasks as well as their micro-enterprise activities.

The findings above indicate the following needs to:

- Disaggregate data by gender routinely throughout the rural electrification project cycle;
- Document existing experiences in order to provide (a) empirical evidence of strong linkages between energy, poverty reduction and gender; and (b) examples of "best practices, models and approaches;
- Encourage and support a dialog and interaction between "ways of thinking" in energy, poverty and gender, as well as create capacity to work in this interdisciplinary area;
- Develop new approaches to integrating energy (including decentralized supply options) with other development sectors.

Given the recent burst of interest and activities in this area, and the limited existing capacities available (experts and organizations, especially in the South), any initiatives will be well-advised to focus on capacity-building and to interact closely with other programs and establish effective partnerships with the various organizations now interested in energy, poverty reduction and gender equality.

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Annex 1

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Annex 2

RURAL ELECTRIFICATION BENEFITS WOMEN'S HEALTH, INCOME AND STATUS IN TUNISIA

Rural electrification in Tunisia is rooted in a strong national commitment to a broader program of rural development, gender equity and the reduction of social inequities. The increase in the rate of rural electrification, from 6% in 1976 to 88% in 2000, has been paralleled by a reduction in the incidence of poverty from 40% at independence to 7% today; achievement of almost full enrolment of children in primary school; the growth of life expectancy from 50 to 70 years; and improvement in the status of women, with women now comprising a third of the labor force. The rural population in this period has stabilized, with the rate of urban growth passing from 4.3% in 1975 to 1.2% in 1999, despite a doubling in the total population. At present, 35% of Tunisians live in rural areas.

Improvement in health services programs (including family planning) and basic education programs were two of the three pillars of the national rural development drive that contributed to these achievements. The third pillar was rural electrification.

The development of rural women's conditions is closely linked with the evolution of health and educational conditions in rural areas in Tunisia. This improvement is clear from demographic trends following independence. In the 1950s, Tunisian women had on average six births; infant mortality was 50%. In the 1960s, infant mortality declined drastically, while fertility boomed, resulting in a high natural population growth. By the early nineties, however, the rural fertility rate was reduced to 3.7% (compared to 2.6% in urban areas). Tunisia is now rapidly approaching the model of two children per family.

Key factors in these improvements included the rapid development of basic health infrastructure required for the implementation of eradication programs against endemic disease, development of health personnel and reduction of regional disparities between urban and rural in term of doctors per capita, development of primary health care through the reinforcement of basic health centers' role, improvement of nutritional state of children, and increase and improvement of medical consultations before and after birth, and follow up during pregnancy.

These key factors were all supported by rural electrification, as demonstrated in May 2001 by an informal socio-economic rapid appraisal done in connection with a study for ESMAP on the main factors in the success of rural electrification in Tunisia. This study on user perceptions of benefits illuminated a number of positive linkages – according to users - between rural electrification and education, health, and the quality of life. Women and girls in particular appear to have benefited from improved access to education, health services (especially reproductive health), information from TV, and economic opportunities.

The assessment was carried out in four villages in three regions of Tunisia: Bizerte in the North, Siliana in the Center-West, and Nabeul in the Northeast. The areas chosen had had electricity for between two and five years. The survey team conducted interviews with 54 households, as well as with key informants in health, family planning and rural development services, and agricultural and agro-processing users. Family planning assistants, who have a long experience of direct relationships with rural families in a larger population, interviewed an additional 50 households. The appraisal explored not only perceived benefits of rural electrification, but also problems in service e.g. power cuts.

User perceptions of benefits of rural electrification: education, health, status, income

The household users had quickly taken advantage of connections. Each had on average two lights per room. Refrigerator, TV and radio ownership varied between 1 for every 2 households and 1 per household, and some households owned cable dishes. (Nationally, 72% of Tunisian households owned refrigerators already in 1994, and 92% had televisions, of which 70% were color.) The beneficiaries were well aware of the benefits of rural electrification.

Education is the number one priority for families in all walks of life in Tunisia, so it is not surprising that the first benefit of rural electrification cited by households with school-age children is improving homework and school performance, while at the same time avoiding eye problems from using candles and kerosene lamps. Schools assert that the rate of enrollment of girls has caught up with that of boys, after electrification not only of households, but also of schools and public streets. Public lighting has reduced the risk of journeys to school - an important concern for families with girls. The construction of tarred roads, in a coordinated rural development effort, has also contributed to reducing the rate of absenteeism. Within schools, electric lighting has improved conditions, especially during the early dark hours of winter, when each student previously was obliged to bring their own candle. All this is believed to have contributed to an increase in the rate of graduation to 60-70% in these rural areas.

Basic health and family planning has been the second most important social priority of the Tunisian State, after education, and this is also reflected in the benefits perceived from rural electrification. Rural electrification was provided at the same time as were clean water and well-equipped and staffed health clinics: e.g. a nurse is permanently available even in these remote clinics, a general practitioner visits once a week, and a specialist health team regularly visits. Health clinics have lights, a refrigerator, negatoscope, sterilizer, popinet, fans, oil heaters, radio, TV and sometimes video. The majority of drinking water points are equipped with pumping devices, with electricity much in demand to replace diesel.

Beneficiaries and health staff attributed at least part of the responsibility for the reduction in the birth rate in their area to rural electrification, which increased the effectiveness of family planning and other health programs. Clinics report being able to expand the range of their equipment and services: for example, TVs/videos present programs on public health and disease prevention in some waiting rooms; instruments can be sterilized; and vaccines for babies and anti-tetanus shots for pregnant women are more widely available. According to a nurse attached to one clinic, the availability of refrigeration for vaccines and medicines has contributed to a noticeable reduction in childhood diseases, diarrhea and poisoning.

Women's reproductive health in particular is seen as benefiting from electrification: women with electricity organize their daily tasks so that they have time to watch TV, which passes on many health messages on e.g. reproductive health and contraceptive methods; vaccinations; and the prevention of sexually transmitted diseases; health checks for e.g. breast cancer, colon cancer, etc. The family planning units in these villages now use audio-visual aids in the village, making awareness-raising campaigns more effective. Better information for girls from family planning services, but above all from TV, is credited with the rapid decrease in teenage pregnancies. Even tube tying and implants, which require hospitalization, have been facilitated by electricity: with refrigeration, women are less reluctant to absent themselves from their household tasks, since they can prepare and store meals for their families in advance!

Women and health staff also perceived other changes in **women's quality of life** due to rural electrification. Both husbands and wives are reported to spend more time at home. Installation of TV (and even satellite dishes) in their homes means that women have become much more aware of political events of the day, and know much more about what is going on in the world even than their husbands, thus giving them confidence to speak up and defend themselves and take more leadership roles. Rural women and children - especially girls - are becoming more demanding about personal hygiene and fashion conscious, following the latest TV advertisements and fashions!

Increased economic opportunities in the home and village for women are perceived as one outcome of electrification. Electric lighting makes evening activities possible, and many girls say they prefer to stay in the village and earn a living using a sewing machine, weaving or knitting, rather than going to the city to work as maids. Sewing workshops and hairdressers (presumably a result of the increased fashion consciousness!) figure prominently among new economic activities seen as developing due to electrification. Equipment is often contributed to households by various development programs of the State. Refrigeration is also valued for being able to conserve food and medicines, and save money by rationalizing shopping.

Based on **Rural Electrification in Tunisia : National Commitment, Efficient Implementation, and Sound Finances** by Elizabeth Cecelski, Ahmed Ounalli, Moncef Aissa, Joy Dunkerley, report to ESMAP, World Bank, Washington, DC, January 2002.