

THE GENDER - ENERGY- POVERTY NEXUS

Finding the energy to address gender concerns in development

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Glossary

Biogas: a combustible gas formed by natural processes of anaerobic digestion, in which micro-organisms convert organic material into a gas which has composition and combustion characteristics similar to natural gas. Biogas units are available in household, community, and industrial sizes.

Biomass fuel: any organic material of plant or animal origin such as wood, agricultural residues and dung, used as a fuel.

Energy: For the purposes of this paper, energy is taken to include fuels such as petroleum products (kerosene, petrol, diesel) and biomass (firewood, charcoal, agricultural wastes, dung), power (electricity) which can be from a number of sources (fossil fuel based or renewable) and animate forms of energy, particularly human metabolic energy. Food energy is not included.

Energy carrier: The form in which energy is delivered to the end user, for example, fuels (biomass and fossil fuels), batteries and electricity (grid). The end-user has to make an additional transformation of the energy into a useful form, for example, switching the radio on which converts electricity into sound.

Energy efficiency: The ratio of output energy to input energy gives a measure of the conversion efficiency of a particular piece of equipment. The ratio varies and can never be 100%. Engineering design aims to maximise the conversion efficiency.

Energy poverty: Absence of sufficient choice in accessing adequate, affordable, reliable, clean, high-quality, safe and benign energy services to support economic and human development.

Energy services: The desired and useful products, processes or services that result from the use of energy; for example, illumination, comfortable indoor climate, refrigerated storage, transportation, appropriate heat for cooking.

Energy technologies: The hardware that converts an energy carrier into a form of energy useful for the end-user.

Productive work: Work done by both women and men for pay in cash or kind. It includes both market production with an exchange value, and subsistence/home production with actual use value and also potential exchange value.

Practical or Reproductive work: Childbearing and daily child-rearing responsibilities and tasks involving the care and maintenance of the household and its family members, in most societies primarily done by women. In some societies, men may have customary domestic activities (e.g. house building). Despite the important role this type of work contributes to the economy, for example, by ensuring that there is a fit and active workforce, it is rarely considered as the same value as productive work. It is normally unpaid.

Strategic needs: Things necessary to change the balance of power between women and men in society, based on the premise that women in society are subordinate to men. Examples of strategic needs include: the law, education and income. Strategic needs aim towards women's emancipation, equality and empowerment.

Women's Empowerment: Process of awareness- and capacity-building of women leading to a more equitable participation in decision-making and enabling them to exercise control over their own lives.

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1. Introduction

The links between gender and poverty have been explored in many papers on livelihood strategy and development “best practice”. However, few of them tackle an element of poverty that can occupy a quarter of the rural woman’s time, affects her health, and is a key to developing her gender-strategic interests: energy. Although the presence of links between gender, poverty and energy have been hinted at in many studies, for example in DFID’s publication ‘Energy for the Poor’ (2002), there are few that tackle it head on. This paper has been commissioned by DFID to explore current thinking on the gender-energy-poverty nexus, in particular to review the key issues and highlight areas that need to be addressed, and to suggest actions and further studies that need to be undertaken in order to “find the energy to address gender concerns”. It is hoped that this analysis and the recommendations that are drawn from it will be valuable to professionals working in the fields of gender and social development, not only within DFID and similar donor organisations, but also in other national institutions, NGOs and academic circles.

Challenges within the gender and poverty nexus concern the ideas of access to resources, decision-making, and control. Most gender analysis tools (as found in development literature, and particularly in ‘toolkits for development planners’ etc, such as Williams et al.,1994) are rather general, and aim to assist the planner to understand the overall situation of women in rural areas. They commonly call for the gathering of data on time inputs by men and women into different activities (as in the Harvard Matrix), and for an assessment of the differences between men and women in their access to, and control over, resources. Planners need frameworks that can be used systematically to analyse different situations and allow reasoned and responsive decisions to be made. However, much of the literature on access and control fails to note the key role of energy, and it can be questioned whether the usual gender analytic tools are adequate to bring out the energy component in women’s livelihoods.

This paper starts by outlining some of the key concerns regarding poverty and sustainable livelihoods. Noting that the role of energy in these is often not fully recognised, it then

explores energy as a strategic issue in poverty, and discusses the difficulties in the provision of energy services for the poor. The paper then moves on to consider gender aspects of the poverty-energy link, and how energy provision can contribute to moving women and their families out of poverty. The focus then turns to the issue of sustainable livelihoods, and the part energy plays in these, first in general terms and then specifically in gender terms. The paper concludes by listing some of the major areas in which research is still needed to improve our understanding of the role of energy in poverty alleviation and sustainable livelihoods, and the role it can play in meeting women's strategic needs. The focus is primarily on *rural* livelihoods, reflecting the material available. The purpose is to identify current gaps in knowledge of the gender-energy-poverty nexus, suggest further study that can address these gaps, and finally the subtitle can be reformulated as a question: can we find the energy to address gender concerns in development?

The paper is based on a review of the available literature, in particular a bibliography on gender and energy that was earlier prepared by the authors (Feenstra, Clancy, and Skutsch 2001) and a survey of development practitioners working in gender and energy, which was carried out for DFID by the research team and presented under the title *Gender, Energy, Poverty Nexus – where is the strategic interest?* Quotes which represent the opinions polled by this survey are included to support many of the points made in the current paper, in small boxes adjacent to the text.

2. The Nature of the Problem

Poverty is one of the world's most fundamental issues, and urgently needs to be addressed. Moving people out of poverty forms a cornerstone of DFID policy. Poverty can be conceptualised in a number of ways, for example, in economic terms (an income of less than \$1 a day) or in social terms (lack of access to adequate levels of food, water, clothing, shelter, sanitation, health care and education). It is also possible to identify an energy dimension to poverty: *energy poverty*. Energy poverty has been defined as the absence of sufficient choice in accessing adequate, affordable, reliable, high quality, safe and environmentally benign energy services to support economic and human development (Reddy, 2000). Energy poverty interacts with other manifestations of poverty and it is important to explore the issues that surround it, including the gender aspects.

Estimates of the number of people living in poverty put the figure at around 1.3 billion. Poverty is particularly acute in rural areas in developing countries, and the problem is growing, since the number below the poverty line is increasing in absolute numbers if not as a percentage. Poverty is not static but rather a dynamic process: people can move out of, or into, poverty. This needs to be taken into account when policies and strategies are being designed to help people lift themselves out of poverty. Rural people voice the need for the means to provide themselves with adequate livelihoods. These livelihoods should be sustainable, in the sense that they can withstand stresses and shocks, and they should maintain, or even enhance capabilities and assets without undermining the natural resource base. However, the opportunities for people to support themselves from the land are limited. Already many rural families, who might classify themselves as farmers, have diversified their activities and social support capabilities for survival as well as in order to try and improve their standard of living. Another option is urban migration, particularly chosen by men, resulting in a large number of female-headed households in rural areas. For example, it is estimated that women make up

80% of the adult rural population in Zimbabwe (Nyoni, 1993). Access to cash incomes through non-agrarian activities might go some way towards stemming the exodus from rural areas (which reduces the total human capital and threatens the sustainability of an area), as well as contributing to the sustainable livelihoods of those who remain. These processes are well understood by development practitioners, but the energy component within them is often not fully recognised.

3. Energy as a poverty issue

Energy is one of the most essential inputs for sustaining people's livelihoods. At the most basic level, energy provides cooked food, boiled water and warmth. It has long been established that poor people mostly use biomass as their energy carrier and that in many areas there is an increasing shortage in supply, which adds to the burden of the women whose responsibility it is to collect it. This was christened 'the other energy crisis' by the World Resources Institute as early as 1975, when the world was still reeling from the international oil crisis (Eckholm, 1975). However, despite the fact that around two billion people still use biomass fuels (World Bank, 1996), and the fact that these are also the two million poorest people on earth, there has been little attempt to analyse the energy-poverty nexus in depth. This can partly be explained by the fact that the biomass in rural areas is collected at zero monetary cost, mainly by women and children, and so it falls outside national energy accounts, the result of which is that the issue renders itself invisible:

No data - no visibility; no visibility – no interest (Huyer and Westholm 2001)

The invisibility of energy-poverty issues leads to decision-makers not being fully aware of their significance, and so policies and strategies fail to address the issues fully. This can be seen in DFID's own Livelihoods Approach to development. Although the approach recognises energy as one of the key factors in the physical assets of the Livelihoods Pentagon, it has received little attention from both energy and social science researchers to date¹. The Target Strategy Papers also contain only passing reference to energy, although a recent publication by DFID is focused on outlining the role that energy can play in underpinning efforts to achieve the Millennium Goals (DFID, 2002).

The use of biomass has a number of repercussions for poor people. The fuel quality is low, and when burnt it gives off quantities of smoke and particulates that are recognised as having negative effects on health. The several hours a day spent in collecting fuel means that this time cannot be used for other livelihood activities. Although nearly every household in rural areas will use some biomass as an energy carrier, poor households will spend more time searching than those in higher income groups (Reddy, 2000). Wealthier households will also purchase other, higher quality, fuels, which will be used for a greater variety of end-uses than in poor households. In urban areas², poor people have to purchase cooking fuels, and they

¹ Barnett is one of the few researchers to directly address energy within the Livelihoods Approach (Barnett, 2001). The DFID Knowledge and Research Programme has recently supported research in this area (see for example, Doig (1998) and Future Energy Solutions et al. (2003)).

² It should be pointed out that the energy-poverty nexus in urban areas has been less researched than in rural areas although the body of knowledge is beginning to grow. DFID, ESMAP and AFREPREN have all recently been involved in promoting knowledge generation on the energy-poverty nexus (see, for example, Doig (1998), Future Energy Solutions et al. (2003), Barnes (1995) and ESMAP (1999), Dube, (2002)). The urban situation is different to rural areas since there is a greater reliance, even by poor households, on purchased fuels (including biomass) and maybe they are more responsive to market mechanisms.

spend a higher proportion of their income, than higher income households, on fuels (ESMAP, 1999). Typically, a poor urban family spends 20% of its income on fuels (Barnes, 1995). In rural areas, poor households will generally restrict fuel purchases to lighting uses (candles and kerosene).

Energy has an equity dimension: poor households use less energy than wealthier ones in absolute terms. Less water is boiled for drinking and other hygiene purposes, increasing the likelihood of water-borne diseases. Illness reduces the ability of poor people to improve their livelihoods and increases their vulnerability, not only preventing adults from working effectively but also negatively effecting children's learning. It is frequently said that more lighting for poor families would allow children to study at night, but the extent to which home lighting really improves educational performance and life chances is unknown. Lighting, in theory, also provides opportunities for extended working hours and thus improved income generation. Further, street lighting and lighting in community centres can open the way for adult education but whether it does so, and whether poor families take advantage of this, are not certain.

Wealthier people are able to exercise some choice in their energy carrier and many opt for the cleaner and more efficient "modern" energy carriers of electricity or gas, including LPG or biogas, although the use of energy carriers is complex. Many better off households use mixtures of modern and traditional fuels, each matched to a specific end purpose, often for reasons not linked to price (just as many households in the North will on occasions select a 'traditional' form of energy. Modern energy carriers do not have the negative health and time effects associated with biomass. Wealthier people are also better able to afford the appliances that make use of these modern energy carriers. In situations where they are reliant on biomass fuels, they are able to purchase more fuel-efficient stoves. In doing so they may be saving a great deal of money per unit of energy consumed. Unfortunately, poor people are often unable to make such investments, opting for lower first cost options, rather than lower life

A region-based poverty alleviation scheme had no energy component, not even woodfuel. It merely addressed medical, educational and agricultural aspects. A real multidisciplinary approach (including the assistance of energy specialists) could have avoided this situation."

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cycle costs, because of their lack of capital³ (Reddy and Reddy, 1994). The consequences for the poor are that precious cash resources are used on low quality fuels, which are then used at low efficiency, reducing their ability to accumulate the financial resources they need to invest in strategies for improving their livelihoods.

This vicious cycle of energy poverty needs to be broken. Understanding the decision-making process within households when choosing energy services, which would appear at present to work against sustainable livelihoods, is important for designing effective interventions. A first step towards this should be a widespread acknowledgement among the development community that a lack of access to clean and affordable energy can, and should, be considered a core dimension of poverty. In this respect, it is therefore welcome that the World Summit on Sustainable Development acknowledged that access to energy is needed to help achieve the Millennium Development Goals and reference to this effect was included in the Plan of Implementation (<http://www.johannesburgsummit.org>)⁴.

³ Energy services that have lower costs per unit of received energy on a life cycle costs basis may have higher investment costs.

⁴ ENERGIA devoted a special issue of ENERGIA News (vol.5, no.4) to the gender aspects of energy issues raised at the World Summit on Sustainable Development (see <http://www.energia.org>).

4. Reasons why present energy policy does not address energy poverty

The existence of energy poverty makes it reasonable to conclude that the present structures and processes within the energy sector are not functioning in such a way as to benefit the poor. Macro-energy policy in developing countries tends to focus on the commercial energy carriers: electricity, coal, gas and petroleum products. There is a growing interest in renewable energies, primarily for electricity generation, but the overwhelming tendency in the energy sector has been to focus on investment in electricity and fossil fuels. Urban users are the primary beneficiaries, and although the urban poor may also to some extent benefit, the rural poor – the majority of the poor in most developing countries – generally do not benefit at all.

At present, the grid does not extend to many rural areas because the costs of construction and of supplying scattered communities with relatively small quantities of electricity have been seen as prohibitively high. Petroleum products such as kerosene depend on road transport, which may be seasonally unreliable, and the transport costs may increase the fuel cost considerably. As a result, there is a particularly heavy reliance by rural households and industries on locally supplied biomass fuels. In many cases, moreover, the supply of biomass fuel is becoming scarcer and entails more and more effort in its collection as the distance to the source of supply increases, not to mention the concomitant negative environmental effects. Energy planning in developing countries, while usually aware of this process, rarely addresses the roots of this problem in a coherent fashion, with the result that improved energy services in rural areas are in short supply, while at the same time the environmental situation continues to deteriorate. The situation can, in part, be explained by the lack of understanding of processes in rural areas and, in particular, a failure to appreciate the positive contribution that energy services can make to sustainable livelihoods. To some extent it can also be explained by the fact that biomass does not fall squarely under the authority of energy ministries, since it is made up of tree and agricultural products that are normally the concern of ministries of forestry and agriculture. There is frequently a lack of cross ministry co-operation.

The energy sector in developing countries is however not immune from transformations that are taking place in the global economy, which are intended to bring about increased efficiency and lower costs, as well as increasing access. There are two particular changes taking place that are likely to have specific consequences for poor people: privatisation and commercialisation. Privatisation in the energy sector involves the sale of state energy companies, particularly the electricity utilities, to the private sector, as well as the opening up of the market for the private sector to provide other energy services. These trends bring with them wholly new concerns that need to be studied: particularly, how the private sector will respond to the demand from the rural poor for energy services. Will the poor be seen as a mass market needing creative financing programmes to facilitate access to energy services, or will they be regarded as too high a risk, providing too low a profit margin? It is, as yet, not clear whether privatisation will result in more, or less, access for the rural poor to modern energy forms. In some cases, the boundaries of existing services, originally provided with an element of social welfare, are being retracted, as can be seen, for example, in India where previously electrified areas are having services withdrawn based solely on financial criteria (Ministry of Power, 2001). Conversely, privatisation might contribute to sustainable livelihoods by providing new entrepreneurs with the opportunity to enter the market by providing local level energy services in rural areas. Although this is much to be hoped, the scanty evidence so far is not very encouraging. Barja and Uriquiola (2001) report that

following the privatisation of the utilities in Bolivia, there have been no improvements in access to electricity for the poor in rural areas, whereas in urban areas there was access by more than 95% in the lowest income quintile compared with 86% prior to privatisation. Whether this trend is general is not known, although a body of knowledge is beginning to emerge (see for example, Doig (1998)). However, further research, including microanalysis based on case studies, is badly needed to provide a more holistic picture and to identify local factors.

Commercialisation is a process of reducing public expenditure that also aims to reduce the market inefficiencies induced by subsidies. For the energy sector, it has meant the removal of direct subsidies on fuels and appliances, and a shift towards market-based solutions in the provision of energy services. For those trying to promote renewable energy as a means of providing modern energy services, and particularly decentralised energy services for rural situations, this shift in dissemination strategies has come at an inopportune time. Many of the renewable energy conversion technologies have high initial investment costs, and in order to increase access by poor people to these technologies many programmes are reliant on subsidies. Further, the promotion of the market as a way of increasing access to energy services raises some, as yet, unanswered questions; for example, could improved access for the poor be achieved through lower priced conversion technologies, achieved through mass production, or are transformations in the structures and processes within the energy sector also necessary? Here again there is very little concrete information, and practical research is very much needed.

Unlike modern fuels, the supply of biomass fuels such as wood and charcoal are still largely uncontrolled and based in the informal sector. Rural populations generally supply themselves from surrounding forests and from trees in the landscape, in most cases in quantities that do not exceed sustainability limits. The supply of biomass fuel for the cities is also uncontrolled, and, in most cases, biomass production is unsustainable. Although an informal trade, it is a commercial one, the turnover of which in some cases exceeds that of the electricity sector (Skutsch and van Rijn, 2002). Wood is felled in state-owned forests by dealers, but the cost of replacing the trees is not paid, with the result that forests are deteriorating rapidly around major cities. Past efforts to relieve the resulting firewood shortage by encouraging farmers to grow trees have largely failed because the costs of this far exceed the short-term costs of gathering fuel from existing forests (French, 1986). However, new efforts to empower local communities to manage the forests in their areas in a sustainable way for the production, among other things, of biomass fuels are encouraging, particularly as this could provide income sources for the poor within the community. As such projects get underway, it is very important that they are monitored for their impact on the local fuel situation as well as on socioeconomic criteria and environmental indicators.

Since the 'other energy crisis' was identified, the main activity undertaken to combat it has been the promotion of improved (more efficient, sometimes also less smoky) stoves. Both India and China had large state-funded programmes, of which the Chinese one has been much more successful, apparently because so many Chinese women, even in rural areas, are directly engaged in the cash economy and so the time they save in firewood gathering has a very clear economic value. In India, and in the very many other countries where NGOs have been active in this field, results of the dissemination of stoves have been mixed, possibly because the time savings are not seen as economically valuable, but also because the stoves have often failed in many aspects to meet the actual requirements and constraints that women face.

In the past, there has been a tendency to concentrate on *fuels*, such as electricity or petroleum, and the supply of these, or on *energy technologies*, such as solar equipment or improved stoves, within dissemination programmes. Recently, it is been suggested that the focus should be shifted to the concept of energy *services*, with the hope that this will enable better access by the poor (Woroniuk and Schalkwyk, 1998). What this implies is that far more consideration would be given to what people need energy *for*, and identification of the constraints or conditions around these end uses. This approach would seem to offer much better prospects as regards energy poverty since it requires much more attention on the nature of the problem at the user level, and implies a comprehensive analysis of the totality of user needs, rather than a piecemeal, supply driven, approach.

5. The gender component of energy poverty

The energy-poverty nexus has distinct gender characteristics. Of the approximately 1.3 billion people living in poverty, it is estimated that 70% are women, many of whom live in female-headed households in rural areas. It is important to take note of this fact, not only because men and women have different energy needs and may have different ideas about sustainable livelihoods, but also because women and men have different access to resources

"I am not even aware that governments pay attention to the social and gender implications of energy use! The exceptions may occur in two types of projects: (1) cheap energy sources projects (from the user side) and (2) social forestry or similar projects which do involve women as gatherers of forage and firewood."

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

There are a number of important questions that need to be considered when considering how energy poverty affects women.

5.1 *Who makes the decisions about energy within the household, and who benefits?*

The gender dimension of energy and poverty appears in a number of ways. In households where there are adult men and women, the gendered division of labour generally allocates to women the responsibility for household energy provision related to their spheres of influence in the household, in particular activities centred on the kitchen. However, when energy has to be purchased, men enter the decision-making process, for example in the purchase of batteries for radios. In South Africa, it was found that the high expenditure on batteries was for young men to listen to taped music; in many cases, female members of the household had no access to the equipment and no control over battery purchase (Makan, 1995). In some households, recreational equipment, such as TVs and radios, was bought before labour-saving equipment for domestic chores. Decisions about what to buy and who owns it were made by the male members of the household. The impact of such decisions on total household budgets should not be overlooked. Survey data from Uganda in 1996 showed that 94% of rural households not connected to the electricity grid used dry cell batteries, and were estimated to be spending about US\$6 per household per month on batteries (quoted in Barnett 2000). Barnett points out that although such batteries are convenient, they are a very expensive way of buying electricity, as in this form it costs about US\$ 400 per kWh.

Men can also influence the uptake of energy technologies in the women's domain of the kitchen. In Zimbabwe, men are reported to have rejected the use of solar cookers by their wives, since technology and its development are seen traditionally as a male preserve (Nyoni, 1993). Men will often decide on the stove technology if it is to be purchased (Tucker, 1999).

Men also make important decisions on other factors that influence cooking and kitchen comfort, for example material for kitchen walls and roofing (Dutta, 1997). Some men have also expressed concern about the use their wives would make of the time saved through using new stoves, while others saw it as an opportunity for their wives to undertake more productive activities (Wilson and Green, 2000). Women are also aware of the fact that savings in one area of drudgery can result in increased drudgery in another area; Jackson's (1997) study of women's involvement in water projects showed that some women deliberately adopted a non-participation strategy to avoid increasing their overall workload, is instructive in this matter.

There can also be distinct gender aspects to the distribution of benefits from modern energy carriers. For example, the evaluation of a rural electrification project in Tamil Nadu showed that men benefited more than women since the electricity was used to run irrigation pumps substituting for oxen-drawn water (Rengasamy et al., 2001). The care of the oxen was traditionally a task for men. They gained more free time when the number of draft animals decreased, and they used this time for involvement in politics and improving their agricultural methods, thereby increasing their social and human capital. However, electricity did not substitute for any of the tasks of women, and hence their strategic needs were not addressed.

Women and men have different perceptions about the benefits of energy, men see the benefits of electricity in terms of leisure, quality of life, and education for their children; while women see electricity as providing the means for reducing their workload, improving health, and reducing expenditure. However, women have also been found to benefit from access to television, such as in Nepal where it is reported that women's empowerment was enhanced when they could see pictures showing that they "don't have to remain as second class citizens" (quoted in Barnett, 2000).

5.2 What are the implications for women of biomass fuel use?

In poor households, biomass collection to meet a household's energy needs is the burden (physically and metaphorically) of women and girls. In rural areas, it can mean spending several hours a day collecting fuelwood loads of 20 kg or more. In urban areas, meeting family fuel needs can entail juggling tight household incomes in order to buy charcoal or kerosene; increased fuel prices result in less money for food and other essential items thus increasing household vulnerability. The responsibility for household energy provision affects women's health disproportionately to men's (for example, higher levels of lung and eye diseases due to the longer hours of exposure to smoke and particulates in smoky kitchens experienced by women compared to men⁵). Fuel collection also reduces the time women have available for contributing to other aspects of livelihood strategies, and girls are frequently kept away from school to assist their mothers.

The full consequences of women continuing to rely on their own energy inputs and biomass fuels are not known. While there is some excellent research being carried out, much with the support of the World Health Organisation, into the effect of smoky kitchens on women's and children's health (see for example, Smith (1999)), other health linkages are not so well researched. For example, although the amount of time spent by women in collecting and carrying heavy loads of fuel is often noted, the damage these loads cause to women's spines is not documented. Mechanised transport, even bicycles, would be a great boon to women, not just for fuel transport but also for carrying other goods, such as harvested crops from field to

⁵ Poorly vented cook stoves have been stated as having the same adverse health impacts as smoking two packs of cigarettes a day (quoted in UNDP press release *UNDP Pushes for Expanded Energy Services to Meet the Poor's basic needs*, 10 April 2002).

storage and market. Women are also responsible for a number of other survival tasks needed to sustain the household such as water collection, food processing and cooking. Many of these tasks are demanding in terms of both human energy and time; the preparation of many staple root crops and grains takes upwards of an hour of vigorous pounding. Energy interventions are available which could do much to reduce the drudgery involved in these daily household activities. For example, the human energy in grain preparation could be simply substituted by a milling machine.

The whole issue of women's time and effort saving (reduction of drudgery) seems not to receive the attention it deserves. This might be attributed to the fact that decision-makers and planners are not fully aware of the situation regarding women's physical labour. Women's survival tasks, based on their own metabolic energy inputs are, like biomass, invisible in energy statistics (Cecelski, 1999). As a consequence, the development of labour-saving devices, which could contribute significantly to women's wellbeing, is not high on the agenda.

A simple conclusion is clear: the burden of biomass fuel use is a major aspect of most poor women's lives. It absorbs large amounts of time in heavy work, it can have negative effects on health, and although this problem has been recognised for 30 years very little has been done about it.

5.3 How do women cope with their energy problems?

It would be incorrect to view women as passive victims of biomass use. Women have responded to fuelwood shortages by adopting management strategies to conserve fuel: they shorten cooking times, explore less fuel-intensive cooking and food processing methods, cook fewer meals, serve cold leftovers, change the types of food eaten, and purchase other fuels. Women are important managers of natural resources and also producers of biomass fuels. They make rational decisions about which resources to use and how to use them. A great deal can be learnt from such coping strategies. The history of projects that have attempted to introduce improved stoves is instructive. Many such programmes have failed, either, as suggested in Section 4, for economic reasons, or because the technologies have not fitted the real needs of the women concerned. Stoves may be simply not used, or not replaced when they get broken, a sure sign that the technology is not really popular. Where programmes have succeeded this has often been because local women have been involved in the design of the stoves, and particularly in the dissemination process. In one example, local women were trained as stove masons to market these services (Sarin, 1984). What can be learnt from this is that trying to convince women that improved, more fuel efficient, stoves are in their interest is doomed to failure unless the factors which women themselves consider important are taken into account. This general lesson may certainly be extended to other energy technologies.

5.4 What are the implications for women of current energy policies?

The current focus in energy policies and planning, as noted above, is very much on increasing the efficiency in the electricity sector through privatisation, and reducing subsidies on fossil fuels. The implications for women of this focus have not been well thought out. Although electricity has many benefits, it does not help address the major energy problem that most women in rural areas face in terms of their practical needs: their daily cooking requirements. Cooking with electricity is not cheap in terms of either the energy itself or the stove. Even if privatisation results in lower electricity prices (which is debatable) it is unlikely to meet cooking needs, even of richer women.

Stand-alone photovoltaic home systems are not capable of delivering sufficient power to cook family meals. Solar cookers seem to be undergoing a period of renewed interest with donors⁶ but the vast majority of past programmes have failed miserably. The popularity of solar cookers with cooks over the long-term has to be re-evaluated as new models and approaches are developed. The most serious objections to solar cookers are that cooking at midday does not coincide with the time of eating the main family meal in many cultures (Mandhlazi, 1999), and that many cooks prefer to cook indoors (Wilson and Green, 2000). Whilst it can be argued that this requires encouragement to change cooking styles, Green (2001) has pointed out that a shift to outdoor cooking can lead to a reduction in women's social capital. The cooking fire is seen in many societies as the social hub of the family, the women of the household are able to socialise with their families while cooking. In her work in South Africa, Green suggested that solar cookers might even lead to a breakdown of this social web. The real value of electricity for poor women lies in other things, in lighting, especially in public places where it increases their safety, and in mechanical applications such as milling.

Petroleum supply has also been affected by deregulation. In many places there have been reductions in subsidies on transport fuels, which has increased the cost of getting to work for women in urban areas and pushed up prices in general. Generally, however, governments still control kerosene prices. Despite this, women are often only able to buy this lighting fuel in small quantities that match their cash flows. Reductions in the subsidy would make the problem even worse.

Ideas on community forest management with a view to providing a sustainable supply of biomass fuels are only just starting on a project basis, and are scarcely represented in policies, but the implications for women need to be watched. Most of these projects aim to provide sustainable woodfuels for city populations, and in the long run they will inevitably entail higher commercial prices for wood and charcoal. This has serious implications for urban women's budgets in the short term, but in the long run it may act as an incentive for the development and marketing of better (more efficient) stoves, which should also have health benefits for women. It may also help improve the profitability of microenterprises, which frequently use process heat. The impact in rural areas of increasing the commercialisation of woodfuel is likely to be felt more gradually. However, unless action is taken on the biomass front in rural areas, both in terms of supply and in terms of combustion technology, women will continue to shoulder the very heavy burden of energy provision for their families for generations to come.

6 Moving women and their families out of energy poverty

There is no doubt that energy plays a major role in meeting women's practical and reproductive needs (such as cooking, food processing and water hauling), but it can also be seen as a component necessary to meet their productive and strategic needs (lighting to enable evening study, street lighting for safety in attending community meetings, power for women's enterprise development). It is remarkable that the use of gender analysis in energy planning is virtually unknown, whereas it has been successfully used for many years in the health, water and agricultural sectors. This is evidently because the gender component in energy poverty

⁶ For example, a solar cooking workshop was organised in 1999 under the auspices of UNESCO and the European Union.

has not been fully recognised. Energy planners have usually equated women's interest in energy with cooking, to the exclusion of other needs, particularly of needs related to productive activities and emancipatory goals. In addition, since the main focus of energy planning has been on fossil fuels to the exclusion of biomass fuels, even women's practical needs have hardly been addressed.

Table 1 illustrates how different forms of energy can be seen as contributing to women's practical, productive and strategic needs. It is important to recognise that energy should be seen not just as an efficiency or welfare element in development, but that it is also an indirect means for enhancing gender equity (Skutsch, 1998).

Table 1 Possibilities for improving the position of women through energy

Energy Form	Women's needs		
	Practical	Productive	Strategic
Electricity	<ul style="list-style-type: none"> - pumping water: reducing need to haul and carry - mills for grinding - lighting improves working conditions at home 	<ul style="list-style-type: none"> - increase possibility of activities during evening hours - provide refrigeration for food production and sale - power for specialised enterprises such as hairdressing and internet cafes 	<ul style="list-style-type: none"> - make streets safer: allowing participation in other activities (e.g. evening classes and women's group meetings) - open horizons through radio, TV and internet
Improved biomass (supply and conversion technology)	<ul style="list-style-type: none"> - improved health through better stoves - less time and effort in gathering and carrying firewood 	<ul style="list-style-type: none"> - more time for productive activities - lower cost of process heat for income generating activities 	<ul style="list-style-type: none"> - control of natural forests in community forestry management frameworks
Mechanical	<ul style="list-style-type: none"> - milling and grinding - transport and portering of water and crops 	<ul style="list-style-type: none"> - increases variety of enterprises 	<ul style="list-style-type: none"> - transport: allowing access to commercial and social/political opportunities

The table does not however answer the question as to what women themselves want in terms of their fuel type and its acquisition. Do women want to continue to use wood/charcoal, albeit with more efficient stoves, because it fits with their traditions – in which case, what kind of improvements are needed - or would they prefer to use gas (biogas or LPG) or electricity because they value the convenience? Would rural women pay for wood (good quality, regular supply, in quantities that matched cash flow) if it relieved them of the burden of collection and freed them to participate in income generation, community activities, or to devote more time to their families? The answers to these types of questions are important for the formulation of policies that address women's strategic needs, and research is necessary to find the answers in a variety of contexts.

If gender aspects of the energy-poverty nexus are to be adequately dealt with, it is clear that two major transformations have to take place. Firstly, women have to be empowered to make choices about energy. Enabling choice is linked to issues of sustainable livelihoods and poverty alleviation, including access to income generating activities. However, there is more

at stake than just improvements in women's financial resources. Women should be able to act upon the energy choices open to them, and their scope for this type of action is linked to decision-making within households. Such a shift in decision-making requires women's social and political empowerment.

Secondly, it also requires changes on the energy supply-side. It will require responsiveness by the energy sector in the provision of equipment using modern energy forms that reduce the drudgery of much of women's labour, and that at affordable prices. The challenge to the energy profession is evident.

7. Energy and sustainable livelihoods – opportunities and constraints

One aspect of sustainable livelihoods is access to reasonable levels of income. In rural areas, this can be achieved in a number of ways: for example, through increasing the level of farm output, improving product quality, and paying fairer prices directly to farmers. However, as was noted earlier, the number of people who can be directly supported by farming is limited, and there is a need to stimulate new employment opportunities in rural areas. Energy is recognised as a critical factor in many farming and income generating activities (for example, charcoal making is itself an income generating activity). However, the processes and structures which enable better access to energy, as well as the linkages with other factors in the production process, have not been extensively researched in the context of sustainable livelihoods.

“The energy use of both women and men needs to be better understood. Men and women often have different energy needs, as do people of different classes, locations, and so on. Disaggregation is the key, but don't focus on gender to the exclusion of commonsense”

“.... it may be because very few direct information materials are available in gender and energy sector.”

“Indeed, a better understanding of gender implications of energy use is needed and energy planners and other stakeholders should be convinced that gender issues need to be integrated in the process. On the other hand: don't overdo things!”

Consultation responses DFID Project CNTR998521

A large part of the energy input in agricultural production in developing countries is in the form of human and animal labour (also known as animate energy). In a number of ways relying on this energy form limits output, and mechanisation (substituting for animate energy by mechanical energy) can contribute to improving production and food security. Irrigation through

pumped water is one of the most widespread end-use applications of non-animate energy promoted in development programmes.⁷ Crop processing (which often involves the substitution of animate energy by mechanical energy) and storage (refrigeration) can lead to better quality products and to higher cash returns, leading to reduced vulnerability and increased food security.

As was observed earlier, many farming households have already diversified their livelihood strategies, and in rural areas there are already a number of small-scale enterprises. Some enterprises are linked to agriculture, for example, leather working, food processing and textiles; while others are not, for example services such as shops and bars, and brick making. Almost all, however, use energy in some form. Many are seasonal activities, producing primarily for the household's own consumption with any excess for sale. There is no doubt

⁷ Not always with positive results, e.g. due to salination of land.

that many of these enterprises could be made more efficient and their sustainability could be improved, not least by reliable and improved forms of energy.

The role of energy as an input factor in small business sustainability is a particularly under-researched area. What constraining role does energy play in the sustainability of small-scale enterprises? The use of stand-alone renewable energy systems such as biomass, wind, solar, and small-scale hydro is being increasingly promoted in response to the high delivery costs of modern energy forms to rural areas⁸. Most of the focus in the 1990s was on the provision of electricity, most notably in the form of photovoltaic systems for electric lighting in

The introduction of Solar Home Systems in rural areas of some developing countries was approached as a technical and managerial exercise and not as part of an integrated development process.
Consultation responses DFID Project CNTR998521

households, usually for consumptive rather than productive uses (van Campen et al., 2000). As noted above, existing businesses rely largely on animate and biomass energy. The opportunities for the substitution of animate energy (and a reduction in drudgery) and fossil fuels with renewable sources of energy, or for improving biomass energy efficiency (with its associated environmental benefits), have hardly been explored⁹.

Electricity is not the best form of energy for meeting every need. As noted, it is not the cheapest means of cooking, and it can have a low efficiency in providing process heat for many production processes. Thus, biomass is likely to remain the main energy carrier for these types of applications. However, there has been little investment in modern and efficient small-scale biomass conversion technologies, and there has been very little support for the promotion of such technologies in energy programmes, although there are a number of NGOs working in this area (see for example, Tedd et al., 2001). Moreover, attempts to ensure sustainability of biomass supply (for example, sustainable forest management by communities) are in their infancy and have hardly been evaluated, although this type of participatory environmental management itself offers major opportunities for income generation and livelihoods diversification, as well as fuel provision and environmental protection.

Rural people are probably hardly aware of the possibilities of modern energy carriers as substitutes for existing energy sources, or of the potential that these sources open up. What is known is that rural people place a high priority on electricity, but primarily for lighting and entertainment, for example radio and television; and it appears that they do not see the opportunities for making productive use of electricity, with the exception of irrigation. In Nepal, by the early 1980s, 28 district headquarters had been electrified by stand-alone systems. Ten years later, it was found that none of these supplies were being used for productive purposes, except for one photocopier (Aitken et al., 1991). Whether this was due to other shortages, such as skilled labour, entrepreneurship, transport and markets, has not been determined (Clancy and Hulscher, 1994).

A further opportunity for diversifying rural economic livelihoods is in the business of providing energy services to rural people. There is little known about the constraints entrepreneurs face in starting up such enterprises, but the need for local energy suppliers (e.g. solar powered battery charging, microhydro installations with mini-grids) and the need for agents who can supply, install and repair the energy hardware is evident. The state is not

⁸ See, for example, the Village Power Conferences: <http://www.rsvp.nrel.gov/vpconference/vpconference.html>; Turkenburg, 2000.

⁹ The Global Environmental Facility and FAO recently held a workshop devoted to this issue (see van Campen et al., 2000)

equipped to undertake this kind of activity at the local level, so until a cadre of small scale, essentially self-supporting, local technicians and business people is in place in rural areas, it is hard to imagine how any serious changes can take place in the nature and quality of energy provision for the majority of the population.

8. Gender, Energy, Poverty, and Sustainable Livelihoods

In most developing countries, the majority of informal sector enterprises are owned and operated by women, with women making up the largest proportion of the work force. Despite this, the contribution of women entrepreneurs to national economies is not explicit in national statistics, leading to the development of policies that do not deal with the specific barriers faced by women linked to their gender-defined roles. Their enterprises tend to be concentrated in a relatively narrow range of activities: beer brewing, knitting, dressmaking, crocheting, cane work and retail trading. These activities tend to have disproportionately low rates of return compared to the activities undertaken by men. However, despite the low financial returns, women's enterprises provide important sources of household income, even in male-headed households. Women-headed enterprises are frequently located in the home, and these "cottage industries" tend to be overlooked by agencies because they are in the informal sector, which is diffuse and difficult to reach. When women are forced to close their enterprises, it is often for non-business reasons, and linked to factors associated with working from home. The low rates of return prevent inward investment, hindering innovation and expansion which are regarded as key factors in enterprise sustainability (Grosh and Somolekae, 1996). There is little research to explain what forces drive these start-ups and shutdowns, and how gender influences these processes. Women's access to resources (such as credit, land and education, which are recognised as key factors in microenterprise development) is significantly less than that of men. Generally, research in small and medium-scale enterprise sustainability indicates that a lack of working capital is one of the two most common causes of enterprise failure (Grosh and Somolekae, 1996). Although there are a number of microcredit programmes targeting women, Bangladesh's Grameen Bank being the most well known, research is increasingly questioning whether women are able to fully utilise the credit, and what degree of control they retain over the loans once disbursed (Baden et al., 1994). Women's access to decision-making within the household and community is also restricted, reducing their ability to influence processes and resource allocation. Given the disproportionate number of poor women in rural areas, research which takes into account gender aspects of the transformation of structures and processes could make a significant contribution to the development of gender-equitable sustainable livelihoods.

The role of energy in the sustainability of women's enterprises is also not well understood. In food processing enterprises it has been estimated that energy costs are 20 - 25% of the total inputs, which would suggest that technological interventions could increase the scale and profitability of these businesses. Box 1 gives some examples of how energy can act as an opportunity or a constraint on women's productive activities.

The types of enterprises that women are traditionally involved in are energy intensive and rely on biomass fuels. Even in rural areas, women may have to buy fuelwood to run enterprises such as beer making (McCall, 2001). An important issue is what sort of mechanisms can assist women in gaining access to improved energy services. Grain mills, which are very popular with women, since they improve product quality as well as reducing women's labour, are typically only provided by the private sector, and are still absent in many rural locations. A much more systematic approach is needed, possibly with some form of incentive to

encourage the spread of mills to areas not yet served. A general rule that can be learnt from attempts to introduce technology for women is that if it does not reduce the labour in household tasks then, no matter how beneficial the technology, it is likely to have low acceptance. A further lesson is that if women do not control decision-making over household purchases, and do not have access to credit, then there will be limited take up.

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

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

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

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

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

There are positive examples of women taking up energy technologies that have contributed to increasing their incomes. For example, women's groups in Ghana use LPG for fish preservation, giving them a better quality product than when using wood, and enabling them to reach export standards, considerably improving their income (Mensah, 2001). Another example is the Multi-Functional Platform (Burn and Coche, 2001). The platform consists of a diesel engine mounted on a chassis to which a variety of end-use equipment can be attached, such as grain mills, battery chargers, oil presses, welding machines and carpentry tools. In addition, the engine can be used to generate electricity for sale, which opens up the prospect of women becoming energy entrepreneurs and setting up their own electricity service companies. Platforms have been installed in 80 Malian villages, and there are plans to extend the project to other African countries.

Women may in fact be ideal candidates to become energy entrepreneurs, as has been argued

by Batliwala and Reddy (1996). Madhu Sarin's work in India has indicated that improved stove programmes run by women tend to be rather successful because they are able to more easily approach their clients (Sarin, 1984). However, energy entrepreneurship could extend beyond stoves to include energy services, for example the supply of, and even the repair of, modern energy appliances such as solar panels. There is an enormous need for agents in rural areas who can distribute such equipment on a commercial basis, albeit with some support in the short term. Women who live in rural areas know and understand local circumstances and needs, and may have a much clearer idea about the energy services that rural people want. In addition, a woman may be able to sell more effectively to other women, since access to female clients is not hindered by social constraints. This may in fact be the best route to greater women's participation in energy choice.

However, as noted earlier, the extent to which electricity can contribute significantly to poverty alleviation is not clear. Many women's income-generating activities are based around process heat, for which end-use electricity is not a realistic option. Where electricity is available in rural areas, it is mainly used for lighting, which can extend evening working hours with both positive and negative effects. More research needs to be done into what use is actually made of the lighting and electricity. A common fear expressed by development workers is that electricity may add to the burden of a woman's working day. There are mixed findings on this. A study into the socioeconomic impacts of rural electrification in Namibia showed that women did stay up later than men, not working but socialising. (Wamukonya and Davis, 1999). In addition, if as a result of improved lighting, women themselves choose to work longer hours to increase their own income, this could be seen as an indicator of empowerment rather than as a loss of welfare.

9. Conclusions – the way ahead

A basic conclusion of this paper is that the energy dimensions, both of the poverty-gender nexus and the livelihoods analysis, have been poorly understood and, hence, their significance underestimated. It is also worth noting here that gender analytical tools and frameworks that are in standard use in the agriculture, health and water sectors (the Harvard Matrix, Gender Analysis Matrix etc.) are hardly used in energy planning. This is partly because these tools do not fully meet the needs of energy planners, focusing on general aspects of women and men's relative situations, rather than on the specific energy dimensions of poverty. To an extent the existing gender tools can be adapted to the energy sector to bring to light hidden aspects of the poverty-energy-gender nexus, but there is a clear need to develop tools specific to the energy sector to ensure that all aspects are analysed. These gender and energy tools need to be 'user friendly' to help social planners incorporate energy dimensions in their work, and energy planners to see the gender and poverty aspects of theirs.

A number of relationships between energy, poverty and gender are clear. The poor, in general, pay more for energy than the rich, certainly in relative terms but also often in absolute terms. Those living in poverty cannot afford the upfront cash for appliances which increase the efficiency of fuel use, or enable the transition from traditional energy to modern energy. The options for poor people are in fact very limited indeed, a situation which has been called *energy poverty*. Biomass fuels (wood, charcoal, dung etc.) are likely to remain for some time the primary fuels for process heat and cooking because electricity is in almost all situations more expensive for such applications. Other options, such as solar cookers and household biogas systems, have not been able to meet the demand for cooking energy,

probably because they require significant changes to cooking practices or are too expensive. Consequently, alternatives to biomass have not achieved widespread use, especially through commercial channels. The supply of biomass resides in the informal sector, which contributes to its 'invisibility' in formal statistics. Biomass supply is usually beyond the influence and control of energy sector professionals. The lack of visibility plus divided ministerial responsibility leads to minimal interest and investment at the national and donor level. Coherent policy is desperately needed, not least to achieve sustainable biomass fuel supply. In addition, equipment for improved small-scale combustion of biomass fuels has had hardly any support. There have been some improved stove programmes, although these have had very mixed levels of success. Interest in household energy seems to have declined. The situation with improved biomass technologies for the kinds of small-scale industries that are run by poor, rural and urban people is worse.

This paper set out to examine the question as to whether we have the energy to meet gender concerns in development, which has been interpreted here to mean: does energy meet women's practical, productive and strategic needs? Women living in poverty are particularly badly served by the energy forms they are using at present: the burden of fuelwood collection and the detrimental health effects of cooking over smoky fires are well known. However, the impacts of poor quality fuels and energy scarcity extend beyond cooking; for instance, they increase vulnerability and threaten wellbeing. It is well known that increasing energy availability can bring improvements to vulnerable households; for example, health improvements through smokeless stoves and increased time available to women for income generation. However, the form in which energy is provided needs to be taken into account; for example, mechanical energy may be useful for transport and grain milling, and electricity for lighting small enterprises. The evidence for the contribution energy can make to meeting women's strategic needs is only now beginning to emerge; for example, electricity creates safer streets at night, enabling women to attend meetings, participate in education classes, gain a feeling of self-worth and link to the outside world through access to television. We have the energy in a variety of forms and there is a reasonable choice of technologies. The challenge then becomes, to enable women to access this energy with its associated conversion equipment for meeting all aspects of their needs, as well as contributing to their empowerment. More involvement of women in the energy sector would make a significant difference in meeting the challenge. Involvement needs to be at different levels, not only in terms of the decision making about energy choices in the household, but also as active agents, such as energy entrepreneurs and as managers of forests for sustainable biomass fuel supply.

The supply of energy to meet gender needs requires an approach to energy planning that focuses on *energy services*, that is to say on a comprehensive demand-side analysis of all the energy needs of poor people to support all their livelihood functions, taking into account their particular constraints and opportunities. This approach would be better than the current supply-side approach that simply takes as its starting point the provision of modern energy carriers such as electricity, petroleum or gas, or of equipment of a particular type (solar technology, biogas).

Whilst the commitment to energy for meeting the Millennium Development goals at the recent World Summit on Sustainable Development is to be welcomed, a considerable amount of policy is made on the basis of assumptions rather than on microlevel evidence on the benefits of access to energy services by the poor. An example of a typical myth is "electric lighting improves educational performance and life chances". The truth is that we simply do

not know whether electricity really leads to greater educational success¹⁰. A number of other questions have also been raised throughout this paper concerning the impacts of energy and the potential/feasibility of improving the situation in terms of sustainability. In particular, in order to build up a body of evidence, the following areas of the gender-energy-poverty nexus, within a sustainable livelihoods framework, need attention and further research:

- Comparative studies of women's strategic energy needs.
- The role of energy in women's productive needs, and the extent to which energy provision has been a stimulus to women's small-scale enterprises.
- The processes by which women are enabled to become energy entrepreneurs.
- A more holistic approach to the analysis of the impacts of biomass collection and use on women's health, including the physical effects of carrying such heavy loads.
- The effects of the privatisation and commercialisation of energy services on enabling people to move out of poverty.
- The processes and structures which would enable better access to energy, as well as the linkages with other factors in the production process that can lead to more gender-equitable sustainable livelihoods.
- Impact assessments of community forest management in meeting women's strategic needs and livelihoods diversification, as well as fuel provision and environmental protection.
- The impact of access to improved (in terms of quality and reliability) lighting and electricity on the livelihoods of women and men.
- New, more appropriate, analytic and data gathering tools for practical use in the field that bring out the energy dimensions of gender and poverty issues.
- Comparative studies of the urban gender-energy-poverty nexus linked to livelihood strategies.

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¹⁰ DFID KaR project R8020 aims to examine the available evidence and so resolve this issue (Downing, 2002).

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