Enabling urban poor livelihoods policy making: understanding the role of energy services

DFID KaR PROJECT R8348

Synthesis Report

Revised March 2006

This report has been prepared by:
Joy Clancy, Department of Technology and Sustainable Development[1],
University of Twente, The Netherlands
Adriana Alvarez, Winrock International, Brazil
Olu Maduka, Friends of the Environment, Nigeria
Feri Lumampao, APPROTECH, the Philippines.

[1] Formerly part of the Technology and Development Group

Table of Contents

Acknowledgments

The authors of this report would like to thank the UK's Department for International Development (DFID) for the funding to carry out the research reported here.

Two other DFID Knowledge and Research Projects allowed us to participate in their own project workshops where we received constructive feedback on our research (ENERGIA - Joy Clancy and Feri Lumampao; Sheilah Miekel from the DPU, London – Joy Clancy).

The comments from the anonymous reviewer on behalf of DFID helped us sharpen this report.

Finally, we are indebted to the communities where we carried out the fieldwork for sharing their daily realities with us. We hope that by providing us with these insights it will lead to a better energy future for them and the other low-income urban communities.

Acronyms

DFID	Department for International Development
ENERGIA	International Network on Gender and Sustainable Energy
ESMAP	The Energy Sector Management Programme (World Bank)
ITDG	Intermediate Technology Development Group
KaR	Knowledge and Research
LPG	Liquid Propane Gas
NGO	Non-Governmental Organisation
SULF	Sustainable Urban Livelihoods Framework

Glossary

Energy carrier	The form (for example, LPG, biomass fuels, batteries, electricity) in which energy is delivered to the end-user.
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.
Useful energy	The form of energy for the end user to provide the desired energy services (for example, light, sound, heat, mechanical energy). Useful energy is usually requires a further conversion from an energy carrier.

Enabling urban poor livelihoods policy making: understanding the role of energy services

DFID KaR PROJECT R8348

Synthesis Report

Executive summary

Introduction
Energy has both a direct and indirect impact on the livelihoods of the poor. Whilst there is a significant body of knowledge on how energy affects the rural poor, relatively little research has been undertaken into the relationship between energy and the livelihoods of the urban poor. Empirical data on the urban poor and energy is lacking and much policy making is based on assumption that the urban poor have better access than the rural poor to clean forms of energy (such as LPG and electricity) with their more efficient conversion technologies.

The Goal of the research project *Enabling urban poor livelihoods policy making: understanding the role of energy services* reported here is to contribute to reaching the Millennium Development Goal of, between 1990 and 2015, halve population whose income is less than one dollar a day

The purpose of the project is to provide a clear understanding, based on micro-level gender disaggregated data, of the issues around urban energy supply and use for poor people's livelihood strategies.

The specific objectives of the research are:

- To determine the role of energy services in enterprise viability and the influence on household livelihoods.
- To analyse the role of social networks and relations in facilitating household livelihoods.
- To analyse the impact of energy sector reforms on access by enterprises to energy services.

The overall outcome of the research is to formulate policy recommendations for the delivery of energy services that positively influence enterprise development and sustainable livelihoods.

Methodology
Empirical data was collected from low-income areas in three countries: Nigeria (Lagos and Abuja), the Philippines (Manila and Marikina) and Brazil (Salvador). The three countries have a number of similarities which would help in generalisation. All three countries have recently experienced economic crises which have increased the number of people in urban areas relying on informal sector enterprises. They are countries with large urban populations living in big cities. Privatisation in the energy sector had already started in the Philippines and Brazil and Nigeria was beginning

the process when the research was started. There was no evidence, at the time the project proposal was written, of analysis of the micro-level impact of these policies in these countries. Nor do the energy policies specifically take into account the needs of the urban poor.

The study did not set out to be comparative but efforts were made to ensure that comparable data was collected (based on a modified Livelihoods Framework). Data collection involved surveys, analysis of secondary data, focus group discussions and interviews with key informants. A review of the available international literature on energy and urban livelihoods was also made.

The research used as its starting point the livelihoods framework. Energy is seen as enabling asset within the framework for reducing the drudgery, saving the time and improving the livelihood strategies. However, whether men and women benefit equally from improving access to energy is not clear. Therefore, an analysis of the energy-gender-poverty linkages needs to be explored within the livelihoods framework. Unfortunately, such an analysis would require a large amount of data which would not have been possible to collect and analyse within the scope of the project. Therefore, the study focused on the enterprises of low-income urban groups, in particular the linkages between energy in enterprises and household members' well-being and productivity. The low-income groups were not the "poorest of the poor" – since, in the opinion of the team, there is no doubt that providing people in this group with energy services will lead to improvements in their livelihoods. Instead, the focus was on those groups which have the capacity to be entrepreneurs or improve their entrepreneurial status since it was considered that here might be possible to have an indication of the role of energy in enterprise viability. The term "viability" was chosen in place of "sustainability" since the latter has an implicit time dimension whereas the reality in the informal sector is that enterprises are often not in continuous operation but entrepreneurs "dip-in and dip-out" as need arises. Therefore, to this type of entrepreneur, energy must not be a barrier to re-start. However, the term "viability" does not preclude "sustainability".

The enterprise sectors covered were: fish processing, cassava processing, akara processing and pottery *(*Nigeria); food and beverage; hairdresser and seamstress/tailor (Brazil); food processing and preparation (household) and shoe making (the Philippines). There is good gender balance in ownership of the enterprises selected.

It was decided that the multiple dimensions of the energy-poverty-gender nexus within the livelihoods framework could be adequately explored by the use of four hypotheses:

1. Clean and affordable energy services are key factors in creating good physical well-being and productivity of urban household members (*human and financial assets)*.
2. Social networks and relationships facilitate access to urban energy services (*social assets*).
3. Energy services are key factors in the sustainable urban livelihoods by increasing the viability of existing enterprises and enabling the establishment of new ones (*physical and financial assets*).
4. Energy sector reforms lead to improved access by urban enterprises to

energy services (*livelihoods context)*.

For each hypothesis, a number of broad indicators have been formulated which determined the data that needed to be collected (Box 1). These indicators were formulated in such a way as to capture as many aspects of the gender-energy-poverty nexus as feasible.

Box 1: Indicators for testing the four hypotheses

Hypothesis 1

- Smoke in the household (qualitative)
- Meals (quantity and type)
- Water potability/sanitation
- Health
- Working days
- Perceptions of well-being and productivity
- Flow of money at the household level (linked to hypothesis 2 and 3)

Hypothesis 2

- Energy services and equipment available
- Involvement in CBOs and NGOs
- Membership of formal associations and clubs
- Information flows about energy services.
- Ability to invest in energy services/technologies
- Decision making within the household/enterprise.

Hypothesis 3

- Energy services and equipment available
  - Physical forms (quantity; reliability; variety)
  - Price
  - Repairs (timely; spare parts availability)
- Demand driven
  - Visibility of service providers
  - Consultation
- End User perceptions of services
- Service providers perceptions of the end-users (low priority for service continuity)

Hypothesis 4

- New policies in place
  - Price driven
  - Cost recovery
  - Tariff reform
  - Regulators established
- New suppliers enter the market.
- State institutions (Central, state, local) perceptions of end-users (linked to 1 and 3)
- Quality of services
- Exclusion/disconnection of enterprises
- Expansion of service delivery
  - Area covered
  - Types of services
  - Local technicians and agents
- Financing mechanisms to enable access to energy services

In Nigeria, data was collected through questionnaires from four poor urban communities in Lagos and Abuja (two from each city). A total sample size of 598 households and 147 enterprises were interviewed. The study population has been selected using multi stage sampling design. In the Philippines, stratified purposive sampling was used to identify two barangays[2] in the six districts of the city of Manila where the population is mainly engaged in entrepreneurial activities related to food and food preservation, with an earning of at least 2 dollars a day. This resulted in a sample size of 600 respondents from the six districts for a more general qualitative questionnaire related to energy and livelihoods with 60 respondents from the sample being selected for focus groups to provide qualitative data. In Marinka, the process was repeated in four barangays with 100 respondents from each barangay (400 respondents in total) for the quantitative questionnaire. Ten respondents from each barangay were selected (40 respondents in total) for the focus group discussions. In Brazil, the number of households surveyed was 259 in Plataforma and 255 in Canabrava. In addition, interviews were conducted with key community members, case studies of 25 small enterprises[3] in each community were made, and two focus group discussions, one in each community, were held.

Results

Testing the hypotheses

Hypothesis 1 Clean and affordable energy services are key factors in creating good physical well-being and productivity of household members.

The results related to hypothesis one are generally supportive of the proposition, although they do not provide a definitive correlation. However, energy price increases are beginning to be felt by households and the consequences of this remain speculative. In the Philippines in 2004, electricity and LPG bills were taking around 15% of low-income household budgets. According to government figures, the real income of the poorest 30% shrank by 6% between 2000 and 2003. Households and enterprises are adopting coping strategies to reduce energy consumption. As part of these strategies, there is a worrying sign that households are economising on cooking as a direct relation to energy costs (22% of households in the Philippines survey). In the communities surveyed in this study, no negative health impacts can be directly attributed to energy use. This should not be taken as sign for complacency but that the situation should be monitored and that the effects on health, and on whose health within the household, need more detailed and specific research.

Water quality is a significant issue for our communities and the need for boiling water in this context is an important household activity. In Nigeria, 46.8% of respondents considered water quality more important than continuity of supply (24.4%). Similar sentiments were expressed in focus group interviews in the Philippines. Households would appear to see water quality rather than food intake as the key to good health. If households need to economise on energy, it is not unreasonable to surmise that boiling water will be the last economy. Therefore, decision makers should see reduction of cooking, not only as a negative transition in itself (if this equates to a

[2] A *barangay* is the smallest unit of government in the Philippines.

[3] Since the household survey identified only 14 family-run small enterprises in Plataforma and 20 in Canabrava, local leaders were asked to indicate additional enterprises for the case studies.

reduction in daily calorie intake) but also as the possible step towards a set of serious health issues. A reduction in meals cooked can be seen as an indicator that households are becoming vulnerable. It should be stressed that no evidence was found in the surveys that a reduction in boiling water as actually occurring. However, we believe the consequences of not boiling water can be seen in Brazil where there appears to be a link between drinking unboiled tap water and parasitic infections. Those reporting infections were 13.9% of respondents in Plataforma and 17.3% in Canabrava and those drinking untreated tap water were 12.8% in Platforma and 25.9% in Canabrava.[4]

The lack of transition to better quality fuels in both households and enterprises, particularly in Nigeria, means that there is no real reduction in drudgery, above all for women.

Hypothesis 2 Social networks and relationships facilitate access to energy services.
In terms of the formal energy sector organisations[5], the evidence to support this hypothesis is negative, while at least in Nigeria, the evidence from non-energy sector organisations[6] would support the hypothesis. In Brazil and the Philippines, organisations, which were meant to be informing communities about targeted programmes, were failing to deliver the necessary information to the intended beneficiaries. Only 14% of respondents in Manila were aware of the Department of Energy's Energy Conservation Committee which is specifically designated for helping with energy problems.

Membership of organisations appears to be low. In the Philippines, very few (17 respondents) even belong to cooperatives that could strengthen their bargaining power over access to electricity. Decision makers should find the reasons cited for non-participation in organisations by respondents in the Philippines instructive: time constraints and fear of additional expenses. Participation in community organisations here is for reasons of solidarity and friendship. In this context, the findings from Nigeria are enlightening where access to energy services has been found through faith-based organisations. In Nigeria, religious organisations play a very important role in community life providing access to many services. Eleven households reported obtaining an electrical connection through a Christian organisation and eight through a Muslim organisation compared to four through a business association. This finding raises the question of trust in members of an organisation. Trust can be assumed high in faith-based organisations which was clearly lacking in the community organisation for one of the surveyed urban settlement in Brazil. Decision makers should take this as a signal to use a broad range of organisations for energy programmes, not necessarily the most obvious.

Not surprisingly in communities where literacy is likely to be an issue, the radio and TV can form useful channels of communication. In Nigeria, 23 percent of the respondents report TV as their main source of information, followed by the radio (18%) and newspapers (5%). It is a cause for concern that campaigns targeted at

[4] No causality is claimed here but it is suggested that this is a topic that warrants further investigation.
[5] Government departments and agencies, private and public energy services companies, and NGOs.
[6] Community organisations, schools, enterprise branch organisations and the media.

the poor to inform them of benefits directed at them do not seem to be making the most effective use of the media for getting the message across (at least in the countries surveyed). In the Brazil, more than half of the households in the sample in this study, despite being eligible, were not aware of schemes to benefit low-income households with electricity and gas bills.

Low-income urban residents do seem to use their networks to take advantage of informal (sometimes illegal) energy service providers. In the Brazil survey, around one third of respondents were prepared to admit to using non-professionals for their electrical connections or servicing. One should not rush to be judgemental on those taking this route. Many low-income households are forced to use this route because of bureaucratic obstacles to registering or qualifying for energy services.

In the two higher income countries, there appears to be a more gender equitable decision making in households about gender and energy issues. However, in Nigeria, it is still men who make the decisions about energy forms and gadgets used in the household. 226 households[7] reported the man made the decision about the fuel, 63 the woman and in only 22 was it a joint decision. Given the close connection between household energy and urban informal sector enterprises, means that any decisions made about household energy also impact on women's enterprises. If women are to have access to modern energy services, decision makers should keep in mind that as well as developing mechanisms to assist women, men also need to be convinced of the benefits.

Hypothesis 3 Energy services are key factors in the sustainable livelihoods by increasing the viability of existing enterprises and enabling the establishment of new ones.
The evidence from our surveys would support the hypothesis.

LPG and electricity are the main sources of energy for the enterprises surveyed in this study in Brazil and the Philippines (48% use LPG and 16.5% electricity). Kerosene is also significant in the Philippines (22.5%). In Nigeria, since process heat is necessary for the enterprises surveyed, wood, charcoal and kerosene are the main fuels used by the enterprises. Despite Nigeria being a major oil refiner, the use of LPG is severely restricted. Only five enterprises reported using LPG.

The availability of electricity in urban areas of the Philippines and Brazil has certainly led to the proliferation of services industries, such as clothes washing, ironing, hair-dressing and dress making. It could therefore be concluded that women in low-income households have been able to benefit from access to electricity by an increase in income generating opportunities. On the negative side, women continue to be trapped in occupations related to housekeeping skills which tend to be low paid.

It should be kept in mind that the equipment being used in many of these enterprises is probably second hand and not energy efficient. Therefore, the action by the electricity utility in Brazil, where it sent conservation teams to households to look for energy conservation opportunities, such as replacing old rubber seals around

[7] This is totalled across all households (married and unmarried with male or female head).

refrigerator doors can be seen as an example of best practice creating a win-win situation for utility and client.

The most serious finding relates to the effects of the recent oil price rises on the viability of enterprises. In the three countries, all fuels have suffered from significant prices increases both directly and indirectly from transport costs. There do not appear to be any cost benefits accruing to low-income users from the deregulation policies in the energy sector (discussed in more detail under hypothesis 4). In Brazil, the cost of LPG cylinders has increased 550% between 1994 and 2004 which is three times the rate of inflation. The cost of the LPG cylinder represents 5-10% of household monthly income, however, people do not appear to be switching back to wood and charcoal although they are resorting to other fuel saving strategies.

There do appear to be improvements in electricity supply stability although consumer confidence is not 100% with enterprises who are highly dependent on electricity keeping stand-by generators. In Nigeria, 44 households in our survey had stand-by generators. While there does not appear to be any sign of a downward fuel transition, there are other, worrying signs in the informal sector linked to fuel price rises. There are signs from focus group discussions in the Philippines of staff retrenchment to reduce costs and hindering of expansion. In Nigeria, the increase in fuelwood price has hindered the expansion of businesses (94 enterprises in our survey reported this problem). Given that the informal sector is a significant employer, these trends should be monitored.

There are mixed approaches to customer-client relations. The LPG delivery by the private sector seems to work well and it responds to consumer demand, for example, by providing different sizes of cylinder. The government in the Philippines has also respond well to consumer pressure for regulation in the LPG market. The electricity sector (at least in the three countries surveyed) does not seem to feel the need to engage with its client base. There is some resentment about the price increases which has the negative effect of making otherwise law-abiding citizens turn a blind-eye to illegal connections. Electricity utilities might consider the carrot rather than stick approach of the LPG sector and work with communities. This might be a more efficient way to encourage more consumers to become legal and in turn boost utility income.

Hypothesis 4 Energy sector reforms lead to improved access by enterprises to energy services.

Deregulation is underway in both the oil and electricity sectors in the three countries. The hypothesis has been confirmed for the oil sector in Brazil and the Philippines but not for electricity in any of the three countries (although it may be too early to judge in Nigeria). The concern for electricity is that the number of connections has probably gone down due to strong action to reduce illegal connections. It is disappointing that utilities have not attempted to find ways of converting these illegal clients into legal ones and so boosting income rather than focusing on reducing looses, thereby creating a win-win situation for consumer and supplier. There needs to be attempts to increase competition in the electricity supply market which might encourage the establishment of ESCOs or cooperatives willing to work in low-income communities.

It is still early days in the deregulation process but it is clear that the regulatory commissions need to find a balance between all parties and resist pressure from the more powerful groups at the expense of the low-income households. The regulator in the Philippines petroleum sector is an example of best practice in supporting low-income consumers, while maintaining the credibility of the industry. In the past, the electricity utility in Brazil has also carried out energy conservation activities that benefit the low-income households and enterprises.

Key findings

1. There is a strong linkage between household energy and informal sector enterprises particularly those owned and operated by women since many such enterprises are located in the household. Therefore, measures designed to support household access to clean energy can also benefit enterprises.

2. While energy market liberalisation seems to have brought increased availability of petroleum fuels for low-income groups, the benefits in terms of electricity availability have yet to be realised. Utilities appear to be concentrating on dealing with illegal connections in a punitive way instead of developing creative policy of converting the illegal into legal consumers. We would wish to stress that increased availability is not the same as increased access. Price rises have clearly proved a significant barrier for converting availability into access.

3. Prices rises of petroleum fuels have had different effects on consumer behaviour depending on the length of use of those fuels. In Brazil, where fuelwood is no longer found in urban areas, there is no apparent transition down the fuel ladder. In the Philippines, where low-income consumers have strong rural links and access to fuelwood and charcoal, there is sign of a downward transition. In Nigeria where petroleum fuels are not generally used the oil price rises are blocking an upward transition from fuelwood.

4. Energy price rises are affecting the viability of informal sector enterprises. A disturbing aspect has been noted in the Philippines were employees are reported (during focus group discussions) as being laid off as an economy measure in response to energy prices. There are also reports of businesses being closed because of price rises. Other entrepreneurs are reducing the quality of inputs and business expansions are being put on hold.

5. The cost of transport has risen significantly due to petroleum price rises. This has had a direct effect on low-income households reducing their mobility in search of work and leisure. Their enterprises are also affected since transport prices also increase input costs and restrict travelling for selling products.

6. General support to enterprises, not necessarily specific energy programmes, can lead to enterprises adopting modern energy, as was seen the Nigerian pottery sector and the Philippines micro-finance institutions. However, the nature of informal enterprises, for example, lack of legal registration and small turn over, can be a barrier to taking up micro-credit.

7. Informal food vendors have key role in urban poor's lives both as providing a livelihood strategy and as having an influence on health of poor people who are increasingly using the sources as a coping strategy for reducing household cooking demands. In this context, the flavour imparted by the fuel used to cook food can be a barrier to the transition to modern, cleaner fuels.

Enabling urban poor livelihoods policy making: understanding the role of energy services

DFID KaR PROJECT R8348

Synthesis Report

1 Introduction

1.1 Background

Energy has both a direct and indirect impact on the livelihoods of the poor. Whilst there is a significant body of knowledge on how energy affects the rural poor, relatively little research has been undertaken into the relationship between energy and the livelihoods of the urban poor. Existing research exploring urban household energy use has mainly taken a sectoral focus and not examined the links with household income generation, neglected gender aspects (particularly at the intra-household level) and the strategies poor urban households use to develop livelihoods, nor has it reflected the outcomes of privatisation and commercialisation in the energy sector on energy services for the poor.

Empirical data on the urban poor and energy is lacking and much policymaking is based on assumption. For example, commercial (modern) energy carriers[8], such as LPG and electricity, are more readily available in urban than rural areas and so it is *assumed*, that the urban poor have better access than the rural poor to the benefits these cleaner forms of energy with their more efficient conversion technologies. This lack of understanding is of serious concern since urban poverty is considered to be increasing as a consequence of job growth lagging behind natural population growth, continued urban migration by the rural poor and loss of employment through structural adjustment policies.

The role of energy services in the livelihoods of the urban poor is not specifically reflected in energy policy. Karekezi and Marjoro (2004) consider that energy policy in the South is aimed at developing modern energy infrastructure that largely serves the needs of the urban-based formal industrial and commercial sectors and the medium- and high-income urban households. This approach is in turn supported by international development aid. If the assumption is that the urban poor are able to benefit from access to cleaner forms of energy is *incorrect* then energy policy, and by extension, international development assistance, has a serious gap which will potentially not improve.

This is the background of the research project, funded under the DFID

[8] An energy carrier is the form (LPG, biomass fuels, batteries, electricity) in which energy is delivered to the end-user. The energy carrier will need further conversion to useful energy (light, sound, heat, mechanical energy). An energy carrier has usually been processed or converted from an energy source (such as coal, wood, oil).

Knowledge and Research (KaR) Programme call in 2002, reported here.

1.2 Goal, Purpose and Output of Project

The Goal of the research project *Enabling urban poor livelihoods policy making: understanding the role of energy services* is to contribute to reaching the Millennium Development Goal of, between 1990 and 2015, halving the population whose income is less than one dollar a day

The purpose of the project is to provide a clear understanding, based on micro-level gender disaggregated data, of the issues around urban energy supply and use for poor people's livelihood strategies.

The specific objectives of the research are:

- To determine the role of energy services in enterprise viability and the influence on household livelihoods.
- To analyse the role of social networks and relations in facilitating household livelihoods.
- To analyse the impact of energy sector reforms on access by enterprises to energy services.

The overall outcome of the research is to formulate policy recommendations for the delivery of energy services that positively influence enterprise development and sustainable livelihoods.

1.3 Aim and structure of report

The aim of the report is to provide a synthesis of the results from the three country studies and the literature review. All documents from the project are available on a website specifically created for the project:
www.urbanenergy.utwente.nl

The report is divided into four sections. Following the introduction is an explanation of the methodology followed in the study. A summary of the existing knowledge about energy and urban livelihoods is presented in section three. This is followed by an analysis of the data and a testing of the four hypotheses used to provide a framework to the study. The report finishes with a summary of the key findings. Recommendations from the three individual country studies can be found in Appendix 6.

2 Methodology

2.1 Background

There is little empirical data on urban livelihoods and energy. The study set out to make a contribution to this knowledge gap by providing empirical data from three countries: Nigeria, the Philippines and Brazil. Such a selection, spanning three continents, aimed to give a more comprehensive, universal picture of energy and urban livelihoods. It will enable the identification of parameters which appear to be generic and those which have a cultural context.

The three countries have a number of similarities which would help in generalisation. All three countries have recently experienced economic crises which have increased the number of people in urban areas relying on informal sector enterprises. They are countries with large urban populations living in big cities. Privatisation in the energy sector had already started in the Philippines and Brazil and Nigeria was beginning the process when the research was started. There was no evidence, at the time the project proposal was written, of analysis of the micro-level impact of these policies in these countries. Nor do the energy policies specifically take into account the needs of the urban poor. Therefore, the research findings also make an important contribution to knowledge at the national level about the current local situation as regards energy and the urban poor which can in turn help to identifying policy gaps.

2.2 Approach

The research team consisted of three national teams with an international coordinator. The national teams were responsible for the collection and analysis of the data which was presented in three country reports.

The study did not set out to be comparative but efforts were made to ensure that comparable data was collected and in this respect, the Livelihoods Framework proved particularly helpful. A planning workshop was held with the country team leaders and the study co-ordinator to define the boundaries of the study (Appendix 2). This was followed by a training workshop in the Netherlands for the three national researchers responsible for data collection and analysis. A mid-term review meeting between the country team leaders and the coordinator was held to evaluate the data collection process.

As part of the output partners were asked to develop dissemination strategies, including holding consultation workshops to disseminate their findings to key stakeholders both at the national and international level. All reports have been made available on a website dedicated to the project[9]. A special issue of ENERGIA[10] News also forms part of the project output[11].

The international coordinator also reviewed the available international literature on energy and urban livelihoods (see Clancy, 2004). The research findings have been collated into this report and a briefing note.[12]

---

9 http://www.urbanenergy.utwente.nl/

10 ENERGIA is the international network on gender and sustainable energy.

11 Published mid-2006 and available from the ENERGIA website: http://www.energia.org

12 A list of project outputs can be found in Appendix 3.

2.3 Framework, scope, hypotheses and indicators

The research used as its starting point the livelihoods framework. The usefulness of the sustainable urban livelihoods framework for analysing urban poverty and energy relationships had already been demonstrated in an earlier DFID KaR funded research project on urban livelihoods and energy (Future Energy Solutions et al., 2002). It should also be recognised that the approach is not without its critics. For example, Murray (2001) considers that the vulnerability context can be underestimated while Kanji (2000) observes that an over-reliance on the log frame and quantitative indicators can lead to gender-equality issues being neglected. The role of energy within the livelihoods framework is a good illustration of this point. Energy is seen as enabling asset for reducing the drudgery, saving the time and improving the livelihood strategies. However, whether the men and women benefit equally from improving access to energy is not clear.

The proposal for the research reported here contained an analysis of the energy-gender-poverty linkages that could be explored within the livelihoods framework (see Appendix 4). At the inception workshop, the team reviewed these linkages and it appeared that such an analysis would require a large amount of data which would not be possible to collect and analyse within the scope of the project. The research team therefore took a number of decisions about the focus of the research.

The study focused on the enterprises of low-income urban groups, in particular the linkages between energy in enterprises and household members' well-being and productivity. The low-income groups were not the "poorest of the poor" – since, in the opinion of the team, there is no doubt that providing people in this group with energy services will lead to improvements in their livelihoods. Instead, the focus was on those groups which have the capacity to be entrepreneurs or improve their entrepreneurial status since it was considered that here might be possible to have an indication of the role of energy in enterprise viability. The term "viability" was chosen in place of "sustainability" since the latter has an implicit time dimension whereas the reality in the informal sector is that enterprises are often not in continuous operation but entrepreneurs "dip-in and dip-out" as need arises. Therefore, to this type of entrepreneur, energy must not be a barrier to re-start. However, term "viability" does not preclude "sustainability".

The enterprise sectors covered were: fish processing, cassava processing, akara (bean pastry) frying and pottery (Nigeria); street vendors, bakeries/small markets (Brazil); food processing and preparation (household) and shoe making (the Philippines). There is good gender balance in ownership of the enterprises selected.

The research team decided that the multiple dimensions of the energy-poverty-gender nexus with the livelihoods framework could be adequately covered by the use of four hypotheses:

1. Clean and affordable energy services are key factors in creating good physical well-being and productivity of urban household members.
2. Social networks and relationships facilitate access to urban energy services.
3. Energy services are key factors in the sustainable urban livelihoods by increasing the viability of existing enterprises and enabling the establishment of new ones.
4. Energy sector reforms lead to improved access by urban enterprises to energy services.

The arguments for the formulation of these hypotheses are as follows: Both the type of energy used in enterprises and households and the services energy can help supply (such as clean drinking water either through pumping or boiling) influence the health of household members. Health is itself an important factor in people's productivity (*human and financial assets*). (Hypothesis 1)

Moser (1996 quoted in Meikle, Ramasut, and Walker, 2001) has stressed the importance of social capital for many households in coping with economic crises. The role of enterprises in households coping with economic crisis is not contested although the significance of the role of energy within these enterprises is not well understood (*physical and financial assets*) (Hypothesis 3). However, since many of the informal sector enterprises use energy it can be reasonably surmised that access to a reliable energy supply will be important at least in letting the enterprise function. What would appear not have been previously researched is the role of that social capital plays in facilitating access to energy services. Therefore, the research team set out to map how social networks and relationships in urban communities helped in access to energy services (*social assets*) (Hypothesis 2). This component of the research can be considered to be innovative. The context in which people live is particularly important in the sustainability of livelihoods. The two most significant contextual factors common to the three study regions are the economic crises and the reforms in the energy sector. The former has contributed to the increase in the urban poor while the latter has promised to contribute to the solution by improving energy services. Hypothesis 4 specifically tests this assumption (*livelihoods context*).

For each hypothesis, a number of broad indicators have been formulated which determined the data that needed to be collected (see Box 1 and Appendix 5 for an explanation behind the thinking of these indicators). These indicators build on an earlier set of indictors in a scoping study for DFID KaR carried out in Ghana, Indonesia and China[13]. The aim within this study was to develop indicators that were independent of location and could be used for comparative purposes. They aimed to be comprehensive without providing unmanageable quantities of data. The indicators within this study fall within the categories proposed by Drake (2001).

[13] Future Energy Solutions et al (2002) Energy, Poverty and Sustainable Urban Livelihoods. DFID KaR R7661.

Box 1: Indicators for testing the four hypotheses

Hypothesis 1

- Smoke in the household (qualitative)
- Meals (quantity and type)
- Water potability/sanitation
- Health
- Working days
- Perceptions of well-being and productivity
- Flow of money at the household level (linked to hypothesis 2 and 3)

Hypothesis 2

- Energy services and equipment available
- Involvement in CBOs and NGOs
- Membership of formal associations and clubs
- Information flows about energy services.
- Ability to invest in energy services/technologies
- Decision making within the household/enterprise.

Hypothesis 3

- Energy services and equipment available
  - Physical forms (quantity; reliability; variety)
  - Price
  - Repairs (timely; spare parts availability)
- Demand driven
  - Visibility of service providers
  - Consultation
- End User perceptions of services
- Service providers perceptions of the end-users (low priority for service continuity)

Hypothesis 4

- New policies in place
  - Price driven
  - Cost recovery
  - Tariff reform
  - Regulators established
- New suppliers enter the market.
- State institutions (Central, state, local) perceptions of end-users (linked to 1 and 3)
- Quality of services
- Exclusion/disconnection of enterprises
- Expansion of service delivery
  - Area covered
  - Types of services
  - Local technicians and agents
- Financing mechanisms to enable access to energy services

2.4 Data gathering

Data collected used both quantitative and qualitative techniques to present a holistic picture of urban livelihoods and the role energy plays in enabling people to move out of poverty. Quantitative data was collected through stratified sampling in representative urban areas (see Box 2) using structured questionnaires (to answer 'what' questions). Qualitative data was gathered using participatory techniques (to answer 'why' questions). A variety of tools was used to provide triangulation and to explore different aspects of women and men's livelihoods and the energy linkages. Semi-structured interviews with

key stakeholders and secondary documentary sources provided supporting information and explanatory data. Each partner developed their own questionnaire in-line with the indicators. The questionnaires were moderated at a review meeting in which all partners participated.

When sampling for data collection, attempts were made to reflect the complexity of households in urban areas where more than one social grouping of people can be living under one roof, the composition of which can vary according to marital status (single, married, widow(er) and divorced/separated), ethnicity and age (Diyamett et al., 2001). In Nigeria, data was collected through questionnaires from four poor urban communities in Lagos and Abuja (two from each city). A total sample size of 598 households and 147 enterprises were interviewed. The study population has been selected using multi stage sampling design. A sensitisation visit was made to the communities prior to administering the questionnaire which was tested using a pilot survey of 40 respondents. In the Philippines, stratified purposive sampling was used to identify two barangays[14] in the six districts of the city of Manila where the population is mainly engaged in entrepreneurial activities related to food and food preservation, with an earning of at least 2 dollars a day. This resulted in a sample size of 600 respondents from the six districts for a more general qualitative questionnaire related to energy and livelihoods with 60 respondents from the sample being selected for focus groups to provide qualitative data. In Marinka, the process was repeated in four barangays with 100 respondents from each barangay (400 respondents in total) for the quantitative questionnaire. Ten respondents from each barangay were selected (40 respondents in total) for the focus group discussions. The questionnaires were validated using feedback in two meetings with enumerators. In Brazil, the number of households surveyed was 259 in Plataforma and 255 in Canabrava. The households were identified from a transect walk, in which every 10th household in a street was selected for interview. The questionnaires were pre-tested in 12 households and 8 enterprises. In addition, interviews were conducted with key people, case studies of 25 small enterprises[15] in each community were made, and two focus group discussions, one in each community, were held.

The enterprises surveyed reflected the different circumstances within partner countries although food processing was a business common to all three. Enterprises in Brazil were food processing, sewing and hairdressing and they were not the main source of household income. These type of businesses were selected because of they are numerous in the communities surveyed, they are energy intensive and they have gender balance. In the Philippines, the enterprises were either the main household income (particularly in Marinka where businesses focus around leather shoes and bags mainly for export) or they were side businesses of office workers. In Manila, enterprises related to some aspect of food production and sale were the focus of the interviews since this represented the activity of more than 50% of households surveyed. In

[14] A *barangay* is the smallest unit of government in the Philippines.

[15] Since the household survey identified only 14 family-run small enterprises in Plataforma and 20 in Canabrava, local leaders were asked to indicate additional enterprises for the case studies.

Nigeria, the enterprises were the main source of household income and mainly carried out by women (fish harvesting/smoking and cassava processing in Lagos; pottery and akara (bean pastry) frying by street food vendors in Abuja).

It should also be kept in mind that the results presented are based to a significant extent on respondents' perceptions of their circumstances. While scientifically this raises questions about validity, for policy makers it reflects much closer the way that voters feel about their policies.

Data cleaning and editing were done manually and by computer to eliminate errors. Quantitative data was analysed using the Statistical Package for Social Sciences (SPSS) and the qualitative data were analysed with QSR.

A small number of key informant interviews were held and secondary data was also collected, particularly in relation to energy policy.

Box 2: Location of data collection sites

Brazil

Salvador, the state capital of Bahia, was chosen because of the city's importance within the context of both Northeast and Brazil. Salvador is a large city – both in terms of territorial extension and population – and urban poverty can easily be compared with other large centres in Brazil. There are high levels of social inequality where many people live in *favelas* scattered in several neighbourhoods throughout the city, thus occupying a large highly densely populated area. Two communities were studied: *Plataforma* and *Canabrava*. *Plataforma*, one of the largest areas of *Subúrbio Ferroviário* a neighbourhood located on the periphery of Salvador. *Plataforma* is an old community which grew up around a textile factory founded in the mid-1800s. The factory closed in 1959 since when the residents of *Plataforma* have had to try to find work in other locations. The establishment of regular bus routes into the city centre has been a significant factor in opening up employment opportunities. This study focused on part of the original settlement covering an area with around 10,000 inhabitants. In contrast to Plataforma, the population of *Canabrava* is relatively new to the area, a significant portion of it having arrived in May, 1977, after eviction from another neighbourhood. There are currently an estimated 6,000 inhabitants in this district. A major problem for the community is that it is located near a city garbage dump which has been linked to a number of health problems experienced by residents.

Nigeria

Lagos and Abuja, the commercial capital and administrative capital respectively of Nigeria were chosen for the study. While Lagos is the old capital and a mega-city with different categories of urban poor, Abuja became the capital city in 1991 and has only recently gained an urban poor of significant size. Four communities were survey: Ijaje and Amukoko in Lagos and Kwali and Karmo in Abuja. Ilaje is a fishing community and food processing is a major income source. Amukoko is a mixed community where for women trading and food processing are important income generating activities. The Abuja communities are peri-urban, where farming is still a major income source and women have food processing and trading as their main enterprise activity.

The Philippines

Metro Manila is composed of seven (7) cities with a population of over 12 million. Manila City is the present capital of the country. Marikina City is considered the shoe capital of the country.

Eighty (80) percent of the population in Metro Manila are considered poor. More than half of this population live in socialized housing subdivisions and resettlement areas. Many of the residents are micro-entrepreneurs, who are involved in the underground or informal economy. These entrepreneurs supported the economy during the 1998 financial crisis and the economic slump in 2000 until now. Most of these entrepreneurs are women and home-based workers.

3 International perspectives on urban livelihoods, poverty and energy[16]

3.1 Introduction

Whilst there is a significant body of knowledge on how energy affects the rural poor, relatively little research has been undertaken into the relationship between energy and the livelihoods of the urban poor (Future Energy Solutions and the Development Planning Unit, 2002). Existing research exploring urban household energy use has mainly taken a sectoral focus and not examined the links with household income generation, neglected gender aspects (particularly at the intra-household level) and the strategies poor urban households use to develop livelihoods, nor has it reflected the outcomes of privatisation and commercialisation in the energy sector on energy services for the poor. This section gives a brief review of the available literature and a more extended version formed an output of this project[17].

3.2 Energy Use Patterns in poor urban households

The two dominant end-uses for energy in urban households are cooking and lighting and in cold climates, space heating becomes significant[18]. Households, irrespective of income, use a mix of fuels for both end-uses, although the fuel of preference does vary with household income. Lower-income households rely on biomass fuels[19] (or coal in some countries, such as China and South Africa), whereas higher-income households will opt for electricity and LPG (Hosier and Kipondya, 1993; Future Energy Solutions and Development Planning Unit, 2002). Kerosene is used both as a cooking and lighting fuel, although electricity is the preferred option for lighting.

Urban size is also found to influence the use of traditional and modern fuels. A survey in Pakistan reported that 93% of households in towns of under 25,000 people depended on woodfuels for cooking and heating, 65 to 75% in medium sized cities and in the large cities (more than 250,000 inhabitants) the figure dropped to 25% (Government of Pakistan (1982) quoted in Leach and Mearns (1988).

Electricity access in urban areas is better than in rural areas. However, there are still substantial portions of urban households and enterprises without access to electricity. For example, even in South Africa where there is a progressive government policy in place to increase electricity access by the poor, around 30% of urban households are still waiting to be connected (ITDG, 1998). Some poor urban communities manage to get connected through a

16 This section is a summary of the paper *Urban poor livelihoods: Understanding the role of energy services* prepared as part of KaR R8348 (Clancy, 2004).

17 Clancy, J.S., (2004), *Urban poor livelihoods: Understanding the role of energy services*.

18 However, in low-income households the cost of a separate appliance for space heating becomes a barrier and households tend to rely on the cooking stove to supply the heat (Banks, 1999).

19 Wood, charcoal, agricultural residues and dung.

combination of illegal hook-ups and private generators (Schutyser, 2003).

The available evidence suggests that urban poor people buy their fuel although there is little quantitative data on the use of non-purchased (scavenged) fuels, although qualitative evidence suggests that this source is not without its risks (Doig, 1998). At the beginning of the 1990s, the World Bank carried out a global survey of 45 cities and 20,000 households when it was found that poor urban households spend a significant portion of their cash incomes on energy (15 to 22%) (Barnes,1995). The poor were found to often pay higher prices for energy than more wealthy households. This was attributed in part to the heat content of the fuels used and the conversion efficiency of the technologies influencing the amount of useful energy produced. The poor often continue to rely on biomass and kerosene for cooking whereas the rich use LPG and electricity. The failure for the poor to switch to LPG has been attributed to the high up front costs associated with the purchase of the cylinder and stoves. However, this might only be part of the problem if the findings from research in rural India can also be applied in urban areas. Work by Sinha[20] in India has found that even under schemes where the poor have facilitated access to overcome these up-front costs the cylinder falls into disuse due to the high cost of refilling the cylinder.

In a detailed household survey in three cities (Dar es Salaam, Mbeya and Shinyanga) in Tanzania, it was found that women-headed households use a higher average percentage of income than that of men-headed households for purchasing energy (Hosier and Kipondya, 1993). The authors attributed this difference to women-headed households having lower incomes than men-headed households, rather than using more energy. The implication of such a finding is that women-headed households will suffer more than men-headed households will from rapid energy price rises.

Hosier and Kipondya (1993) found that household energy use responds to price and availability, with the patterns of use distorted by subsidies (the issue of subsidies is discussed in Section 3.3.1). It is not only the availability of the fuel but also of appropriate appliances which influence the fuel used. Hosier and Kipondya considered that the greater number of households using kerosene in Dar es Salaam (the largest city and port) compared to the number in the other two cities could in part be attributed to the greater availability of kerosene stoves and lamps. Likewise, an increase in cooking with electricity which occurred during a specific three year period could be linked to the removal of import duties on electric stoves. The unreliability of supply was considered a significant barrier to more households not switching to LPG, and the cause of a number stopping using it. On the other hand, charcoal was used as the main cooking fuel because of its reliability. An example of the private supplier satisfier customer needs while the public supplier falling short (despite the social equity aspect of energy policy in operation in Tanzania at that time). Inefficiencies in public supply can also lead to the development of black markets which raise the price of fuel and limit access to those on low-incomes (for example, kerosene in India). In Peru, competitive private distribution of

[20] Unpublished PhD research.

fuels has increased the number of outlets and lead to greater access by all households (Doig, 1998).

Another example of the way in which availability influencing the type of fuel used is that in some urban areas it is possible for households to gather fuelwood. In the Tanzania survey referred to above, low-income households in Mbeya were able to find sufficient fuelwood that it significantly altered the household fuel purchase profile compared to the other two urban centres. Leach and Mearns (1988) consider that "free" wood obtained from a variety of sources, such as timber yards, discarded packaging and the urban hinterland, is an important energy source for low-income households but one ignored by many energy planners. Time constraints and the availability of transport are the limiting factors in access to these sources.

However, is the type of fuel used by households merely a question of price and availability, essentially economic arguments, or are there more complex issues involved? Hosier and Kipondya (1993) estimated, at the time of the survey electricity was the cheapest fuel for cooking (even when taking into account the cost of appliances and conversion efficiencies) yet connected households (which were usually in the higher income groups) were not showing a significant switch to using a cleaner and safer fuel for cooking. Two non-economic alternative explanations are also possible – one relates to cooking practices and the other to intra-household decision making. Long, slow simmering is required to cook two staples in Tanzania (ugali and beans) – without the use of specialised cookers (e.g. slow cooker) the heat out put with electric cookers is difficult to regulate and takes time to learn the skill. One also needs a degree of confidence in the supply reliability to commit ones basic food to be cooked using electricity. Women (the cooks) may actively choose not to use an energy form they find impractical. For example, Leach and Mearns (1988) quote a World Bank study in Niger which found that despite cooking being cheaper with kerosene than wood, wood was still the preferred fuel. Three reasons were cited: (i) the power output of the kerosene stove was significantly less than the traditional woodfire and so cooking took longer; (ii) the kerosene stove did not support the round-bottomed cooking pot used in the area and tended to overbalance during the frequent stirring necessary with staple local foods; and (iii) the kerosene stoves were not robust. Kerosene stoves were used for rapid cooking and water boiling, while wood and charcoal were used for staples.

A second alternative explanation for not switching to modern fuels for cooking would rest on the fact that all households have to make choices about expenditures. While many economists tend to see households as a homogeneous entity making rational choices based only on price, social scientists, based on gender analysis, consider this not to be the case. 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 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). In some households, recreational equipment, such as TVs and radios, was bought before labour-saving equipment for domestic chores (Makan, 1995).

3.3 Fuel Switching and energy efficiency

Encouraging households and enterprises to switch from poor quality fuels, such as wood and coal, has a number of benefits both at the macro- and micro-levels. At the micro-level, switching results in positive outcomes for the household: health gains (less indoor air pollution), time saving (from more convenient fuels) and cost savings (more efficient fuels). At the macro-level, there are environmental benefits to be gained from a reduction in woodfuel use through a reduction in deforestation and coal from contributions to greenhouse gases.

Promoting energy efficiency can be an alternative to switching in which households and enterprises while continuing to use the same fuel use more energy efficient technologies or improved management systems (such as servicing equipment). The macro- and micro-level benefits will be similar although possibly not of the same order.

Section 3.3.1 begins by looking at the factors operating at the micro-level which influence fuel switching while section 3.3.2 reviews some of the evidence of the effects that the controversial policy instrument, subsidies, has on fuel switching and 3.3.3 looks at the energy sector reforms.

3.3.1 Factors affecting fuel switching

Fuel switching can be tracked by reference to the energy ladder which is a concept used to rank fuels based on consumer preference for efficiency (with associated cost and time components) and cleanliness. Each rung on the ladder corresponds to the most commonly used fuel by a particular income group for a specific energy service. For example, for cooking, wood, dung and other biomass fuels are on the bottom rung, with charcoal, coal and kerosene on intermediate rungs, and LPG and electricity on the highest rungs (see Figure 1). As one moves up the rungs of the ladder, that is switches fuel, the energy released as useful energy increases while the emission of particulates and other combustion by-products decreases (Reddy, 2000). The energy ladder concept is based loosely on the economic theory of household behaviour and the assumption that modern fuels (electricity and gas) are normal economic goods and the traditional fuels (such as wood and residues) are inferior goods (Hosier and Kipondya, 1993). If this is the case then it can be expected that as household income increases they will switch from relying on traditional fuels to modern fuels. By extension, higher income households will make greater use of modern fuels than low-income households do.

This was clearly the finding of a comprehensive survey in Hyderabad, India on urban energy use (ESMAP, 1999). A substantial shift was found to have occurred in household energy use: poor households have moved from wood to kerosene and LPG while the middle-class has moved to LPG reducing their

competition with the poor for kerosene. It should be noted that this was over a twenty-year period which is a recommendation for the collection of time series data to track transitions. The decline in fuelwood use in the city has been linked to a significant decrease in deforestation in the surrounding peri-urban and rural areas.

Figure 1 Urban Fuel Preferences and Constraints
Source: Leach and Mearns (1988)

"IDEAL" GOALS	**Clean to use. Delivered to user. No storage. Versatile: e.g. good control of heat output. High efficiency holds down costs.**			
Fuel preference "ladder"		**Barriers to climbing the ladder**		
		Equipment Costs	**Fuel payments**	**Access**
ELECTRICITY		**Very high**	**Lumpy**	**Restricted**
Δ				
BOTTLED GAS (NATURAL GAS)		**High**	**Lumpy**	**Often restricted, bulky to transport**
Δ				
KEROSENE		**Medium-high**	**Small**	**Often restricted in low-income areas**
Δ				
CHARCOAL (may be higher in some cultures)		**Medium**	**Small**	**Good: dispersed markets and reliable supplies**
Δ				
FIREWOOD Δ CROP RESIDUES ANIMAL WASSTES	**Possible conversion to high-grade energy forms (e.g. biogas, electricity)**	**Low/zero**	**Small or zero**	**Good: dispersed markets and reliable supplies. Can usually be gathered "free"**

Leach and Mearns (1988) concluded, based on survey work in Dar es Salaam, that fuel price was not the single determining factor in encouraging fuel switching, unless the price difference is “very large”. They considered that there were two driving forces of fuel switching:

1. access to dependable supplies of modern fuels in sufficient quantities

2. sufficient income to invest in equipment to use modern fuels.

Both are poverty related issues. The second issue is directly related to household income while the first is indirectly related. The lack of purchasing power gives an impression of lack of demand, as well as other factors such as house quality, which would stimulate improvements in modern energy distribution systems.

If it is the cost of equipment rather than fuel that is the barrier to fuel switching, then different strategies are needed, in which case fuel switching can be stimulated by providing credit for equipment purchase. However, equipment costs are not the only up-front costs that can act as a barrier to fuel switching. The failure for the poor to switch to LPG has been attributed to the high up front costs associated with the purchase of the cylinder and stoves (von Molthe, McKee and Morgan, 2004). As one moves up the cooking energy ladder the cost of the conversion equipment increases, although with the exception of electricity, the equipment costs are negligible when spread over their lifetime.

However, upfront costs might only be part of the problem if the findings from research in rural India can also be applied in urban areas. Work by Sinha has found that even under schemes where the poor have facilitated access to overcome these up-front costs the cylinder falls into disuse due to the high cost of refilling the cylinder[21]. Hosier and Kipondya (1993) found cylinder availability also a barrier to fuel switching.

The switch to electricity is hindered by high initial connection charges, the high cost of wiring and high standing charges. Utilities are often deterred from providing a service where there are doubts about legal tenure of property and where the dwelling is also not considered of a permanent construction. Many low-income households would fall into one or both of these categories.

There are also non-financial factors which influence fuel switching. The insubstantial fabric of many low-income housing renders them more vulnerable to theft which can deter people from investing in equipment that is easily portable. The nature of the stove can also be a deterrent to fuel switching or at least making the total transition (see Section 3.2). Urban households seem to often retain a mixture of fuels, not only to safeguard against supply uncertainties, but to match cooking styles and time constraints. In Dar es Salaam, urban households with LPG and electricity tend to use these energy forms for breakfast and for hot drinks in the evening when time saving was a particularly evening and to use charcoal for cooking other meals (Leach and Mearns, 1988).

The energy transition within households reflects individual circumstances as well as events in the wider economy. For example, there are fears that energy sector reforms seem to be promoting a downward transition. However, it can be concluded that even in urban areas, there is no smooth transition up the energy ladder, with the fuel from the low-rung being abandoned in favour of the more efficient, cleaner fuel. More complex factors are in play. Households

[21] S. Sinha, unpublished PhD research, University of Twente.

retain the capacity to use a mixture of fuels for different needs and switch between the fuels as circumstances dictate. Complex management decisions are made balancing preferences and cooking habits with flexibility (influence by access and availability) and time constraints.

As was indicated in Section 3.2, gender relations in the household may also play a role in decisions related to fuel switching. This is a little explored area in urban energy.

Understanding the motivations for households making the transition up the ladder have been the subject of much discussion. Such an understanding gives the key to developing appropriate mechanisms for stimulating fuel switch. If the motivation is non-economic (linked to preference or availability) the mechanisms have to concentrate on issues such as improved distribution services of the next fuel on the ladder rather than fuel-efficient stoves of the current rung. If the cost of energy services is the dominant factor in influencing fuel choice, then fuel efficient stoves are likely to be more attractive to consumers. However, it would appear that motivations are mixed and therefore it can be concluded that a mixture of financial and non-financial mechanisms will be needed.

One of the most common mechanisms for promoting fuel switching is the use of subsidies. This mechanism has been the subject of much debate and hence is discussed in more detail in next section.

3.3.2 Subsidies

The role and effect of energy subsidies is hotly contested. Various arguments are advanced against subsidies, for example, that they distort markets or that they can lead to the development of “inappropriate” technology or the continued use of an out-dated technology. Subsidies can become a considerable drain on the economy. For example, in 2002, the cost of oil subsidies to the Indonesia Treasury was US$ 4 billion, which represented 10% of government spending (von Molthe, McKee and Morgan, 2004). However, subsidies were considered an essential factor in encouraging switching from charcoal to LPG in urban Senegal. Although some authors consider that this switching would have taken place as part of the urbanisation of households and that the subsidies merely speeded-up the process (von Molthe, McKee and Morgan, 2004). The cost of subsidies then has to be offset against the environmental benefits of allowing the regeneration and further protection of natural forests as a result of decreased charcoal production. Although there is little quantitative evidence about the impact of the significant reduction in charcoal use, there is a general perception in Senegal that there has been a positive impact on the forests (Denton, 2002).

It is commonly argued that blanket subsidies on fuels should be removed since middle- and better-off households are considered to reap a disproportionate share of the benefits (see for example Barnes, 1995). However, this is not a universal finding. In urban Zambia, poor urban households have managed to capture the bulk of the kerosene subsidy (87%) (Kalumiana, 2002).

Targeting, for example through ration cards, is an approach that avoids blanket subsides. However, this has not been a successful strategy for reaching poor households, since retailers can divert fuels to more profitable outlets, as for example happened in Ecuador where kerosene intended as poor households cooking fuel was diverted to the transport sector. In India, subsidised kerosene is diverted to the black market in areas where supply outstrips demand[22]. However, there are positive examples of subsidies, for example, in Thailand the "lifeline rates" for enabling access by poor households to electricity ensure that they can enjoy the benefits of a higher quality light provided by electricity instead of candles and kerosene, the favoured options of the poor, which are also fire hazards (Barnes, 1995). Indeed Hosier and Kipondya (1993) considered that in urban Tanzania there would have been no fuel switching without subsidies.

The impact of subsidies and incentives on urban poor household energy use formed part of a recent major study of energy services for the urban poor in East and Southern Africa (Mapako and Dube, 2002). The study has focused primarily on commercial modern forms of energy and not looked at biomass. Subsidies were found not to be decisive for the affordability of energy by the urban poor but the removal of subsidies would impact more on the poor than on the non-poor. Other factors such as upfront costs, proximity and availability of energy sources were found to be more decisive in creating a barrier to access.

It would appear that thinking on subsidies has moved on from the "all subsidies are bad" opinion to the use of so-called "smart subsidies" opinion. Funds should be targeted at specific groups rather than blanket and should be used to cover up-front costs rather than consumption costs. While this would certainly help with access to an electricity connection and LPG cylinder, there is a need for creative mechanisms to ensure continued access to the fuel.

3.4 Privatisation and Commercialisation of the Energy sector

Privatisation and commercialisation of energy services have been advocated on the grounds of economic efficiency. The assumption is that the changes in ownership and management will lead to technological advances, as well as institutional and financial innovations, in providing energy services, which will also benefit the poor. There is little empirical evidence, particularly at the micro-level on the impacts of the reforms and as to whether or not the urban poor are benefiting from improved services. Most research to date has focused on electricity sector reforms (World Bank, 2000).

There are positive results reported in Bolivia of high levels of access by low-income households to electricity following the privatisation of the utilities (Barja and Urquiola, 2001). In urban areas, there was more than 95% access in the lowest income quantile. However, prior to privatisation, there was already an 86% access rate for this quantile. Other evidence is not so positive.

Privatisation has generally been matched by price increases. Table 1 gives

[22] S. Sinha, Unpublished PhD research, University of Twente.

data for the petroleum sector in Nigeria where the government is pursuing a privatisation policy. Price rises do produce a fuel transition but for the poor this appears in general to be downwards. Increase in electricity tariffs lead to a significant loss of revenue by utilities through increased theft. For example, in Bahia State, Brazil, 11% of electricity distributed in 2004 went to illegal connections (Andrade, 2004). Not all electricity used through illegal connections is done so with the explicit compliance of the end-user. Research in Ghana found poor urban households were the victims of deception with unscrupulous fellow residents making illegal connections but collecting the payments with the impression that the money was being passed to the utility (Bannister, 2002). There are also concerns that the deregulation of energy markets has not been matched by a policy framework in which social objectives, such as equitable access, can be safeguarded (Maduka, 2004).

Table 1

Prices per litre of Petroleum products in Nigeria (1990-2004)

Products	1990	1991	1993	1994	1998	2000	2002	2002	2003	2004
Gasoline	0.51	0.6	3.25	11	20	22	42.50	32/34	40.23	42.80
Diesel	0.35	0.5	3.0	9	19	8	42.00	32	38/39	40.50
Kerosene	0.15	0.4	2.75	6	17	19	32.00	32	32/53	41.25
Fuel oil	0.30	0.5	2.75	9	12.40	230	230	230	275	275

SOURCE: NNPC (Nigeria National Petroleum Corporation) (quoted in Maduka, 2004)
All prices are in naira ($1 = 130 naira; exchange rate January 2004).

A desk study of urban household energy use in Pakistan, suggested that with improved fuelwood stoves savings of up to 38% of fuel bills were possible *(*Dasgupta, 1999*)*. A programme promoting fuel-efficient stoves in urban areas of Madagascar is reported as bringing annual fuel savings equivalent to the minimum monthly salary (approximately US$ 24) to households which adopt the stoves (Bazile, 2002). This level of savings should have a significant impact in low-income households and may be of the order that households can begin to accumulate assets.

3.5 Energy and Sustainable Urban Livelihoods

Perhaps surprisingly, there has been little attention to energy within the livelihoods framework in general, despite its acknowledgement as a key aspect of physical capital. Barnett has made an initial attempt to assess how energy can reduce peoples' vulnerability, although this is not specifically dealing with urban energy (Barnett, 2001).

A recently completed KaR research project which has examined the use of the Sustainable Urban Livelihoods Framework (SULF) for exploring the energy/

poverty linkages in poor urban households. This project has confirmed other work that poor households spend a large percentage of their income on energy (see Section 3.2). The study also examined how households respond to energy shocks and found that in order to stay as a family unit, households adopt a number of strategies to fulfil short-term objectives of ensuring sufficient food, fuel and clothing. Households have three options: (i) shift to using cheaper options, (ii) reduce overall energy consumption (iii) reduce non-energy expenditure (for example, children are withdrawn from school). The study found in Ghana, which had recently experienced significant energy price rises as well as other negative economic effects which made it more difficult for poor people to earn income, that which ever option a household adopted there were negative consequences for household assets (World Bank, 2000). People are eating less cooked meals (health), travel to home villages has become too expensive so less contact with family and kinship networks, and entertainment is reduced (quality of life). It was interesting to note that amongst the last assets to be abandoned is that of sending children to school. The study demonstrated one of the values in SULF is its ability to bring out cross-sectoral linkages.

Another example, of how decisions (even well meaning ones) in one sector can have negative outcomes for the urban poor and their access to energy is from Cairo where buildings need an official certificate to prove they meet certain standards. This measure was introduced in response to buildings collapsing as a result of poor construction. The building standards certificate is also required by the utility to connect homes to the electricity supply. Many poor people regard this certificate as too expensive. On the other hand, in some areas, communities have mobilised themselves and through credit associations were able to extend infrastructure to their homes (UNDP, 1999). There is no explanation of why these differences occurred.

3.6 Energy, Urban Enterprises and Poverty

The urban poor are largely dependent on small-scale enterprises for income, for example, street food vendors, small-scale manufacturing and repair services are common. The informal sector forms an important part of coping strategies and their numbers are on the increase. For example, in the Philippines, a large number of factories and small business closed due to the financial crises in Asia, and this has been accompanied by a five-fold increase in street food vendors over the past three years (Lumampao, personal communication). These enterprises are often using process heat and since they operate in commercial markets, they are vulnerable to shocks from energy price rises.

Based on an extensive review of the literature, Meadows and her co-workers (Meadows et al., 2003) considered that the linkages between modern energy and micro-enterprises were:

a) Modern energy can, but does not necessarily, affect the emergence, development, productivity and efficiency of micro-enterprise.
b) While lack of access to modern energy is often characterised as a barrier to micro-enterprise development, removing this barrier (through, for example, energy developments such as electrification) does not necessarily result in

micro-enterprise development. Rather, modern energy should be viewed as one of a suite of critical enabling factors that act individually and/or in concert to create a suitable environment in which micro-enterprises can operate.

c) The linkages between modern energy and micro-enterprise, and the effects of the former on the latter, can have a gender-specific dimension (see Section 3.7).

"Health is the key to productivity among the poor" (Kabeer, 1994:146). The poor depend on their own metabolic energy to make a living. Good health is thus essential for moving people out of poverty. However, the links between good health and energy use in enterprises, or health in the household linked to sufficient quantities of energy to cook food or boil water seem to be unexplored.

Most of the literature reviewed would appear to be linked to the effects of rural electrification on enterprises in rural areas. It is not clear whether urban enterprises have their own specific characteristics, challenges and better access to modern energy services than rural enterprises.

The Intermediate Technology Development Group (ITDG), in Bangladesh, examined the role of energy in informal sector businesses, in particular the cooking aspects of street food vendors. They found that any improvement in household energy would improve the livelihoods of street food vendors since the production of food for sale is a family based activity and a large part of the food production takes place in the household (Tedd, 2001).

3.7 Gender, Energy and Urban Livelihoods

Evidence would suggest that household energy in urban areas primarily remains a woman's responsibility. Based on evidence from other urban livelihoods research (see for example, Beall and Kanji, 1999), this responsibility can be extended to the provision of services for the community which in the case of energy services would include electricity. Urban women also face similar inequalities to their rural sisters: low capabilities, low rewards in the labour market, exclusion through social stigma and discrimination, a lack of productive assets and resources (Amis, 2002). They are over-represented amongst the chronically poor (defined as those living in poverty for a considerable period of time).

Within the livelihoods framework, energy is seen as enabling asset for reducing the drudgery, saving the time and improving the livelihood strategies. However, whether the men and women benefit equally from improving access to energy is not clear. A desk study for DFID found that the urban gender-energy-poverty nexus is under researched (Clancy, Skutsch, and Batchelor, 2003) and there is a lack of empirical data (Barnett, 2001). It would appear that there is a gender division in the types of enterprises owned and operated by men and women. Women's enterprises tend to be home based and use process heat. If this is the case, women might benefit by access to clean modern fuels if they are substituting for the use of biomass in confined spaces.

Women's enterprise development is often advocated as a means for women's

empowerment. The role for energy in this context then becomes one of reducing drudgery and to extend the working day (providing more flexible hours of work combined with other household duties) or enable other opportunities such as education or relaxation. The study in Bangladesh referred to above (see Section 3.6) appears to be the only work to date which has explored gender and household energy issues in urban areas beyond health impacts. The study explored gender aspects in relation to income generation (women are able to control the production process and hence keep the profits generated, which it was concluded would lead to their empowerment) and recognised the need to involve women in technology selection due to their key role in the food preparation.

There have been concerned expressed about lengthening the working day for women by access to electric light, adding to rather than reducing their burdens. Women are well aware of this and women in man-headed households may not wish to increase their workload by becoming full scale entrepreneurs. Perhaps it is better to envisage women's empowerment enabling women to be able to act upon energy choices open to them and this is linked to decision-making within households. To enable such a transition often requires social and political changes.

3.8 Urban Energy Use and Environmental Impacts

A DFID KaR funded study of the environmental impacts of urban energy use found that the urban poor suffer disproportionately from the impacts of air pollution (Watkiss, undated). This is a consequence of the poor tending to live in areas with higher concentrations of roads and industry which are areas that higher income groups can avoid. However, where solid fuels are used for space heating, the indoor air pollution from this source can be of greater significance than from air traffic pollution for poor peoples' health.

The shift from fuelwood to kerosene in Hyderabad (see Section 3.3.1) has been accompanied by a shift to cooking indoors, into poorly ventilated rooms, which it is feared could increase the environmental health impacts on women and children. However, a positive environmental impact from the shift to kerosene, has been the reduction in deforestation in peri-urban and rural areas (ESMAP, 1999), although this might have a negative effect on rural livelihoods through loss of income from wood sales.

Improvements in energy efficiency in the industrial and commercial sectors could bring significant health improvements for workers and the surrounding low-income housing. A study by the Natural Resources Institute for DFID noted that the direct linkage between poverty and the commercial sector was difficult to explore due to a lack of data (Dasgupta, 1999).

4 Results

4.1 Testing the hypotheses

Hypothesis 1 Clean and affordable energy services are key factors in creating good physical well-being and productivity of household members.
In Brazil, it was difficult to test this hypothesis within the sample, due to the near universality of access to clean energy services (electricity and LPG cylinder) among households and small enterprises.

Health
It should be remembered that the findings presented are qualitative and have not been subject to rigorous testing. They should be taken as indicative of how the respondents perceive their health.

Interestingly in Brazil, were households and enterprises are generally using clean fuels, it emerged that at least in the households sampled, respondents reported ailments which are usually associated with "non-clean" energy sources – i.e., eye irritation, cough, sinus problems, and shortness of breath – among their major health complaints. Since the research is not an epidemiological study, it is not possible to give a correlated cause for these health effects. Outdoor air pollution is an unlikely cause since this is not registered as a major environmental problem in Salvador. Although the residents of Canabrava blame the nearby refuse dump, these illnesses were also reported in Plataforma. It is possible that these are residual long-term effects from the use of non-clean energy sources[23], or are symptoms linked to occupational diseases or are related to the asbestos roofs of the houses. However, it would require a more detailed analysis to make statements that are more definitive on the causes of the complaints.

In the Philippines, major illnesses entrepreneurs reported suffering from included hypertension, heart disease and stomach ulcers which are those illnesses usually associated with stress and unhealthy eating patterns. 70% of respondents reported an illness within the household within the twelve months prior to the interview. Coughs and colds are a general problem for all household members and employees and the most reported illnesses (just over half of those reporting an illness). Again, it is not possible to correlate coughs and fuel use. In Nigeria, malaria was the main health issue (376 respondents named malaria as the main health problem experienced by a household member in the previous three months compared to nine naming diarrhoea).

Although woodfuels were not used for household cooking in the three countries, kerosene was being used in the Philippines with stoves that emitted black soot which made the room, cooking utensils and other equipment dirty[24]. This is in sharp contrast to Brazil where LPG is used in nearly all households

[23] Jyoti Parikh (Executive Director, Integrated Research and Action for Development, New Delhi), personal communication.
[24] Based on observations by enumerators.

surveyed and kitchens and utensils were clean[25]. Enterprises in Nigeria were using woodfuels which produced a lot of smoke.

Water supply

In Nigeria and the Philippines, water quality was a major concern[26]. In Nigeria, the residents of the communities surveyed obtained their water from a variety of sources with less than 20% of households obtaining their water from a tap internal to the house or compound. Despite this diarrhoea is not reported as a major health concern, since people are able to treat the illness through easy access to appropriate medication (see above for data). Water quality was certainly considered more important than continuity of supply (46.8% of respondents compared to 24.4%). Kerosene was used for boiling drinking water as a preventative measure. In the Philippines, although the supply is piped, the utility is not always able to provide a continuous supply. When there are supply problems these are also linked to quality problems. During these periods, those who can afford it, buy bottled water (only two participants in the focus groups reported buying bottled water). Others will boil water, although this is expensive in terms of energy as well as being time consuming. During focus group discussions, women reported spending considerable amounts of time waiting for the household water requirement to trickle from taps.

In Brazil, water borne illnesses were generally considered to be linked to human waste disposal rather than poor quality of the supply. A sizeable portion of the surveyed population report suffering from parasitic worms (13.9% in Plataforma and 17.3% in Canabrava). A possible explanation is that a significant proportion drink untreated tap water, which is not potable. (The percentages show a reasonable match with reported worm infections to those drinking untreated tap water – 12.8% in Platforma and 25.9% in Canabrava)[27]. Boiling the tap water would help reduce infections. The local authority in Salvador is missing a win-win opportunity: anaerobic treatment of human waste offers a low cost option compared to the conventional aerobic treatment and generates a useful gas (hence renewable energy source) as a by-product! At the same time, the community's health improves.

Meals

The increase cost of energy has induced behavioural changes in respondents with regard to food preparation. In Brazil, energy management strategies such as pre-soaking beans (hence reducing cooking time) and/or using pressure cookers were reported during focus group discussions. In the Philippines, approximately one quarter of the households sampled, reported changing their food preparation techniques due to increases in energy costs, in some cases this can be as extreme as skipping breakfast (1%) while others resort to buying cooked foods (3.7%). In Nigeria, most of the households surveyed have reduced the number of times they cook to one or two times daily. Households resort to buying cooked food in part due to the high cost of energy, and in part because women work long hours outside of the household (potters, fish

[25] Based on observation by enumerators.

[26] Philippines data from focus group discussion.

[27] Causality is not proposed here but an indicative correlation that needs further epidemiological investigation.

smokers and cassava processors during focus group interviews were reporting working days of 12 to 14 hours, three days a week).

Perceptions of well-being and productivity

Good health was identified as a key aspect of well-being and linked to being able to work by more than 50% of respondents in the Brazil survey. Interestingly, money was not the highest priority for the respondents – around a quarter cited this as a factor of well-being despite nearly 50% reporting a lack/shortage of money as a current household problem. In the Philippines, people in focus group discussions report moving jobs for health reasons.

Working days

Working days had been taken as a direct indicator of health and as an indirect indicator of money flows in the households (days worked would indicate money earned and days lost due to sickness would represent a drain on household resources not only due to directly earned income but also the cost of medicines if purchased). The data however proved difficult to obtain in part because the nature of the enterprises studied which did not keep records. Also they were usually one woman businesses in which there was often no-one in the family to take over from the owner due to lack of skills or availability. People therefore work when they are sick which raises concerns for those enterprises involved in food processing.

There was disturbing data found in Nigeria about the length of the working day for women in the types of enterprises surveyed. Women working in pottery and fish smoking worked 12 hours a day, while those involved in cassava processing work 14 hours, six days a week. There is real cause for concern how little rest these women are getting especially since the work for their enterprises is in addition to household chores. Questions should also be asked about the levels of exposure to wood smoke these women experience. The health impacts of using wood stoves outdoors for household cooking are not an extensively studied area. The very limited evidence indicates, at least for the cook, there is no significant difference between indoor and outdoor cooking (Kirk Smith[28], personal communication). If it is found to be generally true and given that the women in Nigeria are being exposed to wood smoke for periods of considerably longer than cooking the family meal, and since time exposure is a significant factor in terms of health impacts, this is cause for concern. It is an area where epidemiological studies are urgently needed.

Flows of money in the household

It was decided that respondents would generally be unwilling to reveal accurate figures on household income so proxy qualitative indications would have to be used to gauge how energy costs affect households and enterprises.

In the Philippines, electricity bills were found to range from Pesos 500 to 1,800 (approximately £5 to £20) per month depending on the level of equipment ownership. The National Statistics Office classifies urban households with

[28] Professor Kirk Smith from the University of California, Berkeley, is a recognised leading international authority on health, pollution and stoves. http//ehs.sph.Berkeley.edu

income less that Pesos 5000 (approximately £ 53.50) per month as poor. Therefore, electricity alone is taking at the minimum around 10% of household budgets. An 11 kg LPG cylinder costs around Pesos 500 (approximately £5) which would last a household of six around three weeks and a small mobile food vendor one month. It can reasonably be concluded that energy prices are causing stress in low-income households. The issue of cost of energy (and water) were raised during both men and women's focus group discussions as causing problems for households. A reflection of these concerns can be seen in the finding that households and enterprises are adopting coping strategies of reducing consumption, fuel switching to lower grade fuels and taking illegal connections, none of which can be viewed positively.

The general economic recession in the Philippines has increased the numbers of people now working in the informal sector which in turn increases the number of enterprises competing for a market with not a lot of cash to spend. The 2003 Family Income and Expenditure Survey showed that for poorest 30% of society, their real income shrank by 6% between 2000 and 2003. Therefore, it is not unreasonable to conclude that energy prices are increasing the vulnerability of households and enterprises.

What is probably most significant in the findings is the rate of increase in energy prices over the last five years which is strongly linked to the market sector reforms. Price changes are discussed in more detail under Hypothesis 3.

Conclusion

The results related to hypothesis one are generally supportive of the proposition, although they do not provide a definitive correlation. However, energy price increases are beginning to be felt by households and the consequences of this remain speculative. Households and enterprises are adopting coping strategies to reduce energy consumption. As part of these strategies, there is a worrying sign that households are economising on cooking as a direct relation to energy costs. In the communities surveyed in this study, no negative health impacts can be directly attributed to energy use. This should not be taken as sign for complacency but that the situation should be monitored and that the effects on health, and on whose health within the household, need more detailed and specific research. The long hours of exposure to wood smoke by Nigerian women in their enterprises is particularly worrying.

Water quality is a significant issue for our communities and the need for boiling water in this context is an important household activity. Households would appear to see water quality rather than food intake as the key to good health. If households need to economise on energy, it is not unreasonable to surmise that boiling water will be the last economy. Therefore, decision makers should see reduction of cooking, not only as a negative transition in itself (if this equates to a reduction in daily calorie intake) but also as the possible step towards a set of serious health issues. A reduction in meals cooked can be seen as an indicator that households are becoming vulnerable. It should be stressed that no evidence was found in the surveys that a reduction in boiling

water is actually occurring.

The lack of transition to better quality fuels in both households and enterprises means that there is no real reduction in drudgery, particularly for women.

Hypothesis 2 Social networks and relationships facilitate access to energy services.
Organisations that can provide information about energy services, and even facilitate access to modern energy services, fall into two broad categories: sector and non-sector. The former would include government departments and agencies, private and public energy services companies, and NGOs. Non-sector organisations could include community organisations, schools, enterprise branch organisations and the media.

The three country studies produced some interesting and surprising findings.

Membership of organisations
There seems to be low participation in associations despite the potential benefits in membership. In Brazil, there was considerable distrust in Plataforma over the residents association (at least amongst the focus group members) which was criticised for poor communication, including disseminating information about important services, such as the government's energy programmes targeting low-income groups. Certainly in the two communities in Brazil, there was a surprisingly low awareness about the special programmes for low-income consumers.

Lack of awareness of organisations is an obvious reason for low participation in organisations. Only 14% of respondents in Manila were aware of the Department of Energy's Energy Conservation Committee which is specifically designated for helping with energy problems. Very few (17 respondents) even belong to cooperatives that could strengthen their bargaining power over access to electricity[29]**.** Other reasons cited for low participation include time constraints and fear of additional expenses. People became members of community organisations for friendship and solidarity rather than for direct access to services.

However, in Nigeria the opposite situation exists, where religious organisations play a very important role in community life providing access to many services including energy, for example, securing an electrical connection. Eleven households reported obtaining an electrical connection through a Christian organisation and eight through a Muslim organisation compared to four through a business association.

Information Flows about energy services
The television and radio are important providers of information. In Nigeria, 23 percent of the respondents report TV as their main source of information,

[29] In the Philippines, electricity cooperatives are usually established by electric power distributors and whose members are mainly its electric subscribers or consumers.

followed by the radio (18%) and newspapers (5%). This is not surprising in locations where literacy rates are low.

Government campaigns are variable in getting their message across to low-income group. In the Brazil, the government introduced, in 2002, the national Low-income Consumers Program (*Programa do Consumidor de Baixa Renda*) part of which includes a reduced electricity tariff to clients who consume less than 100kWh/month. More than half of the households in the sample in this study, in both neighbourhoods, despite being eligible to participate in the scheme, were not aware of it. There was a similar finding in relation to the Federal Government's LPG vouchers (*Auxílio Gas* programme) which were offered to low-income families until the beginning of 2004. Likewise, in the Philippines, (see above) there was a lack of awareness amongst respondents about the Department of Energy's Energy Conservation Committee.

Ability to invest in energy services/technologies

This indicator was intended to demonstrate whether or not urban low-income households were sufficiently embedded in their communities to have access to informal energy services. Such informal services are cheaper than official providers and are not usually encumbered by the bureaucratic barriers (such as the need for a registered address) which can hinder access (even by those willing to pay full costs) to energy services. However, on the negative side they can be dangerous (for example, electric wiring installed by untrained professionals) and are reducing the income of energy service companies.

Direct evidence proved rather difficult to obtain which can mainly be attributed to activities often being illegal. Anecdotal evidence known to the three national teams is that electricity from stand-by generators is sold to neighbours. In the Brazil survey, around one third of respondents were prepared to admit to using non-professionals for their electrical connections or servicing.

Decision Making in Households and Enterprises

Since many of women's enterprises are home based, decisions about energy affect the viability of enterprises. In Nigeria, men in urban households make decisions about energy and its associated technologies, even for cooking and other activities that fall within women's responsibilities. This is even in households where women are the main contributors to the household income. While in Brazil, the household head irrespective of gender makes the decisions about energy. In some households, men still consider themselves the household head even though they do not work or contribute less to household income. In the Philippines, decisions on budget allocation are shared by both husband and wife, where the woman usually manages the budget, including energy, for the family. If it is the husband who is the sole household income earner, money is given to the wife to allocate for family expenses[30].

[30] Focus group discussion.

Conclusions

In terms of the formal energy sector organisations, the evidence to support this hypothesis is negative, while at least in Nigeria, the evidence from non energy sector organisations would support the hypothesis. In Brazil and the Philippines, organisations, which were meant to be informing communities about targeted programmes, have been failing to deliver the necessary information to the intended beneficiaries. Decision makers should find the reasons cited for non-participation in organisations by respondents in the Philippines instructive: time constraints and fear of additional expenses. Participation in community organisations is for reasons of solidarity and friendship. In this context, the findings from Nigeria are enlightening where access to energy services is through faith based organisations. This raises the question of trust in members of an organisation. Trust can be assumed to be high in faith-based organisations which was clearly lacking in the community organisation for one of the surveyed urban settlement in Brazil. Decision makers should take this as a signal to use a broad range of organisations for energy programmes, not necessarily the most obvious.

Not surprisingly in communities where literacy is likely to be an issue, the radio and TV can form useful channels of communication. It is a cause for concern that campaigns targeted at the poor to inform them of benefits directed at them do not seem to be getting the message across (at least in the countries surveyed) and so could make better use of radio and TV.

Low-income urban residents do seem to use their networks to take advantage of informal (sometimes illegal) energy service providers. One should not rush to be judgemental on those taking this route. Many low-income households are forced to use this route because of bureaucratic obstacles to registering or qualifying for energy services.

In the two higher income countries, there appears to be a more gender equitable decision making in households about gender and energy issues. However, in Nigeria, it is still men who predominantly make the decisions about energy forms and gadgets used in the household. 226 households[31] reported the man made the decision about the fuel, 63 the woman and in only 22 was it a joint decision. A similar distribution was given for decisions about the purchase of electrical appliances. Given the close connection between household energy and urban informal sector enterprises, this means that any decisions made about household energy also impact on women's enterprises. If women are to have access to modern energy services, decision makers should keep in mind that as well as developing mechanisms to assist women, men also need to be convinced of the benefits.

Hypothesis 3 Energy services are key factors in sustainable livelihoods by increasing the viability of existing enterprises and enabling the establishment of new ones.

Forms of energy used and associated equipment

LPG and electricity are the main sources of energy for the enterprises surveyed

[31] This is totalled across all households (married and unmarried with male or female head).

in this study in Brazil and the Philippines (48% use LPG and 16.5% electricity in the latter). Kerosene is also significant in the Philippines (22.5%). In Nigeria, since process heat is necessary for the enterprises surveyed, wood, charcoal and kerosene are the main fuels used by the enterprises. Despite Nigeria being a major oil refiner, the use of LPG is severely restricted. Only five enterprises reported using LPG.

Electricity is used for lighting and for running enterprises. Women seem to benefit by increasing the range of services they can offer with access to equipment running on electricity (or at least a service that is cleaner and less drudgery, such as ironing). In the Philippines, many enterprises are providing services such as clothes washing and ironing which are using electric appliances[32] and in Brazil hairdressing and clothes making also benefit. Electrical appliances reduce drudgery, a benefit which appears not to have yet reached women in Nigeria who continue to use major inputs of metabolic energy into preparation of their products. However, a notable exception amongst the enterprises surveyed in Nigeria was the pottery industry in Kawali where a small number of entrepreneurs were founding to be using electricity and LPG. The use of modern energy services in this branch can be attributed to a programme by the government of general support (not specifically to up-grade the energy source used) to develop an industry with a high value product.

Since the enterprises surveyed are involved in food production, fuel cleanliness is one of the important criteria for users. On the other hand, clients like the taste of food cooked on charcoal and wood[33] which limits the option of fuel switching. Kerosene is considered to make food taste and smell, so customers avoid food prepared with this fuel.

What emerged from the surveys is the strong linkage between household energy and enterprises. Since many of the enterprises are located, at least for part of the process, within the household, it is difficult to disaggregate energy and equipment use between productive and reproductive activities. Many enterprises use standard household equipment for operating their businesses, which are frequently located within the household itself. For example, food processing enterprises use blenders, refrigerators, freezers, and stoves while hair salons use hair dryers, irons and electric razors. In Brazil, this has meant that enterprises have been able to benefit from packages designed to benefit the family, for example, the LPG voucher which entitles them to a small free cylinder of LPG. Similarly, electricity for the household is also used by the enterprise at a lower tariff than for commercial premises.

Demand driven services

An interesting example of the lack of consultation with urban poor people about energy services emerged from Canabrava where a biogas plant had been installed to make use of the near by rubbish dump. The plant is part of a pilot project producing approximately 75 kW of electricity which is sufficient to

[32] Focus group discussion.

[33] Anecdotal evidence reported by enumerators in Nigeria.

support around 100 households. However, the energy generated is used to light the park that was also built on the site rather than nearby households. It is estimated that the dump has the capacity to generate electricity to meet the needs of up to 50.000 families, at low cost, for about 18 to 20 years. Meanwhile the community feels resentful that they have not been consulted nor benefited from a "resource" that has for many years been seen as the cause of a number of problems for them (for example health).

Users of LPG cylinders do find it difficult to manage their use of the gas since there is no means of telling how much gas remains in the cylinder (other than a very rough estimate of weight)[34]. This complaint is well known yet no-one seems to have addressed this issue of providing a cheap and reliable method of estimating the quantity of gas remaining.

On the other hand an example of best practice of demand driven services can be seen in the Philippines where inspections and investigation of LPG establishments and gasoline stations are made in response to complaints about tampering with cylinders.

Price

Energy prices have risen significantly in the three countries. There are two contributing factors: the removal of subsidies linked to the liberalisation of energy markets and the steep increase in the global oil price during the early part of the 21st century.

Three significant findings emerged from the surveys. Despite the increase in oil prices, in Brazil there does not appear to have been a switching down the cooking fuel ladder to lower quality fuels. In Brazil, the cost of LPG cylinders has increased 550% between 1994 and 2004 which is three times the rate of inflation. The cost of the LPG cylinder represents 5-10% of household monthly income, however, people do not appear to be switching back to wood and charcoal although they are resorting to other fuel saving strategies. However, in the Philippines the rises in LPG prices in 2004 has certain seen a shift towards using charcoal and wood to reduce energy expenses[35]. A possible explanation for this difference in response to price increase maybe that households in the Philippines still have rural plots of land where they have access to fuelwood and charcoal whereas in Brazil fuelwood and charcoal suppliers for Salvador have disappeared as demand decreased, although it should be made clear that these vendors did not supply low-income households. Low-income households used to collect their own wood but environmental degradation reduce supply to the extent that fuel switching occurred.

Urban enterprises in Nigeria buy fuelwood. While there does not appear to have been a marked shift from kerosene to fuelwood, those enterprises using fuelwood have borne a significant price increase because the cost of transporting the wood has gone up. A 10kg bundle has gone up from 80 naira

[34] Women's focus group discussion.
[35] Women's focus group discussion.

(approximately 35p) in 2004 to 100 naira (approximately 44p) in 2005. Kerosene is suffering a double burden – the retail price reflects not only the increase in the wholesale price but also the transport costs. The cost of gasoline has risen from 42 naira/litre (approximately 17p/litre) in December 2004 to 65 naira (approximately 26p/litre) in August 2005.

While the increases in fuel prices do not appear to be encouraging a transition down the cooking fuel ladder, they do however appear to be hindering an upward transition. The entrepreneurs interviewed in Nigeria stated that the cost of LPG prevents them from switching from fuelwood.

The price of electricity is has risen substantially since market liberalisation in all three countries. For example, in the Philippines the basic household tariff has risen from 3.4329 Pesos/kWh in June 2003 to 4.8970 Pesos/kWh. This has caused considerable resentment amongst low-income households and as a consequence there is a form of "silent protest" by many otherwise law-abiding citizens turning a blind eye to illegal connections[36]. There continues to be lack of competition in electricity supply in all three countries which is considered to be a factor in price increases as utilities try to balance their books. However, only using the price mechanism as part of demand side management is not benefiting low-income households.

In general, transport costs appeared as a major concern for all respondents. In Brazil, an indication of costs can be seen from the focus group interview in Plataforma where households reported using between 14 and 27% of total income on transport[37]. The cost of transport for raw materials, goods and people are rising significantly since urban areas rely on diesel or petrol based transport systems. Since the enterprises surveyed are serving local markets where customers are on low-incomes, passing increased costs to the customer is not an option readily undertaken.

Service Provider's Perception of the end users

When it comes to supplying electricity to poor districts, utilities still seem to see clients in poor urban areas as a problem rather than as customers. Much effort in Brazil is made on reducing illegal theft of electricity but there seems to be little effort in trying to ensure that people become legal clients. People have to pay for the installation of their own meter. The utility claims to run a monthly instalment plan to pay for meters, however, this scheme would appear not to be well publicised. None of the respondents surveyed knew of the scheme. The utility has also run energy conservation campaigns for low-income households. In 2001, the utility sent conservation teams to households to look for energy conservation opportunities. In most cases, households had very old refrigerators with old rubber seals around their doors that no longer were able to properly seal the doors. The company helped many customers replace these seals.

[36] Focus group discussion.

[37] This data can only be taken as indicative since the surveys did not set out to gather data on this issue. It was however raised as a concern in all three countries during focus group discussions. It is therefore a topic which should be the subject of further study.

In Nigeria, the utility company sees the poor as a liability, because there a lot of illegal connections and where meters are installed, payments are not made regularly. The utility company has therefore introduced slot meters in some areas. To its credit, the utility is not charging a higher tariff for slot meters, as is commonly the case.

LPG providers appear to have a different client orientated service approach. In the Philippines, suppliers deliver cylinders by truck and an order can easily be placed by telephone. In Nigeria, very few urban poor households use LPG, and those that do, purchase it from petrol stations or private dealers, which can be very expensive. In many cases, gas passes through up to three levels of middle men before it gets to the end-user, who carries his/her gas cylinder to the dealer.

End Users Perception of the Energy Service

The cost of energy services is contributing significantly to the dissatisfaction felt by the end-users. While LPG services, where available, are reliable, there is less satisfaction about the reliability of the electricity supply. While power cuts appear to have diminished, brown outs and power surges continue to be a problem, including when privatised utilities become the supplier. The uncertainty about electricity causes entrepreneurs in the Philippines to purchase stand-by generators – despite improvements in the supply – and some households in Nigeria to do likewise (44 households in the survey). The high price of electricity does cause resentment and communities in the Philippines demonstrate a resistance to increases by condoning illegal connections, from passive toleration through to as warning of the approach of a utility representative.

In Brazil, around half of the survey respondents were unaware that the electricity utility had been privatised. Around 40% of the respondents rated the utility service as “regular” and complained about the high prices and occurrence of power surges which damages equipment. Given the linkage between household energy and enterprises, this equipment damage has a double impact on household income: the cost of replacement of broken equipment and the loss of earnings until the equipment is replaced.

A significant finding from the surveys is that, despite the recent high energy price rises, respondents tended to have greater concerns about water supply than energy. A possible explanation might be that water has no real substitute whereas energy comes in a variety of forms which are interchange (at least theoretically). In addition, households and enterprises with illegal connections are unlikely to voice criticisms of the utility which could influence the responses.

Viability of Enterprise

The reliability of energy services is certainly important in enterprise viability although it is not the only factor that influences viability, poor roads and the lack of support to informal sector entrepreneurs were key factors that emerged during the surveys.

The price rises referred to above are certainly putting the viability of enterprises

under strain. In Nigeria, the increase in fuelwood price has hindered the expansion of businesses. Ninety-four enterprises reported this as a problem. Fish smokers were particularly affected with 65% of the business reporting negative effects. In the Philippines, price rises have resulted in entrepreneurs retrenching staff who have joined the ranks of the unemployed[38].

In Brazil, respondents failed to identify the effect of price rises on their enterprises, possibly because most enterprises were home based and hence business operating cost is mixed with that of the household. However, transportation costs were identified as one of the main problems facing enterprises which in turn, have a direct impact on enterprises as it limits operational options and possibilities to expand business particularly to other locations in the city.

Conclusions

The evidence from our surveys would support the hypothesis. The availability of electricity in urban areas of the Philippines and Brazil has certainly led to the proliferation of services industries, such as clothes washing, ironing, hair-dressing and dress making. It could therefore be concluded that women in low-income households have been able to benefit from access to electricity by an increase in income generating opportunities. On the negative side, women continue to be trapped in occupations related to housekeeping skills which tend to be low paid.

It should be kept in mind that the equipment being used in many of these enterprises is probably second hand and not energy efficient. Therefore, the action by the electricity utility in Brazil, where it sent conservation teams to households to look for energy conservation opportunities, such as replacing old rubber seals around refrigerator doors can be seen as an example of best practice creating a win-win situation for utility and client.

The most serious finding relates to the effects of the recent oil price rises on the viability of enterprises. In the three countries, all fuels have suffered from significant prices increases both directly and indirectly from transport costs. There do not appear to be any cost benefits accruing to low-income users from the deregulation policies in the energy sector which are discussed in more detail under hypothesis 4. There do appear to be improvements in electricity supply stability although consumer confidence is not 100% with enterprises who are highly dependent on electricity keeping stand-by generators. While there does not appear to be any sign of a downward fuel transition, there are other worrying signs in the informal sector linked to fuel price rises. There are signs of staff retrenchment to reduce costs and hindering of expansion. Given that the informal sector is a significant employer, these trends should be monitored.

There are mixed approaches to customer-client relations. The LPG delivery by the private sector seems to work well and is responds to consumer demand, for example, different sizes of cylinder. The government in the Philippines has

[38] Focus group interview.

also responded well to consumer pressure for regulation in the LPG market. The electricity sector (at least in the three countries surveyed) does not seem to feel the need to engage with its client base. There is some resentment about the price increases which has the negative effect of making otherwise law-abiding citizens turn a blind-eye to illegal connections. Electricity utilities might consider the carrot rather than stick approach of the LPG sector and work with communities. This might be a more efficient way to encourage more consumers to become legal and in turn boost utility income[39].

Hypothesis 4 Energy sector reforms lead to improved access by enterprises to energy services.

New policies in place

Privatisation in the electricity sector is already in place in Brazil while the Philippines and Nigeria are at different stages of transition. The oil sectors are also being deregulated.

New suppliers enter the market

The reforms in the oil sector rather than in electricity seem to be succeeding in bring improvements to low-income households. In the Philippines, the deregulation of the oil industry led to the entry of more players on the petroleum retail business. LPG can now be easily obtained from various retail outlets. A negative fall out from the proliferation of LPG retail outlets has been tampering with LPG cylinders by some retailers. However, the government has been quick to react to maintain consumer confidence that cylinders provide the right quantity and good quality of LPG. Routine and complaint-related inspections and investigation of LPG establishments and gasoline stations are currently being pursued to protect the public against illegal and unfair practices.

State institutions

The changes in energy markets have required the introduction of new institutional structures. In Brazil, regulatory agencies have been established in all the major infrastructure utilities. However, in the case of the petroleum sector, privatization has not been successful in generating more competitiveness and thus a decrease in price to consumers as it has in other sectors. The petroleum sector regulating agency has been subject to undue pressure from special interest groups which have prevented pricing structures favouring low-income groups, although the international oil price has also not helped.

In Nigeria, the energy reforms, including deregulation, have yet to deliver benefits since the Power Holding Company of Nigeria (PHCN – formerly the National Electric Power Authority (NEPA)) which is the sole distributor of electricity continues to be a monopoly. The government has also created in 2005 the Energy Regulatory Commission that will regulate pricing of power distributors. However, it was too early at the time of the survey to assess the impact of this body.

[39] The KaR project report here can claim to have had an impact already. In response to the research findings from Brazil presented at the national workshop, the representative from the utility was so surprised at the results that she promised to respond to the criticisms.

Quality of services
Electricity supply does not appear to have improved in terms of quality – although power cuts have virtually become a thing of the past. However, all three countries continue to experience fluctuations in voltage which undermines confidence in the utility. This poor public perception is not aided by the high prices which causes resentment. This resentment is also felt about petroleum sector prices, although there is a much higher level of satisfaction in relation to improvements in supply.

Expansion or contraction of service delivery
All of the communities surveyed had electricity supplies. However, the level of connection has not improved with privatisation. In fact, the number of connections has probably decreased in part due to price rises leading to disconnections due to unpaid bills and/or utilities pursuing a vigorous policy of tackling illegal connections.

Petroleum fuel supplies in Brazil have been well established in the urban communities surveyed. In the Philippines, oil sector liberalisation has brought an expansion of services and so there is increased availability (but not necessarily access) to these fuels for low-income households. Kerosene can obtained from stores within 250 metres of households surveyed and few households reported supply shortages. The supply of petroleum products in Nigeria is well established in the urban communities surveyed. Petroleum products can be bought from any fuel station while kerosene is sold by vendors in the communities. In these cases, consumers are usually paying a higher price compared to that at fuel stations – which can be seen as the cost of convenience. LPG sometimes passes through three levels of vendors before reaching the customer.

Financing mechanisms to enable access to energy technologies
Social policies in Brazil have certainly facilitated access by low-income groups to LPG and electricity through voucher schemes. However, the way the system operates mitigates against broad access since it requires consumers to apply for their vouchers through the internet!

The Philippine government has the Barangy electrification program (BEP) that targets 100 percent electrification of all areas in the country by 2010. However, the BEP's focus is in the rural areas. There are non-government organizations that work with the urban poor through micro-lending but none have the specific mandate to enable access to modern energy sources or more energy efficient technologies. The Development Bank of the Philippines and the Land Bank of the Philippines can provide funds for renewable energy technologies for medium and large enterprises. However, large numbers of small and informal sector enterprises are excluded from this programme by the lack of formal registration of such enterprises.

In Nigeria, there are currently no government programmes to provide financing mechanisms to enable access to modern energy sources or more energy efficient technologies. However, evidence would suggest that when support has been provided for upgrading enterprises, one of the options entrepreneurs

take up is modern energy.

In the three countries surveyed, there are financing mechanisms for enterprise development, although there are none that specifically target urban enterprises and access to modern energy. A key reason why enterprises fail to take up opportunities is that the repayment patterns do not match income flows. In many cases, women's enterprises are so small that they do not have sufficient daily capital accumulation to repay loans.

Conclusions

Deregulation is underway in both the oil and electricity sectors in the three countries. The hypothesis has been confirmed for the oil sector in Brazil and the Philippines but not for electricity in any of the three countries (although it may be too early to judge in Nigeria). The concern for electricity is that the number of connections has probably gone down due to strong action to reduce illegal connections. It is disappointing that utilities have not attempted to find ways of converting these illegal clients into legal ones and so boosting income rather than focusing on reducing looses, thereby creating a win-win situation for consumer and supplier. There needs to be attempts to increase competition in the electricity supply market which might encourage the establishment of ESCOs or cooperatives willing to work in low-income communities.

It is still early days in the deregulation process but it is clear that the regulatory commissions need to find a balance between all parties and resist pressure from the more powerful groups at the expense of the low-income households. The regulator in the Philippines petroleum sector is an example of best practice in supporting low-income consumers, while maintaining the credibility of the industry. In the past, the electricity utility in Brazil has also carried out energy conservation activities that benefit the low-income households and enterprises.

4.2 Key findings

1. There is a strong linkage between household energy and informal sector enterprises particularly those owned and operated by women since these enterprises are wholly or partially located within the household. Therefore, measures designed to support household access to clean energy can also benefit enterprises.

2. While energy market liberalisation seems to have brought increased availability of petroleum fuels for low-income groups, the benefits in terms of electricity availability have yet to be realised. Utilities appear to be concentrating on dealing with illegal connections in a punitive way instead of developing creative policy of converting the illegal into legal consumers. We would wish to stress that increased availability is not the same as increased access. Price rises have clearly proved a significant barrier for converting availability into access.

3. Prices rises of petroleum fuels have had different effects on consumer behaviour depending on the length of use of those fuels. In Brazil, where fuelwood is no longer found in urban areas, there is no apparent transition down the fuel ladder. In the Philippines where low-income consumers have

strong rural links and access to fuelwood and charcoal, there is sign of a downward transition. In Nigeria where petroleum fuels are not generally used the price rises are blocking an upward transition from fuelwood.

4. Energy price rises are affecting the viability of informal sector enterprises. A disturbing aspect has been noted in the Philippines were employees are being laid off as an economy measure in response to energy prices. There are also reports of businesses being closed because of price rises. Other entrepreneurs are reducing the quality of inputs.

5. The cost of transport has risen significantly due to petroleum price rises. This has had a direct effect on low-income households reducing their mobility in search of work and leisure. Their enterprises are also affected since transport prices also increase input costs and restrict travelling for selling products.

6. General support to enterprises, not necessarily specific energy programmes, can lead to enterprises adopting modern energy, as was seen the Nigerian pottery sector and the Philippines micro-finance institutions. However, the nature of informal enterprises, for example, lack of legal registration and small turn over, can be a barrier to taking up micro-credit.

7. Informal food vendors have key role in urban poor's lives both as a livelihood strategy and the influence on health of poor people who are increasingly using the sources as a coping strategy for reducing household cooking demands. In this context, the flavour imparted by the fuel used to cook food can be a barrier to the transition to modern fuels.

Recommendations from the individual country studies can be found in Appendix 6.

5 References

- Amis, P., (2002), *Thinking about chronic urban poverty*. CPRC Working Paper No 12. Chronic Poverty Research Centre, University of Manchester. ISBN 1-904049-11-7.
- Andrade, T (2004), *Report: Brazil.* Prepared for DFID KaR Project R8348 "Enabling urban poor livelihoods policy making: understanding the role of energy services"
- Bannister, A., (2002), *The Sustainable Urban Livelihoods Framework – a tool for looking at the links between energy and poverty.* Boiling Point No 48, p 7-10.
- Banks D. (1999), *Financial analysis of appliance options for rural energy services*.
- Barja, G., and Urquiola, M., (2001), *Capitalization, Regulation, and the Poor: Access to Basic Services in Bolivia*, UNU/WIDER Discussion Paper No 2001/34.
- Barnes, D., (1995), *Consequences of Energy Policies for the Urban Poor*, FPD Energy Note No 7, The World Bank, Washington DC. November 1995. http://www.worldbank.org.
- Barnett, A., (2001), Looking at household energy provision in a new way: The Sustainable Livelihoods approach, Boiling Point 46, pp30-32.
- Bazile, D., (2002), *Improved cookstoves as a means of poverty alleviation,* Boiling Point No 48, pp 20-22, ITDG, Rugby, UK.
- Beall, J., and Kanji, N., (1999), *Households, Livelihoods and Urban Poverty*. Urban Governance, Partnership and Poverty Theme Paper 3. Department of Social Policy and Administration, London School of Economics.
- Clancy, J.S., (2002), *Blowing the smoke out of the kitchen: Gender Issues in Household Energy*. Brief 1, SPARKNET. http://www.sparknet.info
- Clancy, J.S., (2004), *Urban poor livelihoods: Understanding the role of energy services*. Paper prepared as part of Research Project DFID KaR R8348.
- Clancy, J.S., Skutsch, M.M., and Batchelor, S. (2002), *The Gender - Energy-Poverty Nexus: Can we find the energy to address gender concerns in development?* Position paper for UK Department for International Development (Project CNTR998521).
- Dasgupta, N., (1999), *Energy Efficiency and Poverty Alleviation, DFID Energy Research Newsletter, Issue 8, May 1999. http://www.etsu.com/dfid-kar-energy/html/8_-_ee_pa.html*
- Denton, F., (2002), *Gender: The Missing Link to Energy for Sustainable Development*, Paper prepared for the World Summit on Sustainable Development, Johannesburg, South Africa, August/September 2002. Enda Tiers Monde Energy Programme, Dhaka, Senegal.
- Diyamett B et al. (2001), *Exploring rural-urban interactions in Tanzania: a critical review of the methods and tools used*. IIED. ISBN. 84369-036-5.
- Doig, A., (1998), *Energy Provision to the Urban Poor*. Report of the Household Energy Development Organisation Network IX Meeting. DFID Energy Research Newsletter, Issue 7, November 1998. http://www.etsu.com/dfid-kar-energy/html/7-urban_poor.html
- Drake, L., (2000), *Scoping Mission to investigate the development of*

Livelihoods Indicators and Livelihoods Monitoring Systems for DFID-Bangladesh quoted in Future Energy Solutions et al (2002) *Energy, Poverty and Sustainable Urban Livelihoods*. DFID KaR R7661.

- Dutta, S., (1997), *Role of Women in Rural Energy Programmes: Issues, Problems and Opportunities*, ENERGIA News No.4, pp11-14.
- ESMAP (1999), *Household Energy Strategies for Urban India; the case of Hyderabad*. Report 214/99, World Bank, Washington, June 1999.
- Future Energy Solutions and the Development Planning Unit (2002), *Energy, Poverty and Sustainable Urban Livelihoods*. Research Report, DFID KaR R7661.
- Hosier, R.H., and Kipondya, W. (1993), *Urban household energy use in Tanzania*, Energy Policy, May, pp454-473.
- Kabeer, N., (1994), *Reversed Realities: Gender Hierarchies in Development Thought.* Verso.
- Kalumiana O (2002), *Energy Services for the Urban Poor*: *The Zambian Perspective*. Proceedings of a National Policy Seminar: Zimbabwe's Policies on Urban Energy for the Poor. Mapako M and Dube I (eds), AFREPREN Occasional Paper No 20.
- Kanji, N. (with Sarah Salway) (2000), *Promoting Equality between Women and Men,* Dept of Social Policy, LSE. SD SCOPE Paper No2.
- Karekezi S., and Majoro, L. (2004), *Improving Modern Energy Services for Africa's Urban Poor*. AFREPREN Newsletter No. 35, January 2004. pp 9-12.
- Leach, G., and Mearns, R. (1988), *Beyond the woodfuel crisis: people, land and trees in Africa*, Earthscan Publications Ltd., London. ISBN 1 85383 031 3.
- Maduka J.O. (2004), *Inception Report: Nigeria.* Prepared for DFID KaR Project R8348 "Enabling urban poor livelihoods policy making: understanding the role of energy services".
- Makan, A., (1995), *Power for women and men: Towards a gendered approach to domestic policy and planning in South Africa*, Third World Policy Review, Vol 17 (2).
- Mapako, M., and Dube, I., (eds) (2002), *Proceedings of a National Policy Seminar: Zimbabwe's Policies on Urban Energy for the Poor*. AFREPREN Occasional Paper No 20.
- Meadows K,, Riley C., Rao G., and Harris, P. (2003), *Modern Energy: Impacts on Micro-enterprises*, Report of Literature Review for DFID KaR Project R8145.
- Meikle, S., Ramasut, T. and Walker, J. (2001), *Sustainable Urban Livelihoods: Concepts and Implications for Policy,* Working Paper No. 112, DPU, University College, London. http://eprints.ucl.ac.uk/archive/00000035/01/wp112.pdf (accessed 18 August 2005).
- Moser C., (1996), *Confronting Crisis: A Comparative Study of Household Responses to Poverty and Vulnerability in Four Urban Communities*. ESD. Washington.
- Murray, C., (2001), *Livelihoods research: some conceptual and methodological issues,* CPRC Working Paper No 5, Institute for Development Policy and Management, University of Manchester, (www.chronicpoverty.org).

- Reddy A K N (2000), *Energy and Social Issues*, in "World Energy Assessment", UNPD, New York. ISBN 92-1-126-126-0.
- Schutyser, P.J. (2003), Small diesel generators in rural Sudan: Social, management and technical issues. Unpublished Technical Internship Report, Department of Technology and Sustainable Development, University of Twente, The Netherlands.
- Sinha S (forthcoming 2006), Department of Technology and Sustainable Development, University of Twente, unpublished PhD research.
- Tedd, L. (2001), *Energy and Street Food Vendors*. Boiling Point No 47**,** p 10-12**.** ITDG. Autumn 2001.
- Tucker, M., (1999), *Can Solar Cooking save Forests*? Ecological Economics 31:77-89
- UNDP (1999), SLA in Urban Areas. http://www.undp.org/sl/Documents
- von Molthe, A., McKee, C., and Morgan, T. (2004), *Energy Subsidies: Lessons Learned in Assessing their Impact and Designing Policy Reforms*. UNEP/Greenleaf Publishing Ltd., Sheffield, UK. ISBN 187471911X.
- Watkiss, (undated) *Urban Energy Use: Guidance on Reducing Environmental Impacts*, DFID KaR Project R7369. Project Report Summary. http://www.etsu.com/dfid-kar-energy/html/r7369.html
- World Bank, (2000). *Energy Services for the World's Poo*r. Washington D C: The World Bank.

Appendix 1: Log Frame

Enabling urban poor livelihoods policy making: understanding the role of energy services

Log Frame

NB This is the logframe as set out in the proposal. The activities and output dates were changed and the project end date is 31st December 2005.

	Narrative summary	**Measurable indicators**	**Means of verification (MoVs)**	**Important assumptions**
Goal	Energy Extreme poverty and hunger Between 1990 and 2015, halve population whose income is less than one dollar a day	- Population with income less than one dollar a day in 1990 has halved by 2015	UN and national government statistics.	No input required.
Purpose	- To provide a clear understanding, based on micro-level gender disaggregated data, of the issues around urban energy supply and use for poor people's livelihood strategies.	- International development agencies have adapted energy policies which reflect the reality of poor urban peoples' livelihoods - National and local governments in the South have pro-poor urban energy policies. - Poor urban people have better access to energy services and increased household incomes.	- Policy documents and statements by bi-lateral and multi-lateral development agencies. - Policy documents and statements by appropriate government and private sector bodies - Surveys	- donor interest in urban livelihoods - perception of need for support in public and private sector to improve access to energy services for urban poor

Outputs	Inception Report	December 2003	Outputs are all documents prepared by the project team.	- The documents are read and acted upon by bi-lateral and multi-lateral development agencies and governments (national and local) and the private sector in the South.
	Best Practices Paper: Energy Services for the Poor	Paper published – February 2004		
	Data Collection Methodology Report	March 2004		
	3 Country Reports which explore the urban livelihoods and energy nexus	3 Reports published – December 2004		
	3 National Workshops	Workshops held by January 2005		
	3 National Workshop Reports	Reports published – January 2005		
	3 Dissemination Strategy Reports	Reports published – January 2005		
	Synthesis Paper	Paper published – February 2005		
	Briefing note	Note published – February 2005		
	International Practitioners Workshop	Workshop held – March 2005		
	International Practitioners Workshop Report	Report published - April 2005		
	ENERGIA News	June 2005		
	Final Report	July 2005		

Activities	1.1 Inception report prepared	Inception Report – December 2003	- Urban poor are prepared to participate in surveys. - Sufficient interest by appropriate stakeholders to participate in national workshops. - Data is available for best practices paper. - ENERGIA is still in existence.
	2.1 Planning meeting	Planning meeting January 2004	
	2.2 Preparation data collection	Training workshop Data collection and analysis – February 2004; Methodology prepared and reported February-March 2004; National teams trained March – April 2004;	
	2.3 Data Collection	April – August 2004	
	2.4 Interim review meeting	May 2004	
	2.5 Data Analysis 2.6 Writing Country Study 2.7 Dissemination Strategy	April – September 2004 3 Country Reports – October -December 2004 Dissemination Strategy developed – November 2004 – January 2005; Report – January 2005	
	3.1 Best Practices Paper: Energy Services for the Poor	February 2004	
	4.1 National Workshops	3 National Workshops held – January 2005	
	4.2 Reports prepared	January 2005	
	5.1 Synthesis Paper written	December February 2005	
	6.1 Briefing note	January - February 2005	
	7.1 International Practitioners Workshop urban livelihoods and energy	March 2005	
	7.2 Report prepared	Report published April 2005	
	8.1 ENERGIA News Special issue	January - June 2005	
	9.1 Final Report prepared	Final report - July 2005	
			Pre-conditions - Sufficient political stability in poor urban areas to allow access by outsiders.

Appendix 2: Inception Workshop Report

Enabling urban poor livelihoods policy making: understanding the role of energy services
KaR research project R8348

Inception Workshop Report
8 to 12 March 2004
University of Twente, Enschede, The Netherlands

Attendees: Joy Clancy (Project leader), Tanya Andrade (Brazil National Team leader), Olu Maduka (Nigeria Team Leader), and Feri Lumampao (the Philippines National Team Leader)
Support: Wendie Klieverik (Project Administrator)

Objectives

- To determine the role of energy services in enterprise viability and the influence on household livelihoods.
- To analyse the role of social networks and relations in facilitating household livelihoods.
- To analyse the impact of energy sector reforms on access by enterprises to energy services.

Assumption

Energy services must be clean and affordable.
[NB. Affordable does not necessarily mean cheap.]

Research Hypotheses

1. Clean and affordable energy services are key factors in creating good physical well-being and productivity of household members.
2. Social networks and relationships facilitate access to energy services.
3. Energy services are key factors in the sustainable livelihoods by increasing the viability of existing enterprises and enabling the establishment of new ones.
4. Energy sector reforms lead to improved access by enterprises to energy services.

Livelihood is defined as:
The capacity (ability and opportunities) to enjoy long, healthy lives in a manner of one's choosing in harmony with one's physical and social environment.

Definition of the target group which will form focus of study

The study will focus on enterprises of low-income groups, in particular the linkages between energy in enterprises and household members' well-being and productivity will be analysed (hypothesis 1). These will not be the "poorest of the poor" – since there is no doubt that providing people in this group with energy services will lead to improvements in their livelihoods. Instead, the focus will be on those groups which have the capacity to be entrepreneurs or improve their entrepreneurial status. The characteristics of the study target group are:

- Precarious access to basic amenities eg water, sanitation, health, education, food security, shelter

- Low capacity skills
- Physical assets are of poor quality eg low energy efficiency
- Non-permanent material for housing construction
- Some capacity to participate in entertainment
- Some access to physical infrastructure eg roads, community buildings.

Enterprises:
- Can be seasonal
- Will be a major contributor to the household income
- Have significant energy inputs
- Are not necessarily located in a physical structure.

Selection will be from micro and small scale (exact division depends on country classification); informal and formal (registered; own bank account).

Provisional Sectors:
Nigeria
Lagos - Fish supply chain
- Cassava processing
Abuja - Waste management (?)

Brazil
Street vendors
Bakeries/small markets

the Philippines
Food processing and preparation (household)
Shoe making

All three will take informal sector energy suppliers.

Definition of a household

People who live within a physical structure and have common use of resources eg kitchen/sanitation, electricity, income, labour, equipment (eg iron). A household can consist of more than one unit and the individuals within the units may or may not have kinship relations with other units. The head of the household is the owner of the property or the recognised senior resident. The individual units can have their own heads.

Unit heads can be:
- Unmarried
  either living alone (widows/widowers; single;)
  or head of a family (single parents; siblings)
- Married
  male or female headed (partner working/resident elsewhere – rural/other city/abroad)

Units/households can vary with:
- Age

- Income/occupation
- Ethnicity (indigenous; migrant)
- New or long term urban resident

Indicators

Each hypothesis has its own broad indicators which can be used across the three countries. The type of data for these indicators will be elaborated between now and the workshop for data gathering in May.

Hypothesis 1

- Smoke in the household (qualitative)
- Meals (quantity and type)
- Water potability/sanitation
- Health
- Working days
- Perceptions of well-being and productivity
- Flow of money at the household level (linked to hypothesis 2 and 3)

Hypothesis 2

- Energy services and equipment available
- Involvement in CBOs and NGOs
- Membership of formal associations and clubs
- Information flows about energy services.
- Ability to invest in energy services/technologies
- Decision making within the household/enterprise.

Hypothesis 3

- Energy services and equipment available
  - Physical forms (quantity; reliability; variety)
  - Price
  - Repairs (timely; spare parts availability)
- Demand driven
  - Visibility of service providers
  - Consultation
- End User perceptions of services
- Service providers perceptions of the end-users (low priority for service continuity)

Hypothesis 4

- New policies in place
  - Price driven
  - Cost recovery
  - Tariff reform
  - Regulators established
- New suppliers enter the market.
- State institutions (Central, state, local) perceptions of end-users (linked to 1 and 3)
- Quality of services
- Exclusion/disconnection of enterprises
- Expansion of service delivery

  - Area covered
  - Types of services
  - Local technicians and agents
- Financing mechanisms to enable access to services.

The SULF indicators were assessed and some were not considered generic. The rest could be adapted and absorbed into the indicators given above.

Community selection criteria

- Ethnic mix
- "precarious" settlements
  Not passive victims but vulnerable to man-made calamities (eg fires and compulsory relocation) and natural disasters (eg floods)
  new settlements
  more established settlements.
- Enterprises (number, size, type)
- Grid electricity available
- Transport network

Preliminary selection of location of urban conurbation:
Nigeria – Lagos and Abuja
the Philippines – Metro Manila
Brazil - Salvador

Outcome
Policy recommendations for the delivery of energy services that positively influence enterprise development and sustainable livelihoods

Appendix 3: Project Outputs

- Inception Report (December 2003)
- Best Practices Paper: Energy Services for the Poor (February 2004)
- Data Collection Methodology Report (March 2004)
- 3 Country Reports which explore the urban livelihoods and energy nexus (December 2004)
- 3 National Workshops (January 2005)
- 3 National Workshop Reports (January 2005)
- 3 Dissemination Strategy Reports (January 2005)
- Synthesis Paper (August 2005)
- Briefing note (August 2005)
- International Practitioners Workshop (August 2005)
- International Practitioners Workshop Report (September 2005)
- ENERGIA News Special issue on gender, energy and urban livelihoods (December 2005)
- Final Report (December 2005)

Appendix 4: Energy-Poverty-Gender linkages to be explored within the components of the Livelihoods Framework

Energy-Poverty-Gender linkages to be explored within the components of the Livelihoods Framework

Livelihood Component	General livelihood related aspects	Energy-Poverty-Gender links to be explored
Household assets		
Human	Skills; entrepreneurial ability; education level; ability to work (health); security of employment; income-earner dependency ratio	**Human energy** is an important asset for gaining employment in unskilled manual work, for example, portering. This clearly related to health and nutrition. **Energy-health** related issues (lung and eye disease from smoke – women household and productive related; men productive. Illnesses associated with unboiled water). **Access to education and skills** (who within the household?) for energy service delivery creating employment opportunities formal (utilities or entrepreneur) or informal (charcoal selling; providing illegal connections).
Social	Exchange of goods and services; assistance to or from extended family networks (rural, urban, abroad); membership of community groups; nature of interaction with other households; level of social isolation.	**Networks and social relations** often determine an individuals access to resources: who can scavenge for fuel at a particular location, access to energy conversion technology owned by others (eg portable generator, sewing machine), access to knowledge and skills of others (electrician to legal wire house or make illegal connection), information about technical alternatives. Women's networks will be important for household reproductive needs; women's and men's for productive needs. How do new migrants cope? (Gender differences? Young single men – eat outside the household, young women at home?) Rural relatives bring charcoal while those abroad provide access to energy conversion equipment and devices.
Physical	Basic infrastructure for the supply of energy, shelter, water, transport and communications, production equipment and location for production and service provision (permanent structure/shop/stall/pitch)	**Access to energy** of appropriate form and quantity at affordable price directly affects livelihoods and health. **Access to energy conversion technologies** affects efficiency (technical and economic), which in turn influences health (drudgery reduction; reduced emissions, more comfortable working conditions). **Provision of energy services** (direct provision, eg charcoal, or support eg electric wiring) can be an income generating opportunity. **Transport services** need reliable and affordable energy supplies – influences entrepreneurial and employment opportunities. **Communication technologies** allow social networks to be maintained and opportunities related to production and services. Energy enables the **provision of services (**also livelihood opportunity) (eg charcoal for roadside restaurants; electricity – music). Housing quality may influence connection chances as well as spaced heating/cooling requirements.
Financial	Savings, credit, remittances, ownership of disposable assets (home, animals, means of transport eg bicycle, cart)	Many poor people are unable to get together **enough cash to invest in more energy efficient conversion equipment or benefit from bulk purchase discounts** (kerosene by the can rather than the cup) denying them cash savings. Renewable energy technologies have high up front connection costs but cheaper running costs than fossil fuels. **Privatisation** of energy services will probably bring changes to costs. Do cost changes influence the choices households make about the types of fuels they use, or do other factors play a role? Direct savings on energy expenditure and improved productivity help improve savings and reduce vulnerability. Within the household who makes the decisions on what investment, who has the assets to enable investment and who decides on how to use any savings? What are savings used for?
Livelihood Context		

Location	Location of community with respect to topography. Access to transport and other services. Climate.	**Location** affects choice of energy services and costs of improving infrastructure. **Access to transport** affects livelihood chances in terms of employment or goods. **Climate** influences the need for space heating or cooling and biomass combustion (wet fuel produces more smoke than dry).
Cultural environment	Ethnicity; religion; gender; urbanisation patterns.	These factors influence social networks and access to energy and other assets.
Political environment	Political parties; feelings of insecurity/uncertainty; feelings of political unconnectedness. Informal control through gangs etc., harassment by state institutions. Impact of rules, regulations and policies; access to identification documents and legal registration; taxation; zoning; regulations on informal trading.	**Privatisation and commercialisation** of energy services are a consequence of political processes which directly impact on poor peoples' lives – processes over which they may have no voice due to lack of legal recognition of urban citizenship since the poor are often squatters or lack relevant documentation proving **right of abode**. This situation can influence a utilities decision to provide a service. **Zoning** on environmental emission grounds (eg smoke) can have negative impacts on the poor (removing income generating opportunities) or positive impacts (by creating conditions which improve occupational health). **Taxation and other economic instruments** influences the affordability of energy resources and efficient conversion technologies. **Feelings of insecurity** of right of abode or entrepreneurial location will **hinder investment decisions** in energy efficient technologies. Likewise similar reactions are likely, if state institutions have negative attitudes to, or overlook the consequences of legislation and policies on, the informal sector.
Economic Environment	Macro-economic environment; urban economic base; employment and inflation trends; policies and attitudes towards informal sector activities; micro-finance.	What are the linkages between changes in the energy sector, in particular **privatisation and commercialisation policies**, and the economy? These can influence opportunities for poor people to become involved in energy service delivery, promote or hinder new enterprises and affect existing enterprises' profitability. They outcomes of such policies can also impact on poor people in other ways, such as health and time. Do energy policies recognise specific **urban energy issues**, particularly those faced by poor people? If state institutions have negative attitudes to, or overlook the consequences of legislation and policies on, the informal sector it may **hinder investment decisions** in energy efficient technologies either due to the creation of feelings of insecurity or lack of access to credit.
Institutional environment	Presence and importance of community level institutions; interaction with external organisations; control of resources by organisations; formal vs. informal institutions	While central government is responsible for creating the enabling environment, **local government** is often responsible for planning of urban energy infrastructure. Their attitude towards informal settlements and informal sector activities can be crucial in the delivery of the energy services poor people need for livelihoods to move themselves out of poverty. They can be responsible for transport infrastructure which affects the availability, reliability and cost of energy delivery costs and access to income generation and employment opportunities. They are responsible for regulation and permits associated with small-scale energy retail business (eg sale of charcoal). Often important in mobilising, organising and developing schemes to help the poor are **community based organisations and NGOs**. They can play important role in interventions to improve energy services at the local level, by identifying community needs and providing a resource base of knowledge about technologies. The **private sector**, often in partnership with central government, at one level is the supplier of conventional energy services, eg petroleum fuels, and energy related infrastructure. What are their policies and attitudes towards meeting poor peoples' energy needs, in particular do they recognise their problems in meeting high up-front costs? At the other end of the scale many **small and micro firms** are likely to be the main actor in the supply and use of energy services that are used by poor people (eg illegal retailers of electricity, sellers of kerosene, candles and charcoal/wood) and understand their constraints. Can they be

		facilitated to deliver better quality, affordable services, and more energy efficient technologies, to improve poor peoples' livelihoods?
Livelihood Strategies	Activities undertaken by each household member, level of contribution to household finances, access to employment, income generating activities, access to credit; diversification vs. dependence on single earner; flows of money, people and goods from rural areas and abroad.	Energy services can contribute to urban livelihoods in a variety of ways. **Gaining additional income** by selling energy services (fuels, such as charcoal, kerosene, LPG, and conversion technologies, such as stoves, lamps, batteries, electricity cards). **Gaining access to improved household energy services or fuel switching** (improved stoves; switching from candles to kerosene to electricity for lighting). Gaining access to improve energy services increasing production efficiency (eg through mechanisation) which in turn results in a greater ability to pay for improved energy services (who decides? Who benefits? In what way?). **Grouping with others to obtain access** to improved energy services for production, household consumption or community services (eg security lighting and communications technology) either by providing own services or lobbying utilities/govern-ment. Who makes the decisions within the household and who benefits from improved energy services in terms of health, timesaving and income are key gender issues in the urban energy-poverty nexus.
Nature of shocks	Occurrence, duration and nature of shocks; loss of assets due to shock; employment; illness.	The major energy related shocks have been associated with the availability and price of fuels, for example petroleum products due to commercialisation of prices, charcoal prices due to civil conflict, power cuts due to insufficient capacity. Rampant inflation also works against the urban poor more than rural poor since they are more integrated into a monetised economy – devaluing simultaneously their ability to buy commercial fuels and hiking fuel prices. All energy delivery systems are vulnerable to natural and man-made disasters, to war and conflict. These impact on income generation activities and have health impacts if people have to resort to lower quality fuels insufficient to meet their needs. Women are particularly vulnerable to these shocks since they are the main providers of household energy.
Livelihood outcomes.	Shelter, food, nutrition, health, water, education, community participation, personal safety.	Energy services can contribute to people achieving their livelihood goals in an number of ways: Increasing income (sale of energy services; energy related productivity gains; extending working day; access to liquid fuel based transport); increased well-being (improved street and household lighting; reduce indoor air pollution both in households and enterprises; reduced drudgery; improved information through radio, TV, telephone, internet; increased income generation opportunities through improved energy services).

Appendix 5: Indicators for testing the four hypotheses

Indicators

A set of broad indicators was developed for each hypothesis. The indicators were formulated in such a way that they could be used in the three countries. They were intended to capture a holistic picture of urban livelihoods without the generation of vast data sets which can become unmanageable to analyse. The indicators for the hypotheses plus an explanation of the thinking behind them, are given below.

Hypothesis 1 Clean and affordable energy services are key factors in creating good physical well-being and productivity of urban household members.

- Smoke in the household (qualitative)
- Meals (quantity and type)
- Water potability/sanitation
- Health
- Working days
- Perceptions of well-being and productivity
- Flow of money at the household level (linked to hypothesis 2 and 3)

The aim here is to explore linkages between energy and the health of household members. If household members have good physical well-being (that is, they are healthy) they are able to work and hence provide for the sustainability of the household. Data about three specific factors with energy linkages were collected: smoke, meals and water. Water and food are the basic requirements for general good health while smoke relates specifically to women's health in the kitchen. Smoke exposure has a particular relevance given that many informal sector activities involve cooking food for sale which is prepared in the household kitchen women may spend considerable periods of exposure to smoky fuels. No attempts were made to collect qualitative data on levels of smoke but enumerators were asked to record their own perceptions of the kitchen. A transition to less smoky fuels can indicate a household were incomes have improved to enable the purchase of stoves and fuels – although this is not the only explanation (for example, other fuels may not be available).

Water quality and its mode of delivery both have energy implications. If water quality is poor, it needs to be boiled which increases the energy costs to the household. If the quality is good, the household can make other choices about its disposable income. How does water arrive at the household? Is it piped? Brought by water carriers? Electricity supply needs to be constant to keep pumps running. Petroleum fuels increase the cost of truck delivery. Are supplies being affected by energy availability and/or costs?

Food in the three countries in the study is generally cooked at some stage. The types of foods eaten and quantities of meals taken influence the quantities of energy a household needs to buy while at the same time they can be influenced by energy costs. Are people changing their eating habits? If so, can they be considered to have positive or negative effects on people's health?

It is recognised that other factors also influence health, for example, malaria, so data on common illnesses was collected. The number of days worked was also considered not only as an indicator of health but also as a proxy indicator of

household income. Although attempts were made to establish household incomes, to overcome concerns about the reliability of the data, proxy indicators were used to assess household income, such as household possessions. However, these proxy indicators also have to be assessed with caution since gender issues can play a role. For example, gender issues influence the purchase of household goods and services, men often making the final decision about items bought (Clancy, 2002).

Hypothesis 2 Social networks and relationships facilitate access to urban energy services

- Energy services and equipment available
- Involvement in CBOs and NGOs
- Membership of formal associations and clubs
- Information flows about energy services.
- Ability to invest in energy services/technologies
- Decision making within the household/enterprise.

Urban migration disrupts social networks and new ones need to be established. How do these networks, if at all, influence access to energy services? What other factors influence access? The first indicators looks at the energy services available to the households and enterprises surveyed, although availability is not the same as access. The second two indicators looked at which organisations the households/enterprises had contact or involvement with. The fourth indicator identifies how information about energy services reaches households. The information provided by these three indicators can be useful to governments and utilities designing energy campaigns.

Are the energy services always from the formal sector companies? Informal suppliers can be a lot cheaper. Do you need to be well embedded in your community, therefore have good social networks, to be able to make use of these informal services? Such services are not necessary illegal but there are safety concerns.

Having information is one aspect of access to energy services, who decides is another. Gender issues were assessed as part of relationships facilitating access to services.

Hypothesis 3 Energy services are key factors in the sustainable urban livelihoods by increasing the viability of existing enterprises and enabling the establishment of new ones.

- Energy services and equipment available
  - Physical forms (quantity; reliability; variety)
  - Price
  - Repairs (timely; spare parts availability)
- Demand driven
  - Visibility of service providers
  - Consultation
- End User perceptions of services
- Service providers perceptions of the end-users (low priority for service continuity)

The indicators here examine the quality of energy services and equipment available not only in physical and financial terms but also in terms of how the end-user perceives the service. Do people from low-income households feel that there needs are being met? How do service providers see low-income households? As a client base to be developed? Or as drain on profits?

Hypothesis 4 Energy sector reforms lead to improved access by urban enterprises to energy services

- New policies in place
  - Price driven
  - Cost recovery
  - Tariff reform
  - Regulators established
- New suppliers enter the market.
- State institutions (Central, state, local) perceptions of end-users (linked to 1 and 3)
- Quality of services
- Exclusion/disconnection of enterprises
- Expansion of service delivery
  - Area covered
  - Types of services
  - Local technicians and agents
- Financing mechanisms to enable access to energy technologies.

The indicators here explore different aspects of energy sector reforms and their impact on urban enterprises. The nature of the reforms is established. Is the service improving in quality and availability? Low-income households may not be considered attractive clients (too low profit margin? Dangerous locations to provide service?) to large commercial utilities, so are small operators now able to enter the market to provide services? Alternatively, is the low-income enterprise being assisted in access to energy technologies through appropriate financing mechanisms?

Appendix 6 : Individual Country Recommendations

Brazil

Improvement in Communities

In the focal groups held during the course of the research, participants identified the major problems in their specific communities, and suggested ways of solving these problems, as follows:

a) Plataforma:

1) Better transportation services, including expansion of the service hours of the commuter trains and re-activation of the boats system to and from the Ribeira boat terminal, across the bay from Plataforma;
2) Lowering unemployment rates in the area, by offering training courses;
3) Improving and expanding services in the local Health Centre;
4) Creation of more spaces for cultural and leisure activities, such as reconstruction of local cinema and of the local factory as a cultural centre;
5) Installation of a Police Post in the neighbourhood in order to curtail levels of crime.

b) Canabrava:

1) The re-activation of the Police Post in the neighbourhood (at present, the residents pay private security to curtail the level of local urban violence);
2) Improvement and expansion of services and working hours in the local Health Centre;
3) Installation of more schools in the community, particularly day-care centres and a high school;
4) Linking Canabrava homes to the main sewage system;
5) Improvement and expansion of transportation services to the area.

It should also be added:

a) Expansion of services of the Biogas plat to the local community;
b) Distribution of ceramic filters to the population.

Expansion of Social Benefits

The study found that only a small proportion of households received social benefits. In great, many of the residents were not aware of them. Thus, it is recommend that:

1. National television campaigns provides information about social benefits (what they are, who can benefit, how to apply); TV is recommended because more than 85% of the homes have them and watching TV is the major leisure activity particularly for women;
2. These campaigns should also be disseminated through local Churches and residents' associations.;

Programs for Small Enterprises

1. Management courses to small entrepreneurs, focusing on how to run a business, organization skills and financial management.

2. More access to credit – particularly through *Banco da Mulher* (Women's Bank), to local entrepreneurs to help start up small enterprises;
3. Availability of transportation to different parts of the city in order for small enterprises to have wider option for consumers.

Nigeria

- Subsidy and taxation on fuels should be designed to achieve easier access to cleaner energy by the poor, based on the welfare of the people and not just on the economic benefits to the Government alone. Smart subsidies on energy consumption for the poor should also be considered.
- Need to increase widespread access to fuel supplies as this is important in encouraging transition to modern fuels. Equity of access across the nation should be given priority if the poor are to access higher-grade and more efficient fuels. Incentives should be provided for the private sector to invest in refineries, while government owned refineries should be privatised.
- Appropriate finance mechanisms for equipment and fuel supply should be put in place to allow a wider access of the poor to higher-grade and more efficient fuels at a lower unit cost.
- The newly created energy utility company should be more customer-friendly and create awareness in the area of energy efficiency and sustainable use.
- Low tariffs for the poor, as proposed in the fourth coming electricity act, should be properly implemented.
- Pre-paid metering and billing systems should be introduced to discourage the currently rampant illegal connections to the systems of the national electricity utility. This will improve the revenue generation of the company and enhance its performance.
- Renewable energy technologies to provide electrification should be encouraged and supported for rural and the poor urban communities.
- Most of the enterprises surveyed are carried out by women. It is therefore important that conscious effort should be made to encourage effective women participation in policy and decision-making. There is the need for affirmative and pro-active action to encourage women into policy making bodies by reserving at least 30 percent of the membership composition for women to occupy in energy related policy making bodies.
- The federal and state governments should implement their site and services schemes in order to provide infrastructures and utilities to squatter peri-urban settlements where the urban poor mostly reside.

- There is the need for R and D activities to improve energy sources, especially renewable energy.

Philippines

1. Encourage the entrepreneurs to lobby in congress to urge the government to implement the reform on energy and electrification as shown by the following enabling objectives:

- Increase the investment of private capital in the power industry, while minimizing the government's financial commitment.
- Create an environment of competition and accountability.
- Deliver competitive and affordable prices.
- Improve operational and economic efficiency.
- Make transparent the social subsidies.
- Share social and other costs among all users.

2. Encourage the small-scale entrepreneurs to conduct awareness campaign on information dissemination about possible government reforms in the delivery and pricing of energy through electricity, water, and fuel.

3. NGOs and government bodies tasked on energy concerns to work with the local government officials to create reasonable subsidies for fuel and energy to small-scale enterprise similar to discount cards which could be presented to dealers of these commodities.

4. Conduct citywide campaigns on information about upgrading the knowledge of small-scale entrepreneurs regarding healthful environment for the employees, provision of clean and safe workplace and wise use of fuel and energy.

5. Encourage the membership to organizations, which can assist in influencing reforms and policies of fuel and energy distribution and pricing.

6. Provide information on wise conservation of water and contribute in protecting the water sources from contamination through observance of cleanliness and sanitation.

7. Government and NGOs to explore projects (R and D) for alternative energy sources and also to lessen dependence of urban poor on expensive electricity to enhance their plights.