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Documents

Energy and Poverty

A feasibility study on statistics on access and use of energy in Uganda

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Abstract

The overall Uganda Policy on eradication of poverty as well as the energy specific policy includes strategies and targets for how to develop energy access and use. Numerous indicators are developed with the objective of providing a tool for monitoring of how well the policy targets are achieved. Timely and reliable information from statistical and administrative sources is urgently needed in order to determine these indicators and thereby to enable for monitoring of policy impacts and guidance for further development.

This paper documents the findings and gives recommendations from a study with the objective to assess the available energy related statistics in Uganda in an attempt to link energy statistics to the country's poverty situation. The study was undertaken by Statistics Norway (SN) in close cooperation with the Uganda Bureau of Statistics (UBOS) during a SN mission to UBOS May 23rd to June 10th, 2005. The Norwegian Government funded the project.

The study identifies at least 4 major challenges to overcome: 1) To assemble and harmonize already existing information on energy from a multitude of sources and make it more easily accessible to the users. 2) To further improve the specification of parameters collected in order to fill possible gaps of information and to ensure a core set of information with regular intervals of updates that links the statistics to the policy indicators. 3) To improve the possibilities for regional breakdowns of energy statistics (administrative and socioeconomic divisions). 4) To further explore the link between households and private sectors access to and use of energy to the poverty situation.

The main outputs from the study are; an overview over available energy related statistics and producers of such in Uganda; suggestions for combining data from different sources to better feed into agreed indicators; identification of important gaps in the statistics available; suggestions for combining digital maps with geo-referenced information for illustration/dissemination of regional breakdowns of statistics; and last but not at least the present study makes an initial attempt on using household survey data for analyses on the relation energy/poverty.

Basically, the study looked into the subject from an UBOS perspective and came up with the following main recommendations: 1) Develop the UBOS website in the direction of a "one stop centre" of energy statistics including hyperlinks to the most important stakeholders. 2) Quantify and publish time-series for policy indicators. 3) Further strengthen the cooperation with other data providers and stakeholders. 4) Improve the statistics, especially concerning fuel-wood and charcoal production and use.

The results of the study were presented and discussed in a consultative workshop in Hotel Equatoria in Kampala on June 10th, 2005. A softcopy of the power-point presentations from this workshop can be provided at request.

Acknowledgements

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Table of Contents

Table of figures

Bibliography

Annexes:
1. Abbreviations
2. Metadata by source
3. Annex to the energy and poverty analyses (graphics/tables)
4. Draft budget for a SN mission with the objective to update the UBOS web site on energy statistics
5. Terms of reference

1 Summary

Statistics Norway Division for Development Cooperation in close cooperation with Uganda Bureau of Statistics conducted a study with the objective to assess and relate the available energy statistics in Uganda to poverty situation and recommend further work on possible improvements of the database.

Many of the recently conducted surveys, censuses, case studies include information related to the Ugandan household's and the private sectors access and use of energy by source. Also substantial amount of administratively collected data exists. However, the somehow scattered storage of energy related statistics makes it difficult for the stakeholders to efficiently explore the information.

The overall Uganda policy on eradication of poverty and the energy policy include strategies and targets for how to develop. Thus, timely and reliable information on energy production, distribution and use from statistical and administrative sources is urgently needed for monitoring, planning and research.

Both governmental and non-governmental institutions collect and use energy related information. UBOS plays a key role in building and developing coherent, reliable and efficient information in this, especially focusing on the consumption patterns, expenditure and prices due to household and industry based sample surveys. In this context the most important data sources by UBOS are the Uganda National Household Survey (UNHS), the Uganda Business Inquiry (UBI), the National Service Delivery Survey (NSDS), the Consumer Price Indices calculations (CPI), Trade Statistics and the Population and Housing Censuses (1991 and 2002).

On the production and distribution side of electric energy, the Ministry of Energy and Mineral Development (MEMD) plays a key policy role controlling the organization of production, transmission and distribution. These segments are being implemented by ESKOM (U) Ltd, Uganda Transmission Company Ltd. (UETCL) and UMEME. Which do provide data to UBOS.

Information about supply of oil based energy is derived from private importers which provide monthly and annual data to MEMD.

The National Forest Authority (NFA) provides annual estimates on production of fuel-wood and charcoal in monetary and physical values. Within NFA work is also ongoing to update the land-cover and stocks of biomass resources in Uganda from the 1990/95 baseline. Finally, there is a conglomerate of NGOs conducting energy related in-depth studies in limited thematic and geographical areas.

MEMD has established an exhaustive system of 48 indicators for the energy sector. UBOS should be a main provider of statistics for quantifying 11 of these indicators. Since UNHS will be the main source for this statistics, the indicators can be expected with updates every 2-3 years with information for Uganda totals and the four statistical regions North, West, South and Central Uganda.

As a part of the project, a study was done with the objective of illustrating how available data on access and use of energy by households and private sector can be

linked to poverty in Ugandan households. Statistical findings in this field as well as gaps in data availability are briefly discussed. Energy use and welfare are mainly studied at household level, but also community and at the business level are looked into. The available energy related data on businesses and enterprises are limited, but the study illustrates that the scope for analyses on income generating effects of electricity could be substantial improved with the information on grid availability in community and use of electricity in enterprise.

The household expenditure surveys include information on overall household expenditure as well as aspects on energy usage and are therefore suited for household analyses on energy and poverty. The study illustrates how some small adjustments in these surveys could substantially improve the possibility for revealing aspects on the link between energy and poverty. For example, the household surveys show that there has been a substantial decline in poverty in Uganda over the last 10 years, but that the share relying on wood based energy for cooking is almost unchanged over the period.

With the prevailing pressure on the scarce biomass source there is a need for addressing issues on efficiency, prices and amount of wood based energy by poverty status on a national level. The available data will be improved with the information on type of stove used and time used for collecting firewood as included in the forthcoming Uganda National Household Survey 2005. Another important improvement of the expenditure survey would be to derive prices and quantity used of the respective energies.

Another example is that the analyses show that electricity use is strongly correlated with welfare both in households and in communities, but we are not, with the available data, able to reveal whether this is due to more wealthy household/communities getting access to electricity and/or that the household/communities becomes more wealthy when they get access to electricity . This tendency would, of course, best be investigated with time series on welfare and change in use of electricity. It is unrealistic that this type of data should be available on a national level, but one could shed some more light on these issues if one had information on when electricity became available in community, when household started to use electricity and what electricity is used for in household.

Statistics from the Population and Housing Census (PHC) 2002 was combined with digital maps containing administrative boundaries down to parish level especially prepared for the case-study. The geographical pattern of household energy use is easily identified on the maps produced. For instance, charcoal for cooking and to some extent electricity for lighting is characteristic for urban areas, while in the rural areas the households use tadoobas for lighting and fuel-wood for cooking. However, the statistics at micro level reveals that there may be considerable inequalities between parishes within the urban areas concerning the energy carrier used. For the rural areas, some interesting concentration of parishes where the households are characterized by high share of fuel-wood as the main source for lighting, are identified.

The case-study is for technical reasons mainly restricted to Mbarara district.

As for further work, the study recommends for some small but important improvements on the existing surveys in order to substantially improve possibilities for future planning and research.

The importance of biomass as energy carrier in Uganda is clearly stated. Steps should be taken by UBOS together with main stakeholders to explore the possibilities and need for improvement of statistics on trends and stock of biomass resources, production as well as consumption by carrier and sector in physical and monetary values.

Immediate priority should however be given to update the UBOS website concerning energy statistics in the direction of a “one stop centre”. This could improve the present situation where it is difficult for national and international users to get an overview over status and trends on the energy sector in Uganda due to many providers with somehow un-harmonized and scattered dissemination of information.

Further analyses on energy use and welfare are highly recommended.

2 Background and Objectives

Uganda Bureau of Statistics has over the recent years conducted a series of surveys and censuses which many of them include information related to the Ugandan household's and the private sectors' access and use of energy by source. However, the organisation has up to now, with exception for the UBOS Annual Abstract, not done any far reaching attempt to combine existing statistical information from different sources inside and outside the organization in order to give a more complete description of the status and changes in the energy sector. The somehow scattered storage of energy related statistics makes it difficult for the stakeholders to keep track of what information that may exist. The unfortunate consequence is that the statistics compiled may not be optimally utilized.

The overall objective of the study is to contribute statistical information on energy that feeds into the program on eradication of poverty in Uganda.

The operational objectives according to the project's terms of reference (Annex 5) are as follows:

- Documenting, analyzing and presenting relevant information on access to and use of energy from various sources across regions/sub-regions and socio-economic groups of households in Uganda.
- Presenting a proposal for improvement of statistics to monitor changes in access to- and use of various energy sources in Ugandan households in relation to poverty. Proposals for possible modeling approaches should be included.

In the view of the above objectives, the project has assessed possibilities and recommended for a way forward for cost-efficient, permanent, multi source based data- compiling that can feed into existing or further refined sets of indicator in the cross field of energy access/use and poverty eradication.

3 Uganda Energy Policy and Strategies

3.1 Introduction

This chapter comprises quotations from Uganda energy policy documents, Regulations and the Electricity Act. The objective is to give a broad overview of policy statements and relate those to the need for statistical information.

3.2 Sources and Statements

Through downloading from the website of the Ministry of Energy and Mineral Development (MEMD) www.energyandminerals@go.ug and by screening the library of Uganda Bureau of Statistics (UBOS) a series of policy and strategy documents and statements were made available for the study as follows:

The Constitution of the Republic of Uganda (GoU, 1995):
"The State shall promote and implement energy policies that will ensure that the people's basic needs and those of environmental preservation are met".

The Electricity Act of 1999 (GoU 1999):
The Electricity Act of 1999 section 63 as follows: *"The Government shall undertake to promote, support and provide rural electrification programmes through public and private sector participation in order to:*

(a) achieve equitable regional distribution access to electricity;
(b) maximize the economic, social and environmental benefits of rural electrification subsidies;
(c) promote expansion of the grid and development of off-grid electrification; and
(d) stimulate innovations within suppliers".

Further more the Section 67 of The Electricity Act of 1999 states that; *"the Minister shall maintain a national rural electrification database to assist in the monitoring of progress and establishment of the targets for rural electrification".*

The Energy Policy for Uganda (MEMD, 2002):
The main policy goal in the energy sector is: *"To meet the energy needs of the Ugandan population for social and economic development in an environmentally sustainable manner".*

The energy policy seeks to meet 5 broad objectives as follows:

1. To establish the availability, potential and demand of the various energy resources in the country
2. To increase access to modern affordable and reliable energy services as a contribution to poverty eradication
3. To improve energy governance and administration
4. To stimulate economic development
5. To manage energy-related environmental impacts

The MEMD's short and medium priority policy actions are listed as follows:

- Increase power generation
- Diversify power generation sources to ensure security of supply
- Increase access to modern energy in rural areas
- Increase operational efficiency in the utility companies and connect more customers to the grid
- Determine the petroleum potentials of the country
- Create a competitive petroleum supply market in the country
- Promote the use of renewable energy and energy efficient technologies
- Manage energy related environmental impact
- Improving energy governance and administration

The Rural Electrification Strategy and Plan 2001-2010 (MEMD 2001):
The overall objectives with the Governments Rural Electrification Strategy are determined in The Electricity Act of 1999 section 63. The primary objective of the Rural Electrification Strategy is therefore to reduce inequalities in national access to electricity and the associated opportunities for increased social welfare, education, health and income generating opportunities. However, also promotion of renewable energy such as biomass, small hydro, solar, wind and geothermal resources constitutes an important element of the strategy.

The primary target of the Strategy is to provide access for 400 000 extra rural household by 2010 and it is including all sources and techniques for generating electricity.

A similar target of 295 000 extra households is provided for the urban areas.

The National Biomass Energy Demand Strategy (MEMD 2001 Draft):
The overall objective for the biomass supply sub-sector is *for "Government to provide focused support for development, promotion and use of renewable energy resource for both small and large scale applications".*

The draft document available for this study determines the target for the National Biomass Energy Demand Strategy to provide access to improved wood technologies to 900 000 households by 2010. More specifically this means 450 000 rural households equipped with improved wood stoves, 400 000 urban households equipped with improved charcoal stoves and 40 000 urban households equipped with gas/electric stoves. Document also includes targets for implementation of improved biomass based technologies for specific industries as well as quantified targets for use of alternative renewable energy technology such as solar cookers/heaters/driers etc.

The final formulation of the strategy and the possible quantification of targets are not available for the study, however the draft document focus on very relevant issues and need for quantification of targets.

The Poverty Eradication Action Plan (GoU, Version August 22, 2004)
The Poverty Eradication Action Plan (PEAP III) comprises two strategic objectives for the direction of development relevant for energy related to poverty as follows:

- Strengthened infrastructure in support of increased production of goods and services
- Increased and sustainable forestry production consistent with increased forest cover

Linked to the two objectives are two outcome indicators; percent of rural households accessing electricity and average distance to firewood source. The baseline and medium term targets linked to those two indicators area that 10 percent of rural households should have access to electricity within year 2011/2012 (present situation is 3 percent) and that households average distance to firewood should be less than 0.5 km within year 2011/2012 (present situation is 0.73km).

3.3 Policy statements and need for statistics

The overall Uganda Policy on eradication of poverty as well as the Energy specific policy includes strategies and targets for how to develop energy access and use. Numerous indicators are developed with the objective of providing a tool for monitoring of how well the policy targets are achieved. Timely and reliable information from statistical and administrative sources is needed in order to determine these indicators and thereby making them an efficient tool for policy makers, researchers and other national and international stakeholders. The challenge is to build up capacity to provide statistical information that can be linked to policies and strategies.

Based on the policy statements quoted in this chapter, it can be concluded that statistics should aim at providing timely and reliable information on access and use of energy by source. Statistics should enable for monitoring of national production and use of energy and this productions' effects on welfare and possible environmental degradation. This statistics should feed into the National Integrated Monitoring and Evaluation Strategy (NIMES).

The equality concerning the population's access is stressed in the policy and thus the statistics should aim at providing regional breakdowns as well as breakdown on different types of households and industries and not at least a distribution on urban/rural access and use.

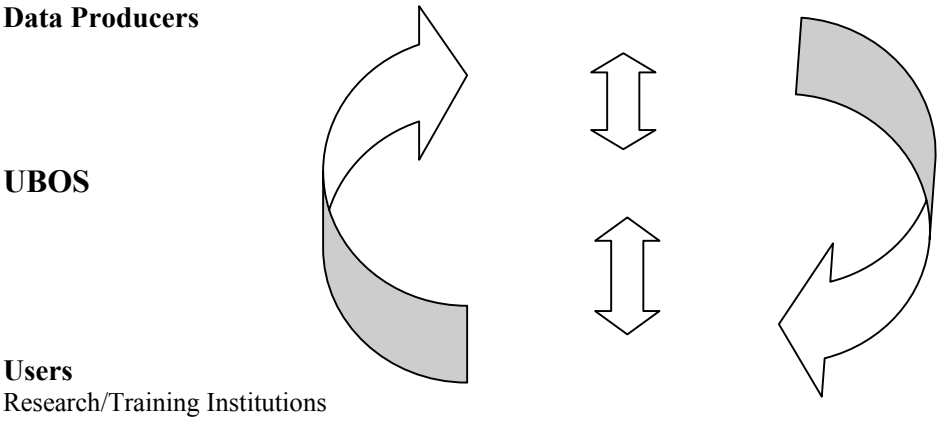
4 Producers and users of energy related data

4.1 Introduction

The objective of this chapter is to present a brief overview over key stakeholders on the energy sector of Uganda. They will both be providers and users of energy statistics.

The producers and users of statistics form the National Statistics System (NSS) with UBOS having the central role of coordinating and supervising the data producers and users. The mandate of UBOS is to develop and maintain the NSS so as to ensure collection, analyses and publication of integrated, relevant, reliable and timely statistical information. This includes statistics on the energy sector.

The NSS includes all agencies in Uganda, whether government or not, responsible, whether under any enactment or otherwise, for gathering statistical data directly through surveys or through administrative action. The stakeholders in the NSS include the central government (line ministries), the Central Statistical Offices (CSOs), private Sector and Local Governments.



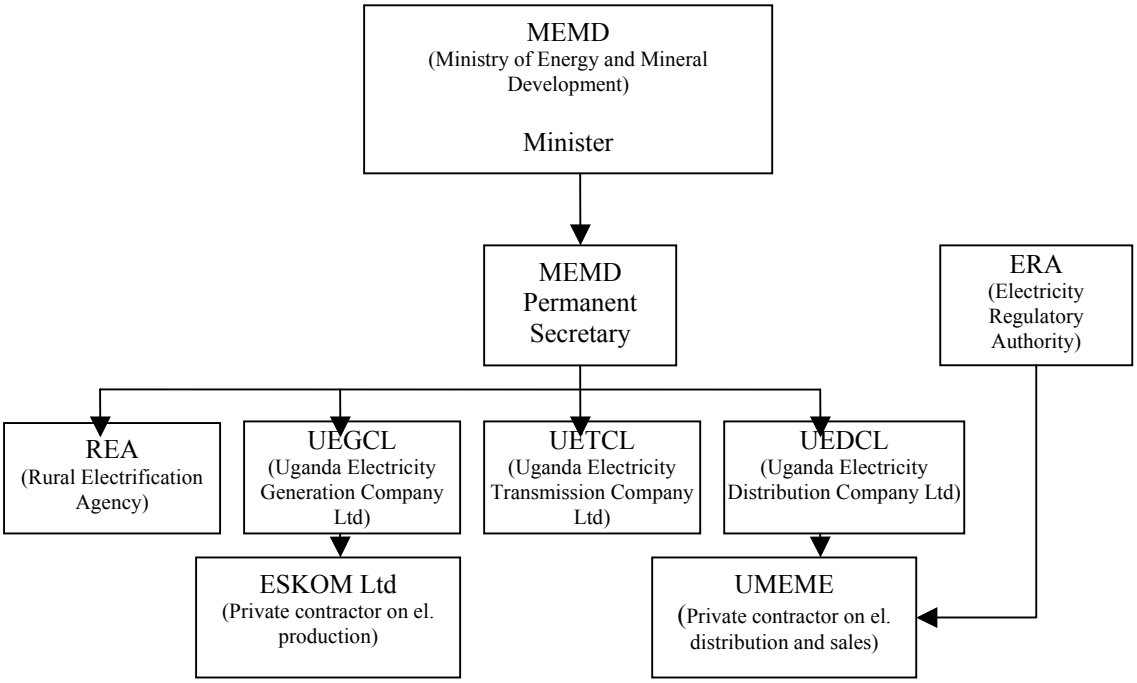
In the energy sector, there are a number of data producers and users. These can be grouped into two groups; the main producers and users (key stakeholders), and the ad hoc ones which produce small quantities of data for their own use.

4.2 Main producers and users

These include; UMEME (a new consortium that took over from UEDCL in March 2005), Uganda Electricity Transmission Company Limited (UETCL), Eskom (U) Ltd, National Forestry Authority (NFA), UBOS and Ministry of Energy and Mineral Development (MEMD).

The formal organization of the distribution and sales of electricity is recently reorganized in Uganda (2005). The present institutions involved and the relation between them is illustrated in the organigram below.

Figure 4.2.1 The formal organization of electricity production, transmission and distribution in Uganda



UMEME
UMEME is responsible for all aspects of the supply and distribution of electricity in Uganda. It is the distributor of electricity that it purchases from Uganda Electricity Transmission Company Limited (UETCL), a government agency responsible for transmission of electricity. UMEME is therefore a producer of data on distribution of electricity in the country. The utility also provides services such as connection of new customers to the grid, hence responsible for access by households and private sector to their services.

Eskom (U) Ltd
The utility is engaged in generation of electricity. It is therefore a producer and user of data on generation of electricity from the power plants located at Jinja. Other users of these data are UETCL, UMEME, the MEMD and UBOS.

Ministry of Energy and Mineral Development (MEMD)
While the MEMD deals with policy issues in the energy sector especially the improvement of the quality and quantity of service, it also handles policy issues on extension of electricity to rural areas where the majority of the households are living. It uses data on generation and distribution to make its policies on rural electrification.

National Forestry Authority (NFA)
This is a self-financing authority that has responsibility for management of central forest reserve (CFRs) and to support districts as appropriate. It is mainly a producer

and user of data on biomass stock in the country. Other users of the institutional data include UBOS, research/academic institutions, and policy makers to some extent.

Uganda Bureau of Statistics (UBOS)
As stated in Section 3.1 above UBOS role is mainly to coordinate, monitor, supervise, harmonize and produce official statistics in the country. It is a producer and user of statistics of energy from UNHS surveys which other users such research and training institutions access.

4.3 Ad hoc Producers and user

Ad hoc producers and users of statistics include some organizations engaged in micro surveys that are focused to specific sites. Such institutions include; IT Power engaged in projects on extension of rural electrification grids; GTZ engaged in energy efficiency in households and small enterprises; Poverty Analysis Unit in Ministry of Finance Planning and Economic Development engaged in baseline surveys on household energy issues.

5 Available energy-relevant statistics by source

5.1 Introduction

This chapter comprises the result of the finding from deskwork study on reports and web-sites as well as results of visits to main Uganda stakeholders producing energy relevant statistics. The objective is to give a broad overview over available statistics by its source.

Concerning information compiled there are some data compilation that include energy information as a primary objective, while others as a secondary one. Data compilation is basically done either by traditional statistical censuses/sample surveys or compiled by administrative systems.

5.2 Statistical Censuses and Surveys conducted by UBOS

5.2.1 Population and Housing Censuses

The Uganda Population and Housing Census of 2002 (PHC 2002) is the most recent complete enumeration of population and households in a series of censuses conducted approximately every 10th years in Uganda since 1911.

The PHC 2002 comprises the following 4 sections:

1. Particulars concerning household members
2. Housing conditions
3. Household conditions
4. Agricultural module

In addition to the 4 household based sections, also full enumeration of the communities was compiled due to a specially designed community questionnaire.

The series of population and housing censuses is the only available data source with basic information on size and composition of the total Uganda population at the individual level. The PHC2002 is up to now the only source that provides information about main source of the households energy use by energy carrier for administrative level per districts down to parish and enumeration area level covering all the Uganda.

General information about the total population size and number and composition of the households and some variables covering the housing characteristics can be obtained from the PHC2002. This information can be produced for any administrative or other geographical units that can be determined by aggregates of Enumeration Areas (EA) as they were defined and documented on hard copy maps during the census taking. Population and household characteristics can also be distributed according to functional criteria of which urban/rural may be the most relevant in relation to energy issues.

Specific energy relevant information can be obtained at the household level, since all households were asked about their main energy source used for lighting and same for cooking.

Assessment of the data quality expressed as completeness reveals that there are very few missing observation for the two variables on household main carries of energy for lighting and cooking.

Obviously, information on the number of households, the composition of household and the size of the population can be obtained from all the population and housing censuses conducted in Uganda. However, in addition to the PHC 2002 only the census in 1991 is easily available and stored as a well organized database in UBOS.

The PHC 1991 has the same questions as the PHC2002 concerning the households main source of energy carrier for lighting and cooking, but the PHC 1991 operated with two main types of questionnaires. Since a questionnaire requesting less information on the housing conditions was used in the rural areas, the information on energy source for lighting and cooking can not be obtained for rural households from 1991. Comparison of data for urban areas for 1991 and 2002 may be possible, but changes of administrative boundaries as well as changing understanding of the term urban may limit the possibilities. See Annex 2 for more details/metadata

5.2.2 Uganda National Household Surveys (UNHS)

The UNHS 2002/03 is the most recent completed countrywide survey on household and housing conditions in a series of 7 starting from 1992/93. A new round of UNHS is carried out during 2005.

The series of UNHS is the most comprehensive source for information on the household use of energy that covers the whole country and that is repeated as often as every 2-3 years.

The survey of 2002/03 and 2005 have a sample size of about 10 000 households located in approximately 1 000 enumeration areas. The survey covers the entire country and it is designed to generate estimates for the whole of Uganda, for urban and rural Uganda as well as for each of the (statistical) regions of Uganda (Central, Eastern, Northern and Western region). For the 2002/03 UNHS estimates for most variables can also be obtained for Mbale, Lira and Mbarara district due to a fairly large sample size.

Urban area: Refers to a functional unit of area. UNHS 2002 has adopted a pragmatic definition of urban areas based on a combination of administrative criteria and population size. According to this definition, all areas within the administrative boundaries of a City, Town or Municipality Council are defined as Urban (like the PHC 2002 definition). The additional population size criteria define areas (EAs) with at least 2,000 resident persons for an urban area. This additional criteria is not precise, since there are no area, density or distance criteria directly linked to the population size.

Household: Refers to a group of persons who normally eat and live together.

UNHS 2002/03 and 2005 have each a total of three modules of which the socioeconomic module and the community survey module are the most relevant for input to energy statistics.

The socioeconomic module has questions about the household's main energy carries for lighting and cooking. These questions are also included in the 2005 survey and are the same as those used in the PHC2002 and 1991.

The socioeconomic module for both 2003/04 and 2005 comprise questions about household consumption of energy by carrier in monetary and physical values. Also questions about purchase of electricity-based goods are included.

Special questionnaires for household-based industries are developed for several types of industries. Related to energy supply issues the questionnaire for households engaged in forest activity is the most relevant since it asks for values and volumes of firewood sold or consumed as well as current stock.

The socioeconomic questionnaire of the UNHS 2005 captures the same energy related issues as the previous survey. However from the UNHS 2005, the survey is strengthened on energy issues with a few new but very important questions. These will capture the household's use of different types of cooking technology and also better capture possible changes of use of energy carrier for a specific household over time. Also petroleum use for local generation of electricity will be captured from 2005 onwards.

The direct relevance for energy issues in the community survey of the UNHS 2002/03 is a question on the existence of electricity in the community in the survey year as well as two specified earlier years.

The Agricultural Module of the UNHS determines crop and livestock production on household based farms at the regional level. The agricultural module of the 2005 survey included questions about number and species of trees planted which could provide some useful background information on potentials for future biomass supply. See Annex 2 for more details/metadata.

5.2.3 The National Service Delivery Survey

The most recent National Service Delivery Survey (NSDS) was conducted in 2002. This is the third in a series of such surveys that started with a Sentinel Community Surveillance in 1996.

The NSDS 2002 had two modules that covered all the 56 districts in Uganda.

A total of 18 000 households were selected for the whole country in 2004. Each districts had at least 30 Enumeration areas per districts with 10 households randomly selected within each EA. The sampling was based on the PHC2002 as a frame.

The selected households were interviewed on household consumption expenditure, purchased-, home produced- and freely received types of energy by carrier. Also price per energy unit was assessed.

A separate questionnaire was developed for the providers of services. This includes questions about projects of electrification of the community for the year 2003 and the current status of this electrification project. Though this survey includes aspects of

energy use, it did not collect useful information for analyses. See Annex 2 for more details/metadata.

5.2.4 The Uganda Business Inquiry (UBI)

The objective for the 2000/01 UBI is to compute value added for estimation of GDP, to obtain information for estimation of capital formation and updating input-output tables. However, not much information on energy could be derived from the Business Inquiry.

The information most relevant for energy issues is monetary values of costs/purchase on electricity and also for some industries sector purchase of fuel and lubricates. See Annex 2 for more details/metadata.

5.2.5 Consumer Price Index (CPI)

The consumer price index is calculated at a monthly basis from the average retail market price for six urban centers of Kampala, Jinja, Mbale, Masaka, Mbarara and Gulu. There are separate lines for monthly fuel-wood, charcoal, paraffin and petrol prices. Annual headline inflation rate and monthly inflation rate are available that provides integrated information on price changes that includes energy component.

5.2.6 Permanent Agricultural Statistics Survey (PASS)

The PASS was conducted in 5 districts in 2004 sampling 720 farms per district. For 2005, it is conducted in 10 new districts. At the present there is funding available for 2 more years of annual surveys of 5-10 districts per year.

PASS 2005 includes questions about cutting of trees for fuel-wood and charcoal production. Sale of wood-based biomass is determined in volume and price. See Annex 2 for more details/metadata.

5.3 Other National Surveys

5.3.1 The Biomass Survey

The National Forest Authority (NFA), under the Ministry of Water, Lands and Environment has now the responsibility of continuation of the former National Biomass study.

The National Biomass Study started in 1989 and has developed through several phases.

The Biomass Survey is an area frame based survey. During Phase 2 of the project, a systematic sampling with over 3 000 grid intersections with 3 sample plots at each intersection in a 5 by 10 km grid was adopted. Plots were visited for field observations of three heights, diameter of the stem etc. Also general information of land cover/land use on each plot was recorded during the fieldwork. A sub-set of plots were revisited after a few years enabling for calculation of biomass growth rates.

The survey provided baseline statistics for biomass volume and also growth rates representative for the years around 1995 for the whole of Uganda with possibilities for breakdown at regional and district level.

Later re-visiting of the sample-plots is the basic for ongoing updating on the volume changes of biomass in Uganda (National Biomass Study 2003)

5.4 Administrative data

5.4.1 Electricity Sales and the Grid-distribution Net

The Uganda Electricity Distribution Company Ltd (UEDCL) collects information about consumers and sales of grid-electricity through its administrative routines. Data are usually collected at the local sales offices. UBOS collects from UEDCL annually aggregated national key figures i.e. number of units sold as well as consumers by main activity class and these figures are published in the UBOS Annual Abstract. The most recent figures published are from 2003.

From March 2005, the distribution of electricity and the maintenance of the grid that connected to the end users (up to 33kV) was taken over by the private consortium UMEME and thus UEDCL remains only with some responsibility for monitoring of the distributive activity. UBOS has taken steps to have agreements on continued access to sales statistics from the new consortium.

The flow of sales statistics from each local distribution office into the central office in Kampala is now fully computerized and transmitted via Internet to a central databank (Communication from Mr M. Sewagudde UMEME 27/5-2005).

Information about the capacity and physical extent of the distribution grid net up to 33 kV is documented on analogue technical /schematic maps for each local distribution office and there are plans for digitizing the distribution net and thereby implementing GIS in the organization (Communication from Mr. S.B Balaba UMEME 27/5-2005).

5.4.2 Import and Sales of Petroleum Products

Ministry of Energy and Mineral Development (MEMD) compiles national figures for sales of petroleum products by type based on information received from the private oil companies operating in Uganda (Communication from Mr J.B. Twodo MEMD, 2/6-2005).

UBOS publishes national figures in terms of cubic meters sold of petrol, aviation fuel, diesel, fuel oil, kerosene and LPG in the Annual Abstract. The most recent figures published are from 2003. Regional breakdowns of statistics are not available in UBOS as well as in MEMD.

5.4.3 Total Production of Round-wood Timber and Charcoal

The Forestry Department under the Ministry of Water, Lands and Environment provides UBOS with annual national figures in terms of weights of total production of round-wood timber and charcoal. The statistics are provided for the end user groups such as; household, commercial and industrial groups for each of the products; fuel wood and charcoal but disaggregated in monetary and non-monetary production. The most recent figures published are from 2003 (UBOS Annual Abstract, 2004).

5.5 Geographical data/GIS

5.5.1 The Cartography Section of UBOS

This section has as its main responsibility to provide cartographic information for Censuses and Surveys conducted by UBOS. The section is currently updating digital administrative boundaries for the whole country. At the present, digital administrative boundaries down to Parish level for the year 2002 are available, although not all datasets are yet cleaned and correctly geo-coded for practical use.

In addition to own production, the section also compiles and stores thematic layers of digital information for statistical use, produced by other institutions (Communication from Mr. B. Muwezi UBOS 30/5-2005). See Annex 2 for more details/metadata.

5.5.2 Data on Biomass Resources

The former National Biomass Survey and related mapping project is now organized as an office under the National Forest authority (NFA). This office comprises a GIS unit that is currently working on updating the digital series of land cover/land use maps established around 1990-95. This office also produces digital layers of main roads, lakes and rivers and agro-ecological zones. Thematic maps are available for sales (Communication from Mr. P. Drichi NFA 30/5-2005). See Annex 2 for more details/metadata.

5.6 Data from Ad-hoc Projects, Research and Market Analyses

Data from large and smaller projects and research work relevant for energy issues are continuously being produced. This can range from in-depth studies of household use of energy linked to socioeconomic and health impacts in small selected geographical areas to market assessment surveys representative for counties and even for entire selected districts. The mission got useful background information from research reports from the GTZ funded Energy Advisory Project in Masindi and Bushenyi districts and also from the UBOS/EDF Socioeconomic report from the Energy Survey from Kalangala district. From those two projects it was possible to get useful background information such as socio-economic characteristics, energy efficiency for different cooking technology, conversion factors and even digital maps and layers could be extracted. See Annex 2 for more details/metadata.

6 A core set of indicators established for the energy sector

6.1 Introduction

This chapter comprises the result of an assessment of national indicators established by MEMD for the energy sector, for which UBOS should be the main provider of input data.

6.2 Indicators for which UBOS should be a main data provider

A thorough documentation and recommendation for indicators for the energy sector is available in the form of a manual on preparing the impact analysis on the energy policy's implementation (MEMD 2003). The objective of the manual is two-fold:

1. To establish a sustainable and simplistic monitoring system for annual assessment of the impact of the policy, and
2. to derive a core set of indicators.

The study has been conducted under the Energy Advisory Project supported by GTZ.

The manual initiated by MEMD on indicators ended up with a preliminary recommendation for a total of 48 indicators and a simplified system for compiling information from several institutions and key persons at an annual basis. The recommended indicators cover mainly the supply side spanning from good governance, socioeconomic and environmental issues. The indicators are all quantitative and feed mostly into the outputs/intermediate out comes part of the Ministry of Finance and Economic Development indicator model approach with inputs, process, outputs, intermediate out comes and final outcome indicators (MoFPED, 2002).

Several visits to stakeholders' institutions and discussions with key officials/technicians and advisors on energy related issues were conducted during the mission in May/June 2005 and also during an earlier visit to Uganda in January/March 2005. As a result of these visits the focus of the study was, in addition to look at the above mentioned 48 indicators, influenced by some additional relevant indicators and data needs expressed by discussion partners.

Out of the indicators provided by MEMD and/or discussed during the mission, a subset of 11 indicators is listed below. UBOS is expected to be the main data provider or at least should be able to provide substantial supplementary data.

Selected indicators where UBOS should be a key provider of statistics

Link to policy objective	#	Indicator	Data provider(s)	Origin of indicator
Make modern energy affordable everyone (objective)	1	Share of the electricity bill on the average household's expenditure	UECDL/ UMEME	MEMD 2003*
	2	Share of the electricity bill on the poorest quintile's per-household expenditure	UBOS	
Increase access to modern energy in rural areas and connect more customers to the grid (objective)	3	Grid electrification rate of households		
	4	Grid electrification rate of rural households		
	5	Inequality of per capita electricity consumption by regions (average deviation)		
	6	Per capita supply of primary energy		
Improvement of economic performance (objective)	7	Petroleum imports as a % of total export value	UBOS	
	8	Petroleum imports as a % of total imports		
	9	Correlation coefficient between the trends of petroleum imports and trade balance		
Promote the use of renewable energy (RET) and efficient technologies	10	Adoption rate of efficient biomass stoves	UBOS MEMD	MEMD 2003*
Sustainable management of biomass resources (objective 1) Reduce women's workload (objective 2)	11	Average distance traveled to collect firewood	UBOS	PEAP III Discussed during the missions 2005

*Manual on preparing the Impact Analysis on the Energy Policy's Implementation

The characteristics of the use of energy should be well covered according to the Energy Policy (MEMD 2002).Therefore it can be argued that the supply and demand indicators listed above as far as possible should be supported by matching information on the use of energy by sector and carrier. UBOS would be a key provider of such information based on censuses and a variety of surveys conducted at regular intervals of time.

According to the Electricity Act 1999 and the Rural Electrification Plan of 2002, the overall objective of the energy policy in Uganda is to achieve equitable regional distribution access to electricity. This will obviously require extensive regional breakdowns of the indicators. In this report, the understanding of regional breakdowns is based on the 4 statistical regions of Uganda; Central, Western, Northern and Eastern Region. However, since districts administrations and their planning units are important stakeholders and decision makers in Uganda, indicators would be even more useful if they were provided at the district level or lower levels.

6.3 Statistics needed for quantification of the indicators

In this chapter data availability for the 11 selected indicators is as far as possible specified by source/variable and characterized by timeliness, possibilities for regional breakdowns and a subjective evaluation of transparency.

Share of the electricity bill on the average household's expenditure / share of bill of the poorest quintile of households (Indicator 1-2)
These indicators are suggested to be quantified based on information compiled through the UNHS on purchased electricity in the last 30 days as a part of the total household expenditure. One should be aware that the reference period of 30 days in the UNHS questionnaire may introduce difficulties if billing of electricity is not done on a monthly basis. Statistics derived from UNHS should be representative for Uganda total with regional breakdowns. Based on experience with UNHS up to now, repeated surveys can be expected every 2-3 years to generate the required data to measure the indicator.

Summary table for indicator 1 - 2

#	Data needed	Data availability			
		Source/ Variable	**Update frequency**	**Lowest level breakdown**	**Transparency /objectivity**
1	Total expenditure in households with purchased electricity	UNHS Household total expenditure last 30 days total	Every 2-3 years	Statistical region	Good
	Total consumption expenditure on purchased electricity in households	UNHS Household purchased electricity last 30 days		Urban/rural	The billing periodicity may cause difficulties

Grid electrification rate of households/rural households (Indicator 3-4)
Total number of households and an approximate number of households with grid connection are easily derived from UNHS. Again there is a possibility for not capturing all households that purchase electricity if the billing frequency is not monthly. Therefore, using this variable for number of households connected to the grid may be slightly inaccurate. The urban/rural distribution of households should be easily available through UNHS.

An alternative approach for quantification of grid electrified households would be to use statistics for households connected to the grid from UMEME sales statistics. However, this source also may have its weaknesses. Several households can be connected to the same electricity-meter and thereby they are registered as a single subscriber. An accurate determination of the urban rural distribution of subscribers in the UMEME sales register may also turn out to be problematic. However if UMEME through its local offices are able and willing to solve these problem, this source should be the most accurate and above all the most dynamic for quantification of number of households connected to the grid.

The UMEME sales/distribution districts may not completely match the administrative districts. However, this is not expected to cause major problems as long as statistics are presented at national and regional level.

Accurate information on total number of households should be derived from the PHC censuses every 10 years. By introducing a specific question about household connection to grid and/or by improving the present question about main source for light to allow for specification of "grid based electricity" in the future PHCs, an accurate quantification of grid electrification rates could be done for all regional breakdowns down to enumeration areas every 10 years. Adjustments of previous time

series of the actual indicator should be considered as new census results become available.

Summary table for indicator 3 – 4:

#	Data needed	Data availability			
		Source/ Variable	**Update frequency**	**Lowest level breakdown**	**Transparency/ Objectivity**
3-4	Total number of households	UNHS Total number of households	Every 1-3 years	Statistical Region Urban/rural	Good
	Total number of households with purchased electricity|	UNHS Household purchased electricity last 30 days	Every 1-2 years	Statistical Region Urban/rural	
	Total number of households connected to the grid	UMEME Number customers (el-meters) x estimated number of households per meter	Every year	Distribution district	Expected difficult to get customer statistics on urban/rural distribution. Also difficult to estimate # of households connected per meter

Inequality of per capita electricity consumption by regions (Indicator 5)
This indicator should be derived annually by combining information about the total population from PHC with total sales statistics from UMEME. Extrapolation for the size of the population at district level for 2003 and 2004 is available from UBOS (Annual Abstract, 2004).

The weakness of this calculation would first and foremost be the quality of the population extrapolation, especially if the indicator is provided at region or district level for other years than the actual census year. The introduction of a continuously updated population register would increase the quality of this indicator, but recommendation for register work is outside the scope of the present study.

Summary table for indicator 5

#	Data needed	Data availability			
		Source/ Variable	**Update frequency**	**Lowest level breakdown**	**Transparency /objectivity**
5	Total population by region	PHC/Annual Abstract extrapolation of population size at region or district level	Every 10 years with possible annual extrapolations	District Urban/rural (Enumeration area every 10 years)	Good every 10 years Extrapolation reduces quality increasingly over time
	Total electricity sold/consumed by region	UMEME Sales statistics	Annually	Distribution district	Good

Per capita supply of primary* energy (Indicator 6)
The problem on how to achieve high quality population statistics in the years between the PHCs, are the same as those described above. However, for this indicator the lack of comprehensive and timely statistical surveys covering supply of primary energy is even more important.

Unfortunately there is no continuously updated statistical survey giving information on fuel-wood or charcoal (primary energy) that comprises the total amount of fuel-wood/charcoal supplied or used in Uganda. More specifically this means that timely survey data from non-household-based industries and institutions are incomplete or missing hereunder fuel-wood for brick burning and charcoal production. This is a serious lack of information in a country where biomass is the main carrier of energy and where shortage of access to biomass based energy can be expected in many districts due to years of over exploiting. Actions should be taken by main stakeholders like MEMD, NFA and UBOS to bridge this information gap as soon as possible

Until further this indicator will have to be based on administrative data/estimates provided annually by NFA and published by UBOS (Annual Abstract 2004).

Summary table for indicator 6

#	Data needed	Data availability			
		Source/ Variable	**Update frequency**	**Lowest level breakdown**	**Transparency /objectivity**
6	Total population	PHC	Every 10 years with possible annual extrapolations	Region District Urban/rural	Good every 10 years Extrapolation reduces quality increasingly over time
	Supply of primary energy*	NFA for all sectors supply UNHS for household based use	Annual estimates from NFA Every 2 years from UNHS	Uganda total	Incomplete

* Primary energy= the term is here used as fuel-wood and charcoal

Petroleum imports as % of total export value, total import value and correlation between the trends of petroleum imports and trade balance (Indicator 7-9)
These indicators should be based on well established systems for data capture and since they are provided only at the national level, they should be easy to quantify in an objective and transparent manner.

Summary table for indicator 7-9

#	Data needed	Data availability			
		Source/ Variable	**Update frequency**	**Lowest level breakdown**	**Transparency /objectivity**
7-9	Petroleum imports in monetary values	Uganda Revenue Authorities and UBOS	Annual	Uganda total	Good
	Total export in monetary values	Uganda Revenue Authorities and UBOS			
	Total import in monetary values	Uganda Revenue Authorities and UBOS			

Adoption rate of efficient biomass stoves and Average distance traveled to collect firewood (Indicator 10-11)

A few but important adjustments of the content of the socioeconomic questionnaire related to these two indicators were introduced in the UNHS 2005/06 i.e. new questions about hours spent for fetching fuel-wood and on type of cooking technology used by the households. These questions refer to the time of the interview and also to the situation in 2001. Therefore the two indicators can be calculated onwards from 2005 and if response rate and quality of data allows also for the year 2001. The indicators should be strengthened with breakdowns at regional level and at urban/rural areas.

If a similar question is introduced also in the future PHCs, indicators should be calculated down to district and sub-county/parish level to provide local administrations and other with data for planning and monitoring.

Summary table for indicator 10 and 11

#	Data needed	Data availability			
		Source/ Variable	**Update frequency**	**Lowest level breakdown**	**Transparency /objectivity**
10	Households with fuel or charcoal stoves as primary technology for cooking total	UNHS 2005 Households with charcoal, firewood, cow dung/grass or biogas stoves total	2-3 years	Region	Good onwards from 2005
10	Households with improved biomass stoves.	UNHS2005 Households with improved charcoal stove, with improved firewood stove, with saw dust stove or biogas stove	2-3 years	Region	Good onwards from 2005
11	Household interview on the estimated distance for fetching firewood	UNHS 2005	2-3 years	Region	Good onwards from 2005

7 Energy and poverty, analyses and data gaps

7.1 Introduction

The objective of this chapter is to illustrate how available data can be used to link access and use of energy to poverty in Ugandan households. On basis of analyses, we aim to identify and discuss gaps in data availability in this field. The chapter starts out with a brief theoretical discussion on the linkages between energy and poverty and is meant to serve as a motivation for the following analyses. For supplementary information about this theme consult for example Celeski (2003). The remaining of the chapter will focus on analyses and data gaps.

Energy is not the goal in itself but good energy carriers and better equipment can improve quality of life as well as ensure income generation. The poor are often restricted in terms of economic or physical access to good energy carriers. Typically they rely on firewood or charcoal for cooking, and paraffin for lightening. In addition, the equipments utilized by the poor are often inefficient and pollutive. In Uganda it is common to use the three-stone fireplace when cooking with firewood, the metallic stove (sigiri) when cooking with charcoal, and tadooba for burning paraffin. Pollution and inefficiency in utilization of energy could be substantially reduced by shifting to improved stoves and to lantern or to electricity lighting. There are several aspects of welfare that improved energy carries (in terms of both type and equipment) can affect. Below is a summary of the main ones.

Basic consumption needs; access to better energy carriers can make housework easier and electric lighting contributes to convenience, safety, possibility to study and accomplish house-, and other work after dark.

Health; pollution from firewood, charcoal and paraffin; problems related to carrying loads of firewood; boiled drinking water; access to clean water through pumping; storage of medicine in refrigerator (health center).

Gender; women are generally responsible for tasks related to energy use and do often spend hours collecting firewood. Time spent for collecting firewood could alternatively be used for productive pursuits, education, and leisure. Shift to less polluting energy carriers or improved stoves for cooking are envisaged to benefit women, since they often are responsible for cooking.

Education; electricity makes it easier to study after dark; improvement of schools by access electrical teaching aids.

Productive/income generating activities due to electricity; possibility to engage in productive work also in evenings; establishment of household micro-enterprises like workshops and saloons; employment creations due to establishment of electrified enterprises.

The optimal approach for analyzing the *impact* of improved energy on poverty would be to follow up households over time, before and after they start to use for example electricity. One would need time series covering information on households and community welfare prior to, and after electricity became available, to analyze if there

are any changes that can be linked to electricity use. Some effects may only be visible after some time of electrification, and some of the expected effects may be difficult to detect at all, for example the effect on education.

Since no national time series covers energy and poverty in Uganda, the study is only able to do cross sectional comparison and analyses. In the following analyses, the Uganda National Household Survey 2002/03 results have been mainly used. From the household surveys one obtains statistics on use of energy and poverty status. This information will in general be representative on regional/strata level, but for a few district also on district level. Some of the analyses are based on the Census 2002, having the advantage of covering all households on Uganda. The census does not cover information on household poverty status. When the poverty mapping for 2002 is completed one can, however, link poverty to energy consumption at disaggregated levels.

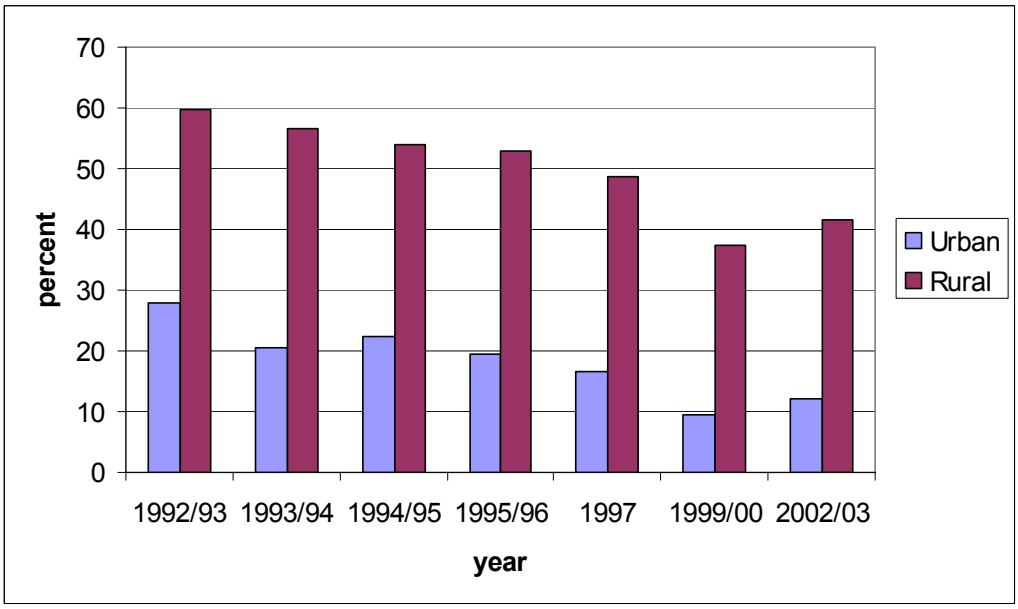
The objective of this study has been to identify data gaps as well as to sketch ways for using available data to analyze relations between energy and poverty. Thus, we have chosen not to dwell too much on the empirical findings, and we have aimed to reduce the tasks of processing large amount of data. Hence, for some of the statistical analyses based on the household survey we do not report the results for each of the regions in Uganda, but focuses only on one of them. As for the Census we have focused on only one district.

The analyses are divided into three sections. The first and main one is concerned with energy usage and welfare at household level. The second covers some issues on energy usage and community welfare. Finally, the third covers aspects of energy usage and establishment of businesses. Additional figures used for the analyses in this chapter are found in the tables in Annex 3.

7.2 Energy and poverty in households

From 1992/93 to 2002/03 a number of household surveys were set through in Uganda. From these surveys one can obtain both energy usage and poverty status. Figure 7.2.1 illustrates that there has been a substantial decline in the poverty headcount ratio in Uganda over this period.

Figure 7.2.1 Poverty in Uganda, 1992-2003

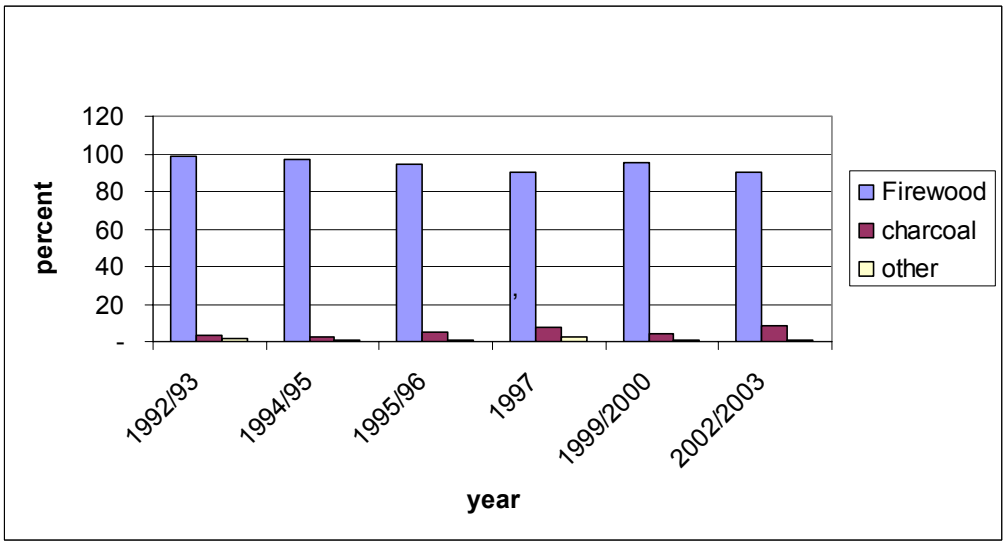


According to the Uganda National Household Survey (UNHS) 2002/03, 42 percent of the rural population and about 12 percent of the urban population had a consumption level below the national poverty line. In 1992 poverty reported by the expenditure survey was 60 percent in rural and 28 percent in urban. How has the decline in poverty affected energy usage in the Ugandan households? How is the relation between poverty and energy usage? In the remaining of this section we will illustrate some approaches for looking into these issues.

7.2.1 Main energy source for cooking

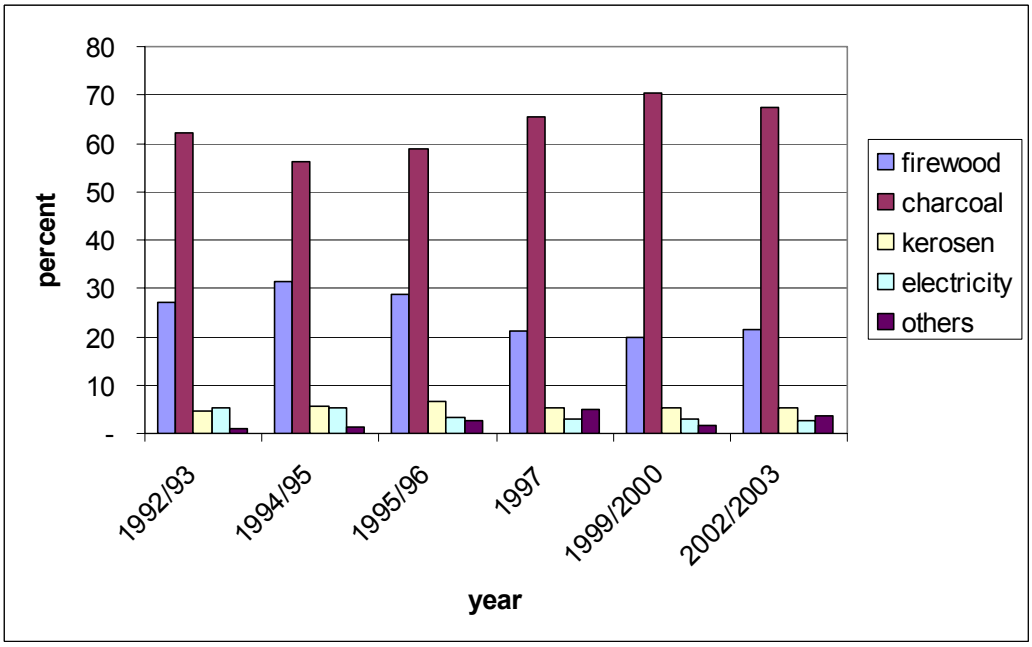
The households in the surveys were asked about the main energy source for cooking. Figure 7.2.1.1 illustrates that the most important energy for cooking in rural areas is firewood. Even though the share using firewood has decreased over the 10 years period, more than 90 percent of the rural households still used firewood for cooking in 2002/3. In 1992/93 almost the entire rural population, 98 percent, used firewood for cooking. The decline in the share of firewood users is mainly a result of increased use of charcoal. The other energy sources used for cooking; electricity, gas and cowdung, constitute only minor shares of total energy use.

Figure 7.2.1.1 Energy used for cooking, by type. Rural



In urban areas charcoal is the main energy used for cooking. The share using charcoal have increased slightly over the period from 62 percent in 1992 to 67 percent in 2002, see Figure 7.2.1.2. The second most important energy source in urban is firewood, constituting of about 21 percent of total energy consumption for cooking in 2002 and 27 percent in 1991. Use of electricity is declining from 5 percent in 1992 to 2.5 percent in 2002. Users of kerosene have increased by one percent over the period while consumption of gas for cooking in urban households is minor.

Figure 7.2.1.2 Energy used for cooking, by type. Urban



Even though there has been a substantial decline in poverty in Uganda, this has not been accompanied by a proportional decline in the share relying on wood based energy for cooking. In 2002/03 almost 100 percent of the rural household reported

that wood based energy was their main source of cooking. In urban areas almost 90 percent used wood based energy as their main source for cooking. Thus, wood is the primary energy source for cooking, and one cannot expect this to change fast although poverty is reducing. This makes it even more important to understand the linkages between usage of wood, poverty, and other factors. In the next section we suggest some approaches and data requirement for looking into these issues.

7.2.2 Suggestions for follow up analyses on wood based energy use and poverty

One of the problems that follow cooking with wood based fuel is pollution. In the health section of the UNHS 2002/03 the households were asked whether any members were sick due to respiratory problems last 30 days. In about 13 percent of all urban households one or more persons report that they suffered from respiratory problems last month, the corresponding figure for rural households was 15 percent. We analyzed the effect of energy use on health by estimating a probability model for whether anyone fell sick due to respiratory problems last month in the household. Explanatory variables included were type of energy used, indicator for type of kitchen (inside, outside (built), outside (makeshift) and none), meals taken per day in household, educational level as well as expenditure level in the households (to correct for general health), we also included dummies for district.

Analysis was conducted separately for urban and rural. For both strata, results showed that with the exception for the district dummies, use of firewood, was the only significant variable in the analyses. The effect of using firewood, however, explains very little of the variation between households. For rural households the probability that one or more persons in a household cooking with wood, suffered from respiratory problems last month was 0.15, compared to 0.10 for a household that did not cook with wood. For rural households, however, about 90 percent of all households cook with wood, which can explain the low explanatory power of the model.

For urban households the probability that one or more persons in a household cooking with wood suffered from respiratory problems last month was 0.15, compared to 0.12 for a household that did not cook with wood.

This type of analysis could be improved by including information on whether traditional or improved stove were used, and also by relating the analysis directly to the person responsible for cooking in the household. This information is not available in any of the national expenditure surveys so far. Information on type of stove used will, however, be included in the ongoing UNHS 2005/2006. Type of stove is also important for estimating efficiency in usage of firewood, which is an important concern due to the reduction in the biomass stock. MEMD/GTZ 2003 found that the amount of firewood burnt when using improved stove for cooking is about half compared to when one use the three stones fireplace. Using the improved charcoal stoves rather than the traditional sigri when cooking with charcoal increases efficiency by about 10 percent.

Figure 7.2.2.1 and Figure 7.2.2.2 show use of energy for cooking by poverty status. We have divided the households into five groups after total expenditure in households.

Figure 7.2.2.1 Source of energy used for cooking, by poverty status. Rural

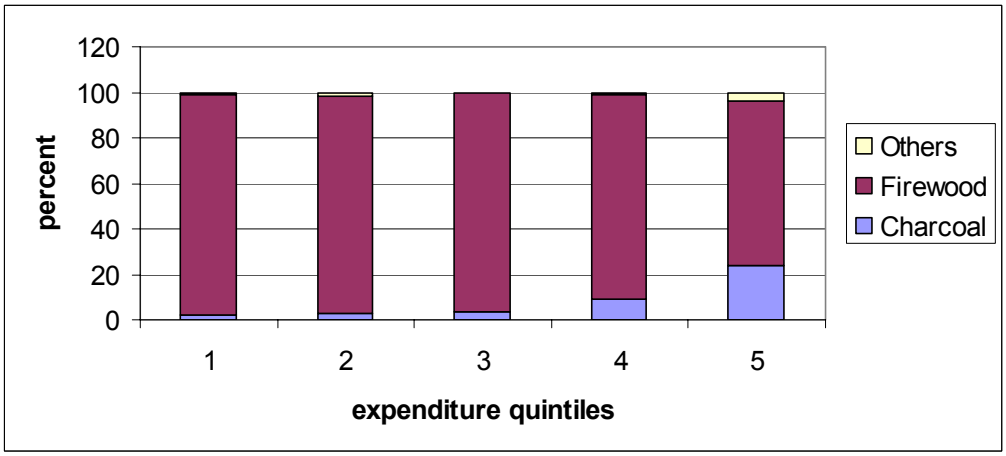
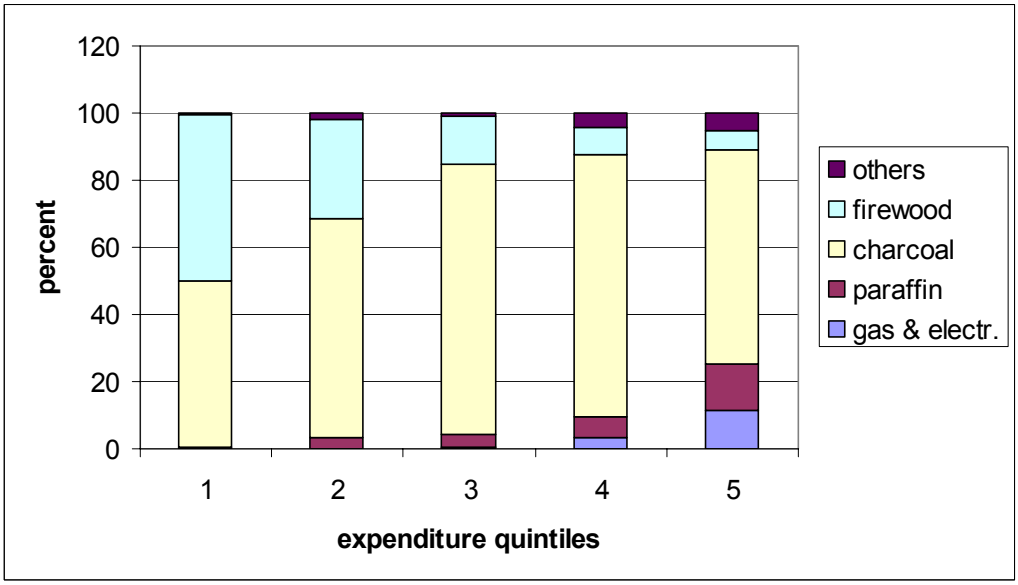


Figure 7.2.2.2 Source of energy used for cooking, by poverty status. Urban



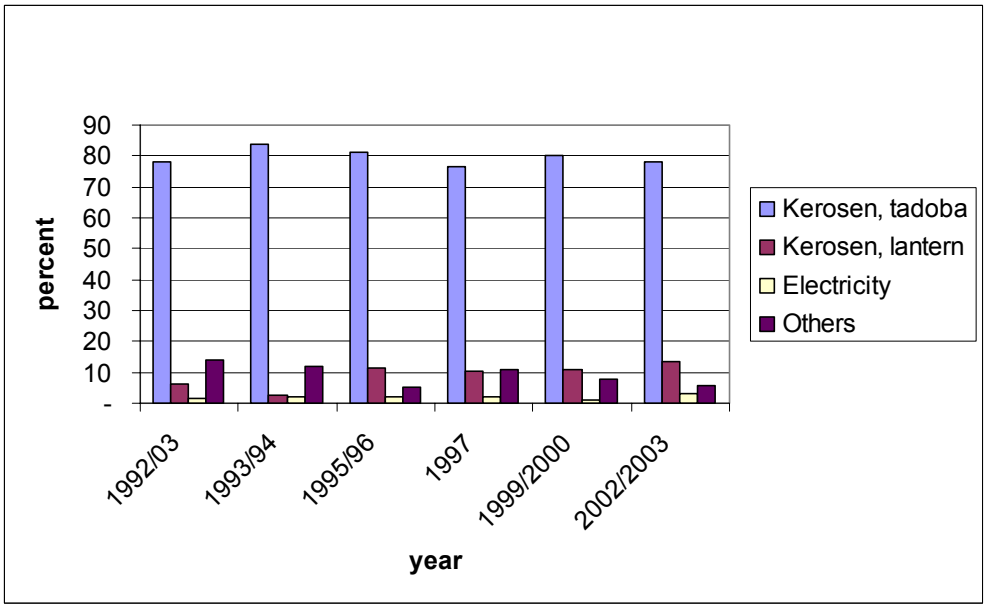
The figures show that the wealthier households in both rural and urban more commonly use charcoal. Firewood is the most important source for cooking for all welfare groups in rural, and charcoal is the most important source for cooking for all welfare groups in urban. Many areas of Uganda face increasing wood shortages. This shortage is likely to be more critical for the poor, since it means more time spent for collecting firewood and higher costs for buying firewood and charcoal. Information on time spent for collecting firewood is not available in the UNHS 2002/03 but will be available in the UNHS 2005/2006. Prices paid for charcoal and firewood could be derived from the expenditure section in the UNHS. The households are asked about the amount spent on electricity, paraffin, charcoal and firewood. For charcoal and firewood one reports the total value as well as units used. Units however, appear is in many variations, from kilos to sacks, bundles and bunches. These units may have different interpretation in different regions or district, hence one need to convert the

units into one common unit to be able to derive local prices and quantities used of each energy type.

7.2.3 Main energy source for lightening

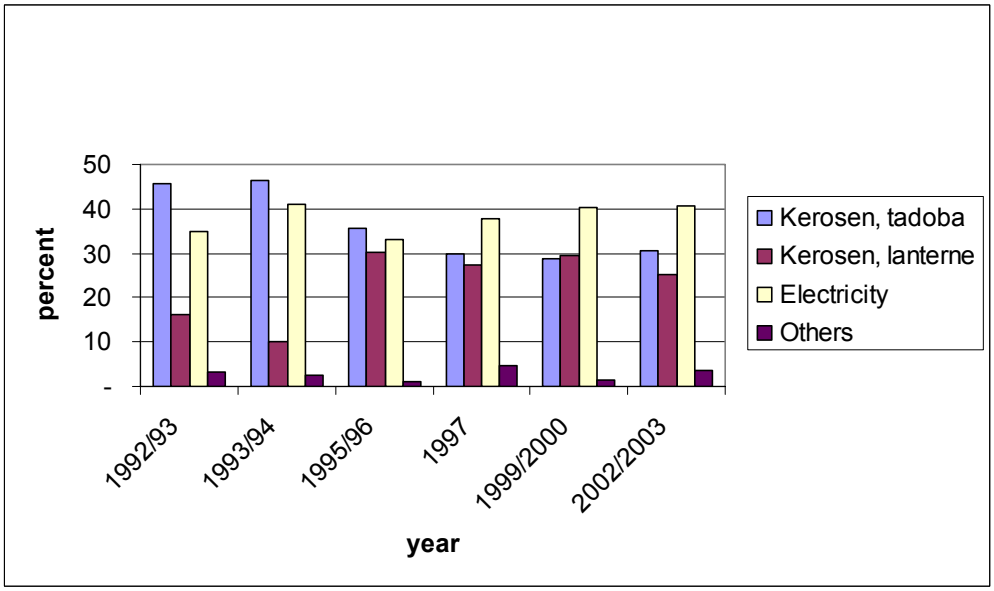
The single most important source for lightening in the rural households in Uganda is kerosene. More than 90 percent used kerosene for lightening in 2002. In 1992, about 84 percent used kerosene. Electricity usage increased slightly over the period but is still a minor source for lightening in rural areas. Only 3 percent used electricity for lightening. The switch to kerosene is mainly explained by a decline in use of other sources (mainly firewood). Kerosene is burnt in lantern and tadooba. Tadoba is most important, about 78 percent of the households used tadooba, while 13 percent used lantern in 2002. The share of tadooba users is unchanged from 1992 while usage of lantern has increased from 6 to 13 percent.

Figure 7.2.3.1 Energy used for light, by type. Rural



Also for urban households, kerosene is the most important energy for lightening, in 2002 about 56 percent reported that kerosene was the most important energy used for light, in 1992 this number was about 62 percent. The figure indicates that there has been a switch from tadooba to lantern. The share using tadooba declined from 46 to 31 percent over the period, while lantern users increased from 16 to 25 percent. The second most important energy source for lightening in urban is electricity, those reporting electricity as the main source for lightening has increased from 35 percent in 1992 to 41 percent in 2002.

Figure 7.2.3.2 Energy used for light, by type. Urban



Linking the trends in lightning and poverty reveals that the decline in poverty has been accompanied by a switch from tadooba to lantern. In urban areas the decline in poverty has also been followed by an increasing share using electricity, although the share using electricity has increased only moderately. In the next section we suggest an analysis for studying factors affecting the choice between tadooba and lantern. Later on we will return to aspects on electricity and poverty.

7.2.4 Suggestions for a follow up analysis on paraffin usage

The trend indicates that there is a tendency that the poor use tadoba and the more wealthy use lantern. Figure 7.2.4.1 and Figure 7.2.4.2 emphasize this showing type of energy used by welfare in household.

Figure 7.2.4.1 Source of energy used for light, by poverty status. Rural

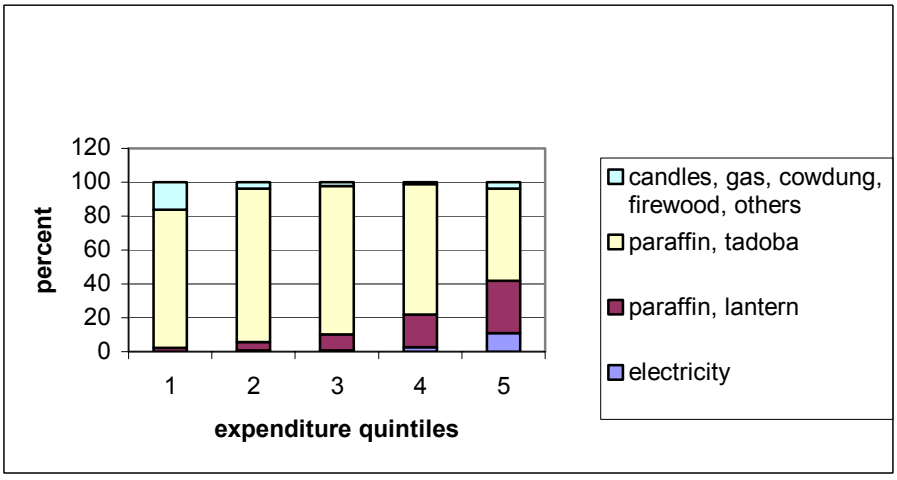


Figure 7.2.4.2 Source of energy used for light, by poverty status. Urban

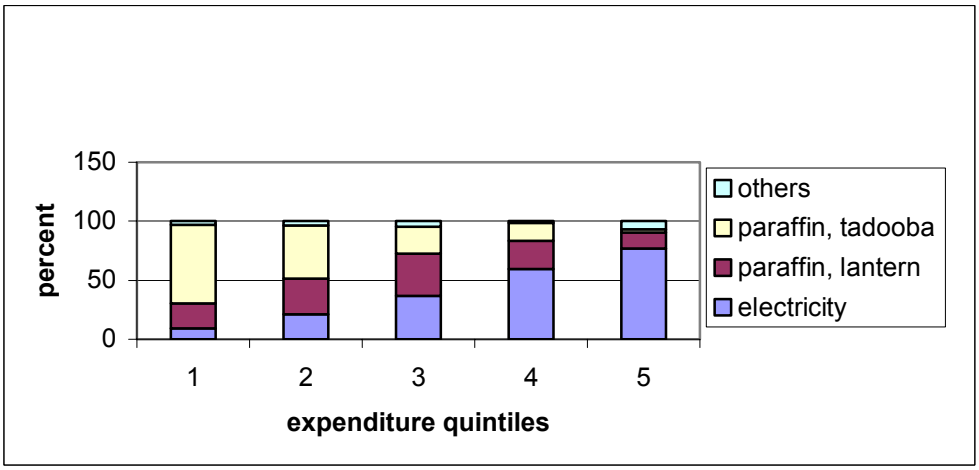


Figure 7.2.4.2 shows that even though the share using tadooba is highest among the poor, there are a considerable proportion of the wealthy in the rural areas that uses tadooba. One may wonder why, since a lantern costs about 8000-9000 shillings (2005) and should be affordable to the more wealthy income quintiles. One may want to investigate this in further details. What are the factors that affect whether households use the more expensive lantern or stick to the cheap, but unhealthy tadooba? We will, as an example, investigate this pattern for the households in the rural western region. The rural part of the western region had in 2002 an energy use pattern for lighting similar to that of the entire rural Uganda. In the Appendix 2, we report the result when modeling the probability that a household uses a lantern rather than tadooba. The basis for the analysis is all rural household in the rural Western region that reported that the main energy source for light was paraffin. The probability that an "average" household in the sample is poor is estimated to 0.15, i.e. a household with the average sample values for the explanatory variables. Table 7.2.4.1 below illustrates the effect of each of the explanatory variables by calculating two probabilities, one with a low value and the other with a high value on the respective variable, while the other variables are given the average values in the sample. For example, the effect of having a radio increases the probability of also having a lantern from 6 to 19 percent, compared to an identical household without radio. Radio aims to capture the effect of information, how well informed the households are in general and in particular on the detrimental effects of using tadooba. We also tried to include a variable for whether household had bought newspaper last week but it gave no significant effect. Education in household has the expected sign, household with highly educated members tend to use lantern, everything else equal.

Table 7.2.4.1 Probability of using lantern for an "average" household in rural Western Uganda

The effect of:		Prob. of using lantern
Radio	yes	0,19
	no	0,07
Max education	16	0,35
	0	0,06
Exp. To paraffin per capita	700	0,20
	200	0,10
Number of members in household	7	0,17
	1	0,09
Household expenditure per capita	100000	0,42
	10000	0,09

Expenditure on paraffin has a positive impact on the probability, i.e. household that consume more paraffin per adult equivalent also tend to have better equipment for burning the paraffin. Number of members in household has a positive effect on the probability that a household have lantern, everything else equal (recall that the expenditure variables are given per person). This can be explained by the fact that light is a good that all members can use at the same time, hence cost per person of buying the lantern decrease when the number of people in the household increases. Finally, expenditure per capita in household is unsurprisingly important for whether the household choose tadoba or lantern. The probability that a household with expenditure per capita on 10 000 Ushs uses a lantern is 9 percent, increasing the expenditure per capita to 100 000 Ushs, cet par, increases the probability of using lantern to 42%. We also included variables for gender; sex of household and whether there was a spouse in household, but these did not show significant effect.

7.2.5 Energy expenditure and poverty status

Figure 7.2.5.1 below shows that the poorest households use nearly 1/10 of total household expenditure[1] on energy, both in rural and urban. The share to energy falls with wealth in household, and the 20 percent wealthiest spend about 5 percent of their total consumption energy.

[1] Note that total consumption includes consumption of own produce, gift and barter.

Figure 7.2.5.1 Energy expenditure as share of total expenditure, by poverty status

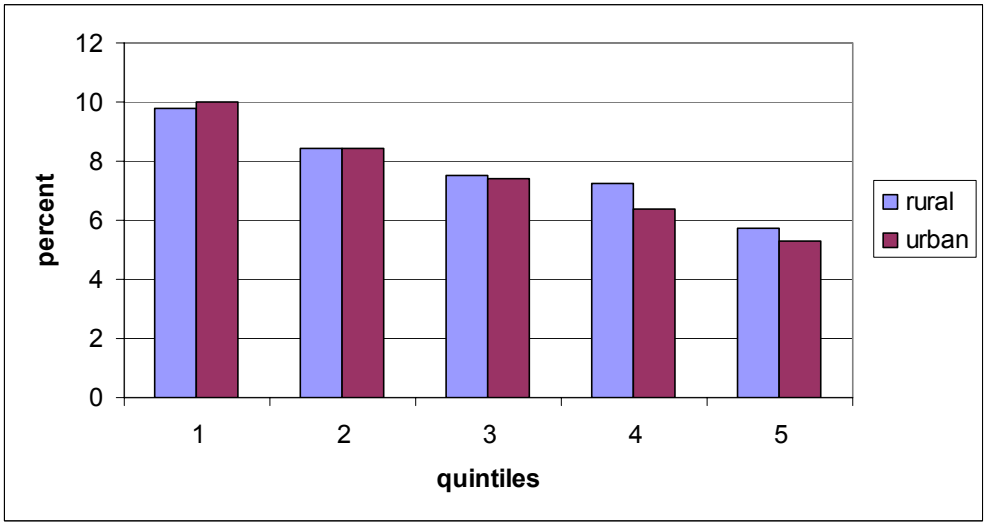
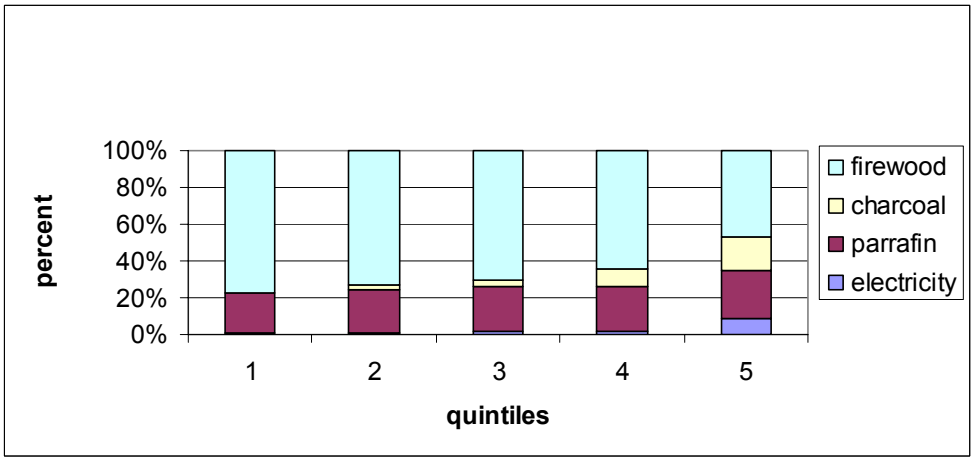


Figure 7.2.5.2 illustrates that for all poverty groups of rural households, firewood constitutes the largest share of total energy expenditure. The share spent on paraffin is approximately constant over the quintiles.

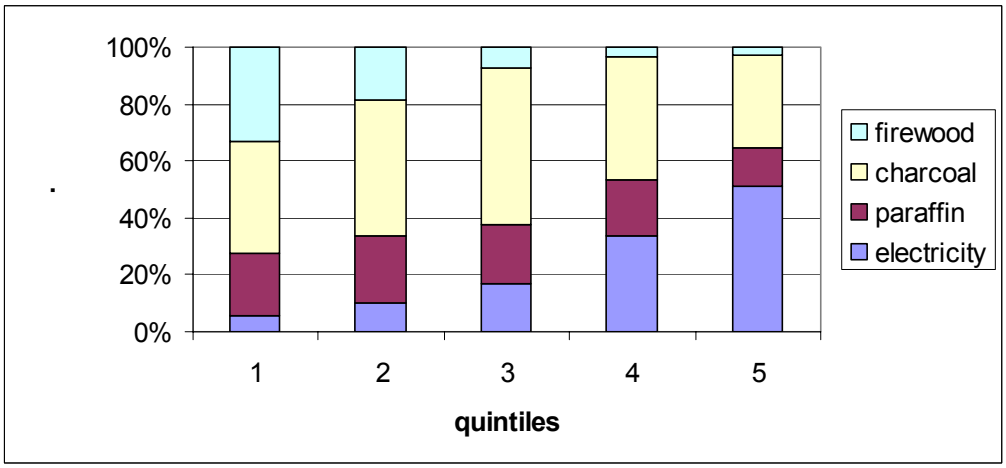
Figure 7.2.5.2 Share of total energy cost, by poverty groups. Rural



Since kerosene and electricity mainly are used for lightening and firewood and charcoal mainly are used for cooking the main share of the energy budget goes to cooking. The poorest use about 80 percent of their total energy expenditure to firewood or charcoal, this share is about 62 percent for the wealthiest households.

Figure 7.2.5.3 shows that, except the wealthiest, expenditure on charcoal constitutes the highest component of the energy budget for all poverty groups. The 20 percent most wealthy households the largest energy share of their energy budget on electricity. The share spent on electricity increases over the quintiles while the share spent on firewood decreases. The urban households spend in general a larger share of their budget on paraffin and electricity than the rural households; about 25 percent on the average budget for the urban poorest and more than 60 percent for the wealthiest.

Figure 7.2.5.3 Share of total energy cost, by poverty groups. Urban



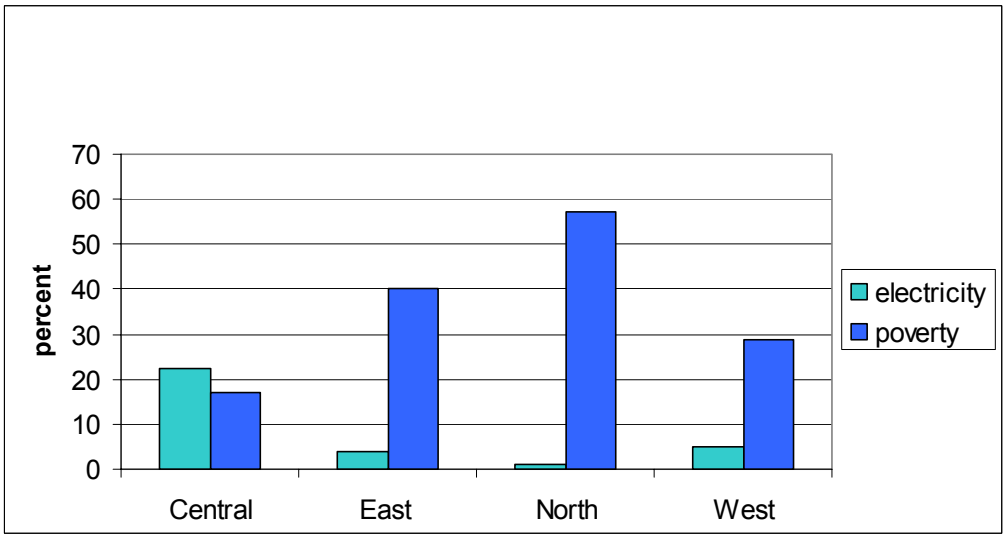
7.2.6 Does poor pay more per unit energy?

It is often envisaged that the poor pay more per unit energy. The argument is that they, due to their financial situation, have a short time perspective and are not able to buy large quantity and therefore cheaper energy. This could be analyzed by comparing the prices paid for energy by poverty groups, correcting for location, household size and other relevant variables. As described before it is possible to derive these prices from the expenditure section in the household survey, but this has not been done so far.

7.2.7 Electricity and poverty

According to the Electricity Act (1999) one main objective is to "achieve equitable regional distribution access to electricity". The next figure shows poverty rate and the share using electricity for lightening in each region in Uganda.

Figure 7.2.7.1 Share using electricity and headcount ratio in Uganda

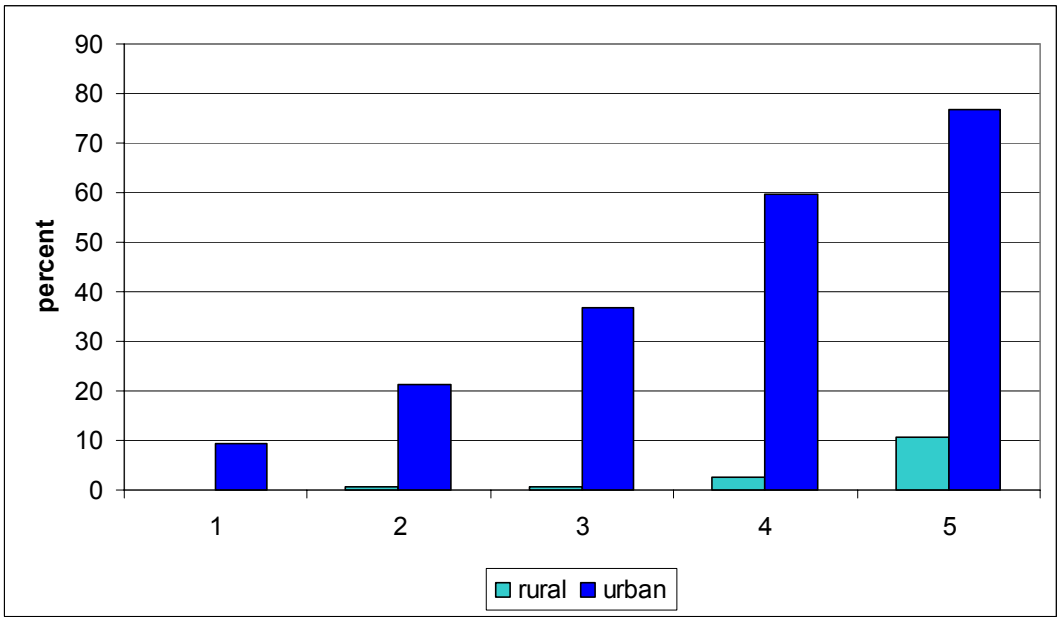


Northern region is the poorest with 57 percent below the poverty line, in this region 1 percent of the population reported that electricity was the main source for lightening. Central has the lowest poverty rate at 17 percent and also the highest share using electricity at 22 percent. Hence, it is clear that electricity is not uniformly distributed across the regions, but rather that the more wealthy regions have a considerable higher share of households using electricity.

Why don't households use electricity? One explanation is of course that there is no grid available in the area. In the UNHS there is a variable for whether there is electricity available in the community or not, but it is not specified whether this is grid or other sources of electricity. It would be an improvement to include a variable specifying whether the grid is available in the community, as I will return to later.

A second obvious explanation for not using electricity, even if grid is available, is the affordability of electricity. Figure 7.2.7.2 shows share of population using electricity by poverty groups.

Figure 7.2.7.2 Share using electricity for light, by poverty groups



The trend is clear; the share using electricity is increasing with wealth. Among the poorest urban less than 10 percent use electricity for lightening. Among the wealthiest almost 80 percent use electricity. In rural the total share of the population using electricity is small, about 3 percent, the trend is however the same as in urban with a relative high proportion of the wealthiest using electricity.

7.2.8 Follow up analyses on electricity

In this section we first aim to compare expenditure used on lightening by the poor to the cost of a minimum requirement of electricity. Such figures can illustrate whether the cost of electricity explains why the poor do not use electricity and also can be used to identifying possible price setting strategies to make electricity available for all.

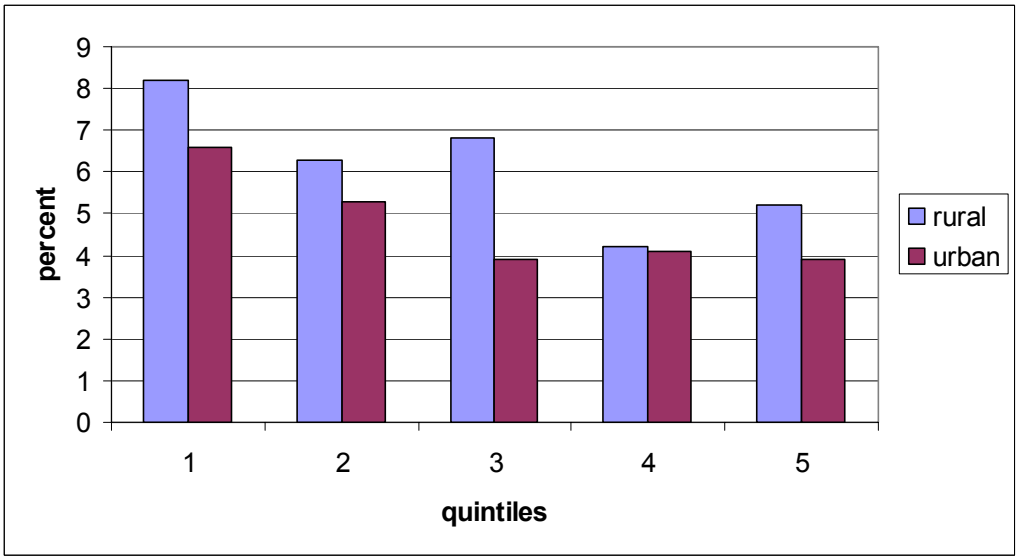
Following the absolute poverty line approach as applied in calculating the national poverty line in Uganda, one can use the information from the households near the poverty line as a guideline to identify the minimum requirement of energy. The basic idea is as follows. The poverty line consists of a food and a non food component. The food-poverty line component is based on the cost of requiring sufficient calories, the non-food component are the share to non-food for those whose total expenditure is near the food-poverty line. The argument is that these households have sacrificed necessary food consumption to acquire non-food and therefore that this level of non-food expenditure is the minimum requirement. Hence the energy expenditure for the households near the poverty line can serve as a guideline to the amount of the basic requirement of energy.

As discuss before, we have not been able to derive the quantities used of the respectively energies, but this is possible to do. When this is done, one can transfer the amount into kW by using energy equivalent values, see for example IEA (2001) and thus, one can obtain an estimate of minimum requirement of electricity.

Another approach is to set the minimum requirement by assuming that a household needs for example one electrified bulb. Given that a household has one bulb, 40 W, which they use from seven to eleven every evening, they will use 4800 W per month. The unit price per kilo Watt is 50 Ushs for usage below 15 kW. Hence, the cost of the single bulb comes to 240 UShs + 1000 Ushs (connection fee) + 17% VAT. Compare this to the median expenditure on light for the 20 percent poorest which was 1000 UShs in rural and 1200 in urban. The largest cost when it comes to electricity is the initial investment which is 190000 UShs, and in addition comes expenditure on equipment. This exercise, however, illustrates that the current cost of a bulb is attainable for most of the poor, but the initial investments are not. Another issue that would be interesting to look into is the occurrence of sharing a meter boxes. Families living in the same house sometimes share a meter box and therefore the cost of the connection fee and the initial investment costs. We do not, however, have information on this.

Figure 7.2.8.1 shows the share of total expenditure spent on electricity for those households that reported any expenditure on electricity. Very few of the households that use electricity use it for cooking (only a few among the wealthiest), hence, those among the poor that use electricity spend a much higher share of their budget on energy than those who do not use electricity. Recall from figure 7.2.7.2 that the poorest quintile spent about 10 percent of the budget on energy (of which the main contribution comes from expenditure on energy used for cooking), while those using electricity spent about 8 percent only on electricity (in addition comes fuel for cooking). It would be interesting to obtain additional information on what electricity is used for in the household, and how it comes that some poor actually choose to spend such a large share of their budget on electricity. There are, however, only few households among the poorest that used electricity, respectively 18 of the rural and 68 of the urban.

Figure 7.2.8.1 Expenditure on electricity as share of total household expenditure, by poverty status



It is clear from the figures above that use of electricity is strongly linked to economic welfare of a household. Hence, it would be tempting to study the relation between income and electricity further. What is the magnitude of the income effect on the

probability that a household uses electricity, controlling for other factors? This is, however, complicated since income may increase as a result of use of electricity. Availability of electricity facilitates setting up household enterprise that requires electricity and it frees time that can be used for other productive activities. To be able to study the impact of electricity on household income one would preferable need to follow up household before and after they get electrified. Such data are not available. In the UNHS 2002 there is, however, a variable that indicates how long time the community have had access to electricity; if electricity was available in community before 1992; if the community got access to electricity between 1992 and 1996; between 1996 and 2002; or whether electricity is not available in community. We tried to include this variable in the regression analyses explaining expenditure. The idea is to include only households that used electricity, for these households one can define a model with variables that are important in explaining expenditure as well as a dummy for whether the community the household belonged to had access to electricity in each the three periods as mentioned above. It turned out however, that the number of households that started to use electricity after 1992 were too few to do a meaningful analysis. This type of study, however, could be followed up if one had information on when household got electricity and preferably also, what electricity was used for.

7.3 Energy and poverty in communities

So far we have looked at energy usage related to welfare in household. In this section we look at energy usage related to welfare in community. One aspect of energy use that is not necessarily reflected in household welfare is the quality of community services, like schools and health centers. In the introduction we argued that electricity in such institutions would improve the welfare for the users. We do not have information on whether schools and health centers are electrified, which would be an improvement of the data on energy and poverty. Another aspect of energy and poverty in community is the extent of trickle down effects. The most obvious example is the creation of employment due to establishment of electrified enterprises. We have tried to look into this with the available data; the table below shows that there is a negative correlation between the poverty rate in communities (LC1) and availability of electricity. Communities with electricity tend to have a lower poverty rate. This correlation is significant for all urban regions with exceptions of North. It is also significant for rural Central and Eastern region. The negative correlation is a support for the hypothesis that the communities with electricity are able to generate more wealth, which can be due to household enterprising and larger enterprises in community. The other explanation, however, it is that it is the more wealthy communities that get access to electricity. This tendency should be investigated in further details, by following up communities that get access to electricity. The relation between poverty rate and availability of electricity get stronger when including dummies for districts in the analyses (linear regression analyses).

Table 7.3.1 Correlation coefficient between headcount ratio and availability of electricity in local community. 2002/03

Rural				Urban			
Central	East	North	West	Central	East	North	West
-0,31	-0,27	-0,057	-0,14	-0,43	-0,42	-0,21	-0,49
(<,0001)	(<,0007)	(<,5621)	(<,0888)	(<,0001)	(<,0001)	(<,0892)	(<,0001)

Data source: UBoS, UNHS 2002/03

ITpower (2004) illustrated, by comparing communities with and without electricity, that there is a tendency that communities with electricity use charcoal rather than firewood for cooking. We have looked into this. The analysis is based on the Census data 2002 for the Mbarara district in Western region. We identify the electrification rates in each enumeration area based on the share of households that used electricity for lightening. We also calculated the share of the households in each enumeration area that used respectively charcoal and firewood. The result of the correlation analysis between the electrification rate and the share of respectively wood and charcoal users are given in table 7.3.2 below.

Table 7.3.2 Correlation coefficient between electrification rate and energy for cooking. Mbarara. 2002

	Rural	Urban
Share using	-0,79	-0,77
firewood	(<,0001)	(<,0001)
Share using	0,80	0,56
charcoal	(<,0001)	(<,0001)

Data source: UBoS, PHC 2002

There is a significant and strong correlation between electrification rate and energy used for cooking. This is further illustrated by the difference in average energy uses for cooking among rural communities (defined as enumeration areas) without availability of electricity and communities where more than 20 percent used electricity for light. Respectively 97 percent used firewood and 2 percent charcoal in the first group, and 46 percent used firewood and 45 percent charcoal in the second group. For the urban sector the corresponding numbers are; 10 percent used charcoal and 89 percent firewood where there was no electricity at all, and where more than 20 percent used electricity for lightening 67 percent used charcoal and 20 percent used firewood.

With the available data we are not able to distinguish between two causes; whether electrification leads to increased income which again leads to increased charcoal use or whether it is the more developed areas that get electricity, since more developed areas often are associated with less availability of biomass and more dense population, both indicating higher use of charcoal.

7.4 Energy and income/job generation in businesses

As discussed previously it is not straight foreword to analyze the relation between household/community welfare and energy use, since we are not able to distinguish between two effects; whether it is the wealthiest households/community that get electricity, or if they get wealthier by actually using electricity. In this section we will sketch another approach for looking into this.

Electricity may enhance productive/income-generating activities in the sense that households set up home-based micro enterprises relying on use of electrical equipment. In the latest UNHS survey there is a section inquiring about non-farming enterprises. The household enterprises are asked about their total expenditure on electricity, water and energy, but from this information we are not able to detect whether the household used electricity. To investigate whether there is an income generating effect from electricity we used the information in the survey on availability of electricity in community. We calculated the weighted number of enterprises per household in each of the enumeration areas, and performed correlation analyses between whether there was available electricity in community and the number of enterprises per capita. We did separate analyses for each strata and each of the following sectors;

- Livestock, Poultry, Bee-keeping and Fishing
- Forestry
- Mining, Quarrying and Manufacturing
- Trade and Services
- Hotels and Restaurants

Only for Trade and Services in urban areas did we find a positive significant correlation between number of establishments and availability of electricity, where the correlation coefficient was 0.23. The studies by ITpower indicate that households plan to set up a small business when electricity become available, while the studies from Masindi and Bushenyi indicate that the households do not set up such activities, partly due to unreliability/erratic electricity. Our study should, however, be followed up with analyses based on more detailed information on type of energy usage and profit/employment in enterprise.

We did a similar analysis by applying the Uganda Business Inquiry (UBI) 1999/00. The aim was to investigate whether availability of electricity generate income and employment opportunities. In the UBI the enterprises are asked about their expenditure on electricity. We do not know if the enterprise is located in a community with availability of electricity, and for those enterprises using electricity we do not know whether the electricity used is from the grid or other sources. We constructed a variable indicating whether the enterprise used electricity, and for each sector we did correlation analyses between this variable and profit per employee as well as number of employees and use of electricity. For some sectors we found some correlation, i.e. that businesses using electricity tend to have higher profit or more employment.

With the existing data, however, we are not able to conclude whether the businesses exist as a result of availability of electricity. To be able to do this one needs to combine the UBI dataset with a dataset containing information on whether electricity

exist in community or not. If such data were available one could follow up the analyses by looking at number and economic activity in businesses in locations with without electricity.

8 Combining digital maps and energy related statistics – a case study

8.1 Introduction

Many countries have digital data sets for their administrative units, which facilitate analyses. For example, census and other socioeconomic information is increasingly provided in digital form. Hence, there are two basic reasons for combining statistical information with digital maps:

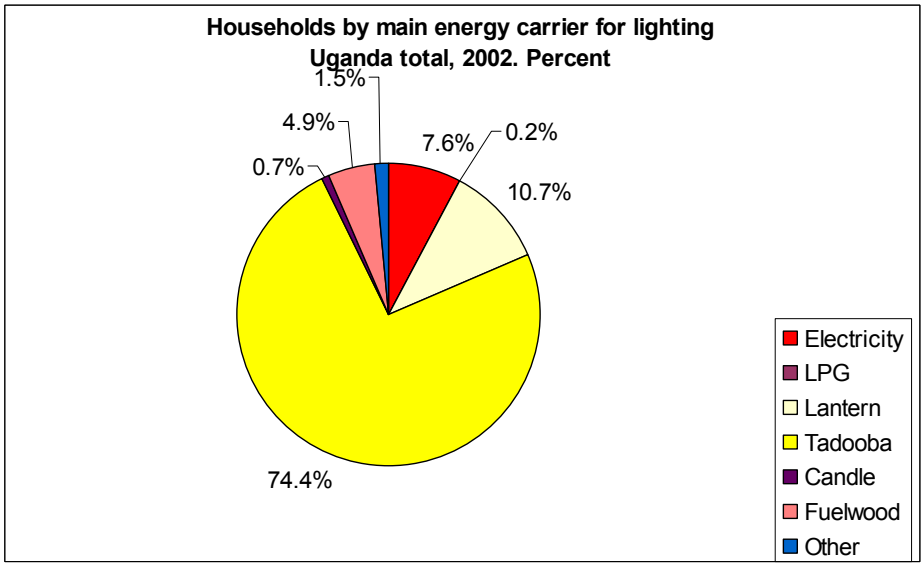
1. To present the geographical dimension of statistic information for the users
2. To combine digital information by geographical location through a geographical information system (GIS) in order to derive new information.

This case-study focuses on the geographical distribution of information from the PHC2002 concerning the households main source of energy for lighting and cooking. Digital maps with administrative boundaries down to parish level are used to illustrate possible local similarities and differences across the districts of Uganda.

8.2 Household use of energy for lighting

According to the PHC2002, paraffin is by far the most used energy carrier for lighting with as much as 74.4 percent of the households using tadoobas as main source for lighting and 10.7 percent of the households used paraffin lanterns correspondingly (Figure 8.2.1).

Figure 8.2.1 Households by main energy carrier for lighting. PHC2002. Uganda total



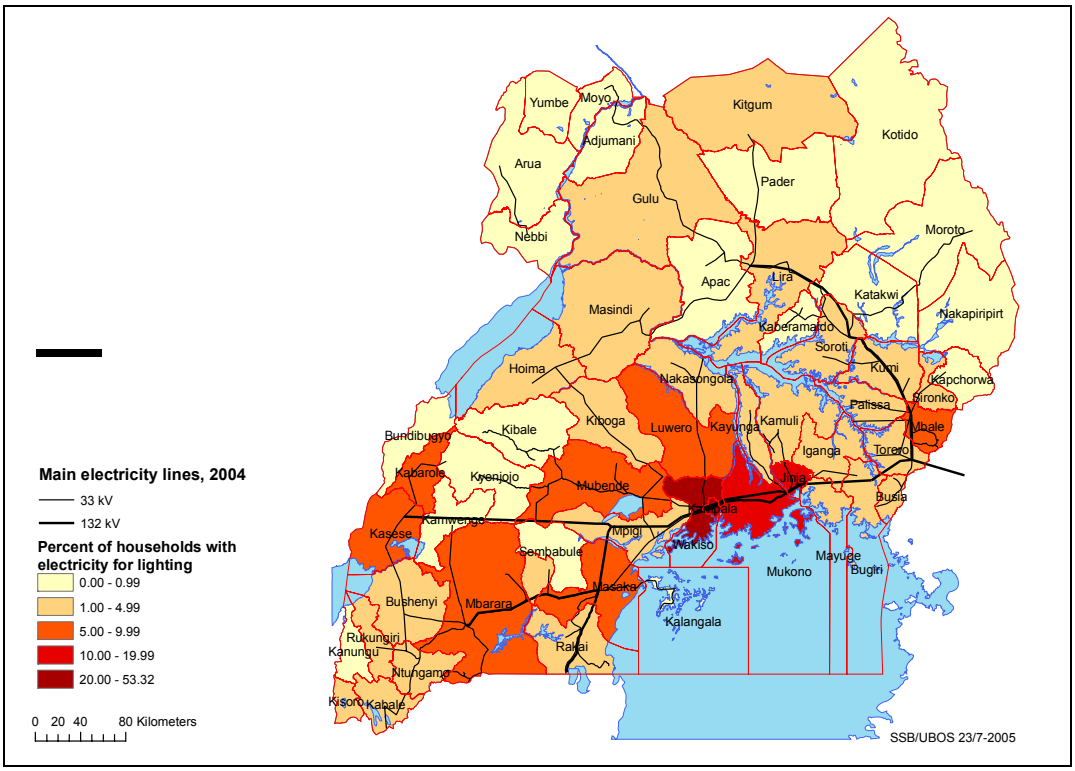
The share of the Uganda households' that used electricity as the main energy carrier for lighting in 2002 was 7.6 percent. Supply and use of electricity is the main focus in the strategies for energy development of Uganda. This is because electricity is

increasingly going to be used for lighting in both urban and rural households. Having the overall objective of equality of distribution, it is relevant to disseminate and monitor the use of electricity for lighting also at districts and lower administrative levels.

The districts in the Central region around Kampala have the highest share of households with electricity as the main source for lighting in Uganda. According to the PHC 2002, the share of households with electricity as the main source for lighting energy is 53.3 percent in Kampala followed by Wakiso district with 30.4 percent. Also Jinja and Mukono district have a relatively high share of households with electricity as primary energy carrier for lighting ranging between with 15.3 percent and 10.2 percent respectively. All these districts have a high share of their population residing in urban areas, and use of electricity for lighting is highly correlated to urban areas as illustrated in this case-study. The lowest share of households with electricity as primary source for lighting are found in districts in the North-East, North-West and in the South, all with less than 1.0 percent.

By overlaying the digitized main grid for high-voltage distribution-network for electricity with the district boundaries of Uganda, only 5 out of 56 districts appear without a main high voltage grid. Arua and Nebbi district in the North-West are not connected to the main grid but they have a local electricity distribution grid based on diesel aggregates (Figure 8.2.2).

Figure 8.2.2. Households with electricity as primary source for lighting by district. Percent of all households in the district. PHC 2002



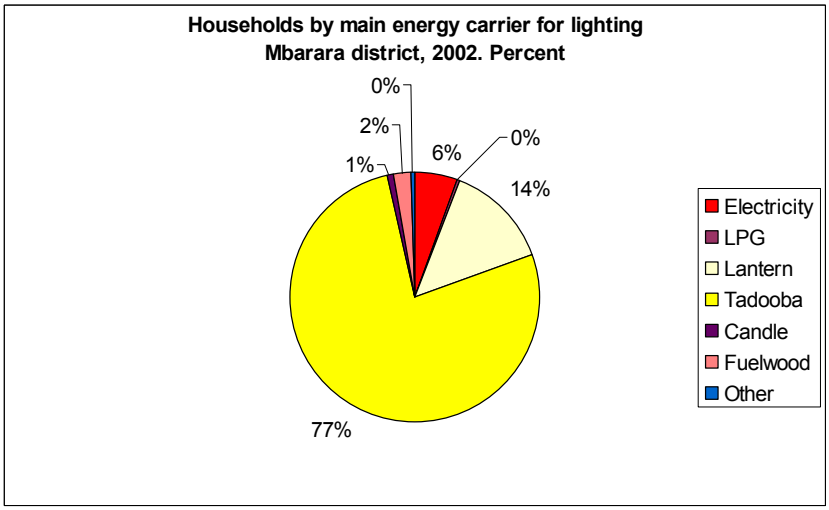
Source for the electricity grid information: IT Power and Afcon Ltd

Digital boundaries for administrative levels below districts are available at UBOS. However, these data are still in the process of cleaning and geo-coding and most of them were not ready for practical use when this report was written. For illustration purposes, digital boundaries for sub-counties and parishes for Mbarara district were prepared for the case-study and information from the PHC2002 was extracted and linked to these areas.

At the district level, 6 percent of the households in Mbarara have electricity as their main source for lighting. As expected, paraffin is the dominant carrier of energy for lighting in the households with 77 percent of the households using tadoobas as main source for light and 14 percent using lanterns.

Figure 8.2.3 Households by main energy carrier for lighting. PHC2002.

Mbarara district total



The main high voltage supply to the South-West of Uganda goes in the direction from Masaka district via Mbarara district. At the transformer station in Mbarara town, the 132 kV line is transformed to 33kV lines with branches covering mainly the Western part of the district. A separate grid-line branches from the main supply line in Nyakashashara sub-county reaching North to the trading centre of Rushere in the Kenshunga sub-county.

Statistics from the PHC2002 are merged with sub-county and parish maps within the Mbarara district for further assessment of the geographical distribution of the households' use of electricity as energy carrier for lighting, (Figure 8.2.4 and 8.2.5). At the sub-county level, a pattern of a relatively high share of households with electricity for lighting appears in the urban areas of Mbarara town (55.4 percent) and also in the Banda Town Council in the North- West of the district (19.5 percent).

When information from the PHC2002 is merged with a digital map of the parishes of Mbarara district, the pattern of urban/rural use of electric energy for lighting becomes even more distinct. The largest share of households with electric energy as primary source is found in the parishes that constitutes Mbarara town and also in Kabare parish. All the parishes that is geographically located more than 15 kilometers from the main high-voltage supply grid have less than 1 percent of the households with electricity as main source for lighting. Even for those 98 parishes where the high-voltage distribution network is physically passing through, as much as 30 parishes have less than 1 percent of the households using electricity as primary source for lighting (Figure 8.2.5).

Figure 8.2.4 Households with electricity as primary source for lighting by sub-county. Percent of all households in the sub-county. Mbarara district. PHC 2002

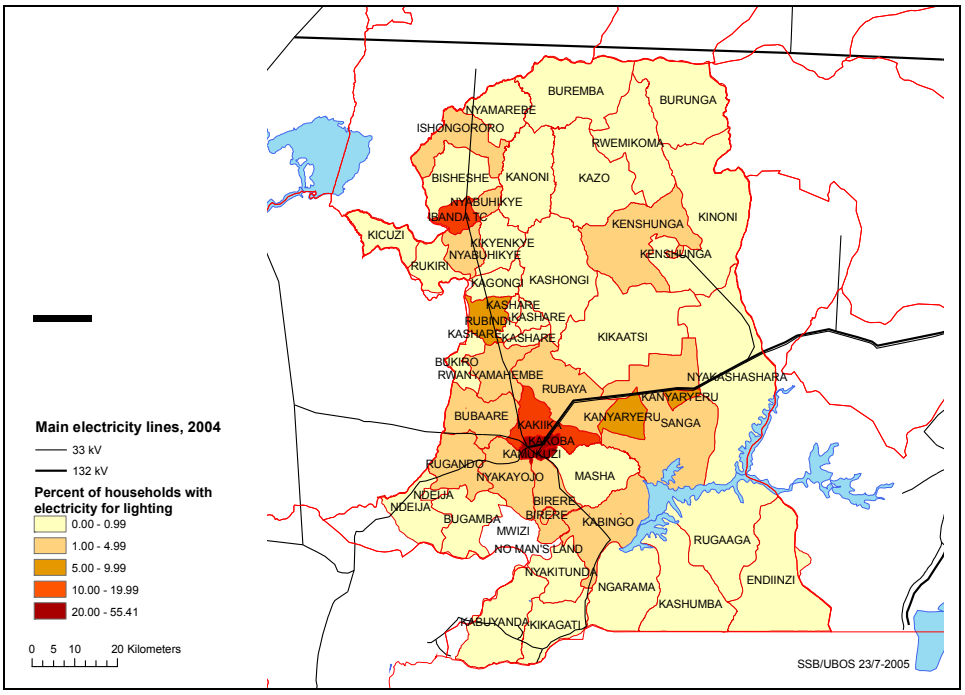
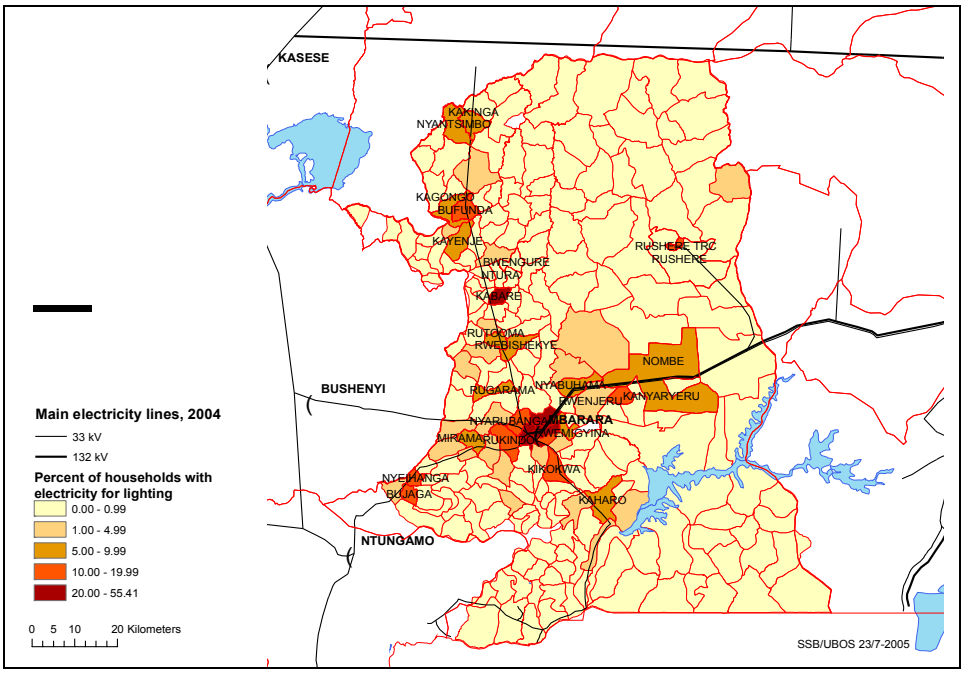


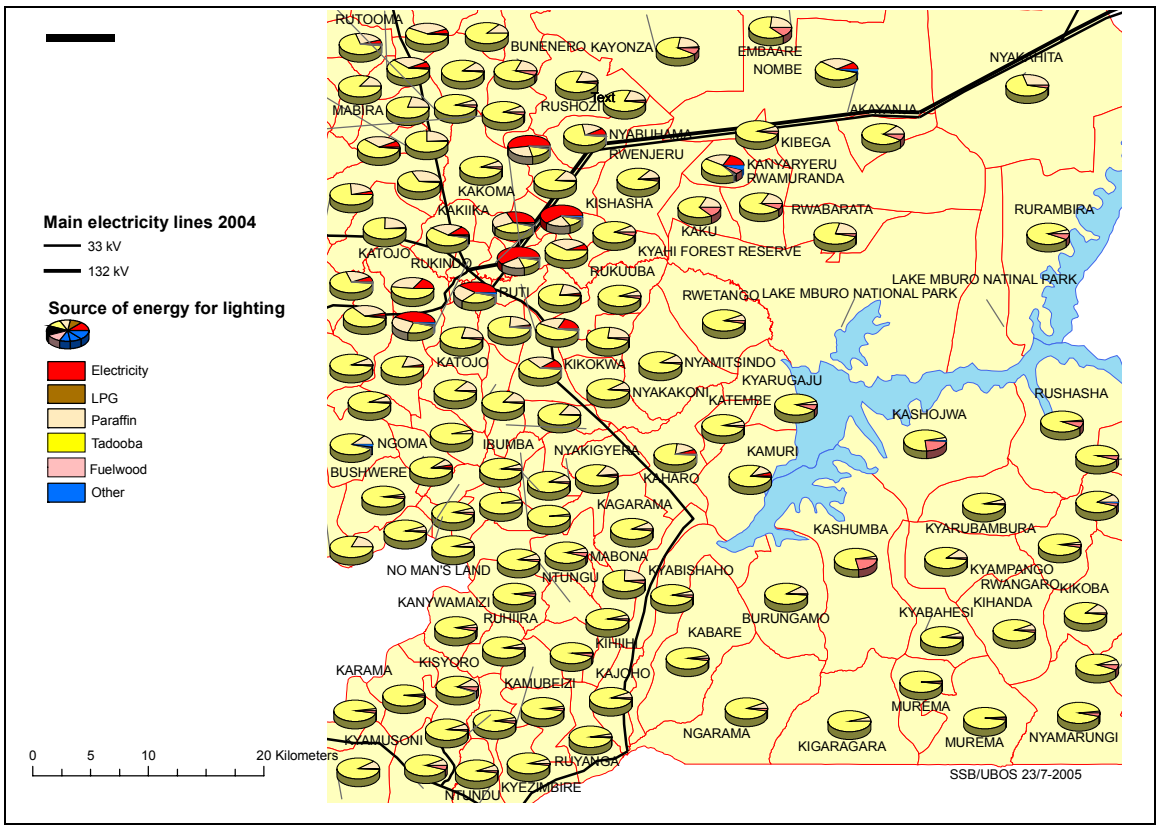
Figure 8.2.5 Households with electricity as primary source for lighting by parish. Percent of all households in the parish. Mbarara district. PHC 2002



By zooming in on the households' use of energy for lighting at parish level in the area stretching South-East from Mbarara town, a few interesting observations can be seen.

Firstly, it is observed that the use of electricity for lighting is concentrated around Mbarara town. Also extensive use of paraffin-based lanterns seems to be concentrated to Mbarara town or parishes with larger trading centers. For rural located parishes, the tadooba is the main source for light. However, for a few parishes around the lake, up to 20-25 percent of the rural households use firewood as the main source for lighting. A closer study on other households' characteristics in these parishes would be necessary to explain the use of this primitive energy carrier as main source for lighting (Figure 8.2.6).

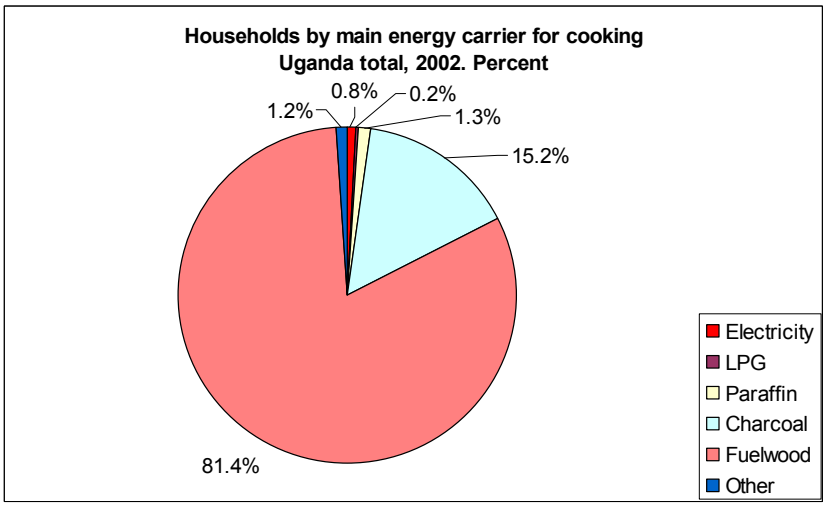
Figure 8.2.6 Households by source of energy for lighting by parish. Percent of all households in the parish. Part of Mbarara district. PHC 2002



8.3 Household use of energy for cooking

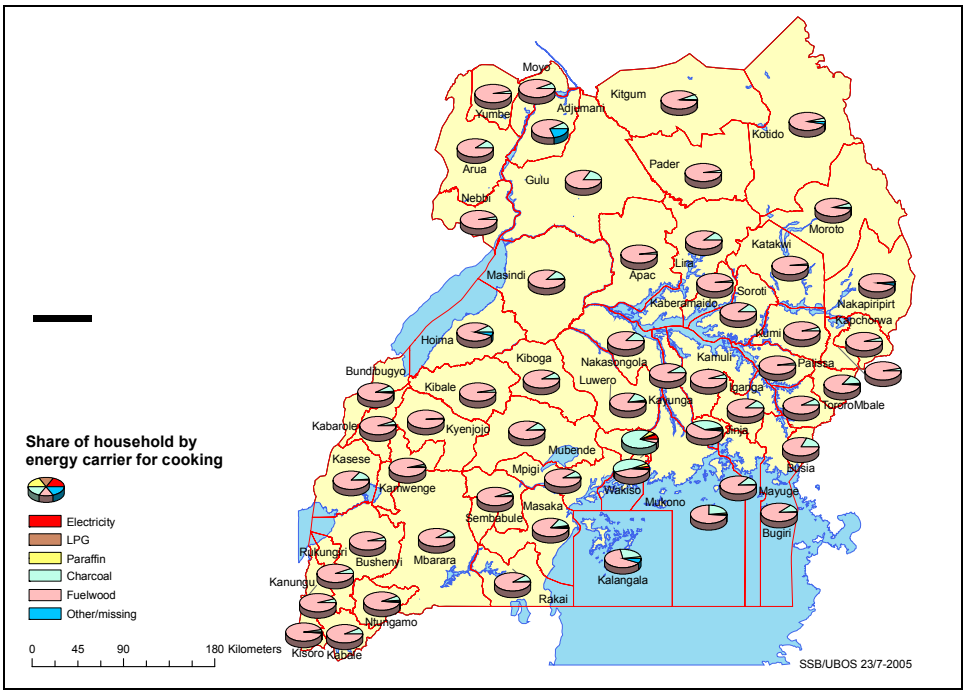
Fuel-wood is the main carrier of energy for cooking with 81.4 percent of the Ugandan households using this carrier for cooking (PHC 2002). With additional 15.2 percent using charcoal, a total of 96.6 percent of the household is based on biomass as primary source for cooking. Only 0.8 percent of the households used electric energy as primary source for cooking. LPG or paraffin is used by 1.5 percent of the households (Figure 8.3.1).

Figure 8.3.1 Households by main energy carrier for cooking. PHC2002. Uganda total



Kampala (78.5 percent) and Wakiso (47.2 percent) districts are the only districts where charcoal is more frequently used for cooking than fuel-wood. Kampala has also a significant share of households that uses electricity (6.1 percent) as the main source for cooking.

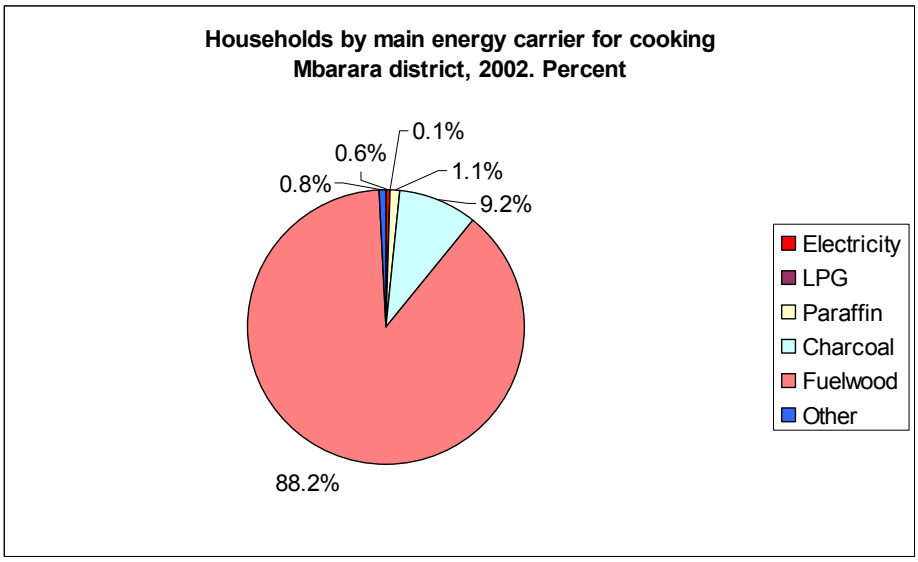
Figure 8.3.2 Households by primary source of energy for cooking. Percent of all households in the district. PHC 2002



In Mbarara district, as much as 88.2 percent of the households use fuel-wood as the primary carrier of energy for cooking. Charcoal was used by 9.2 percent of the

households while electricity was used as primary source for cooking only by 0.1 percent of the households (Figure 8.3.3).

Figure 8.3.3 Households by main energy carrier for cooking. PHC2002. Mbarara district



Looking at the sub-county level, there is clearly a geographical variation in the households use of energy for cooking. More than 50 percent of the households in Mbarara town used charcoal as main source of energy for cooking and considerable shares of charcoal for cooking is also found in all the other sub-counties with larger trading centers. Significant use of electricity as main source for cooking can only be found in Mbarara town.

A closer view on the household use of energy in the parishes surrounding Mbarara town, reveals inequalities on the use of energy by source at this micro-level. Charcoal is the main source for cooking in all the parishes stretching out from the town center. Electricity for cooking is only used in the town center and in the parishes stretching north and east of the town center. Fuel-wood comes in as the main source of energy for cooking in all the parishes geographically located outside the urbanized areas along the perimeter of the town.

Figure 8.3.4 Households by primary source of energy for cooking. Percent of all households in the sub-county. PHC 2002

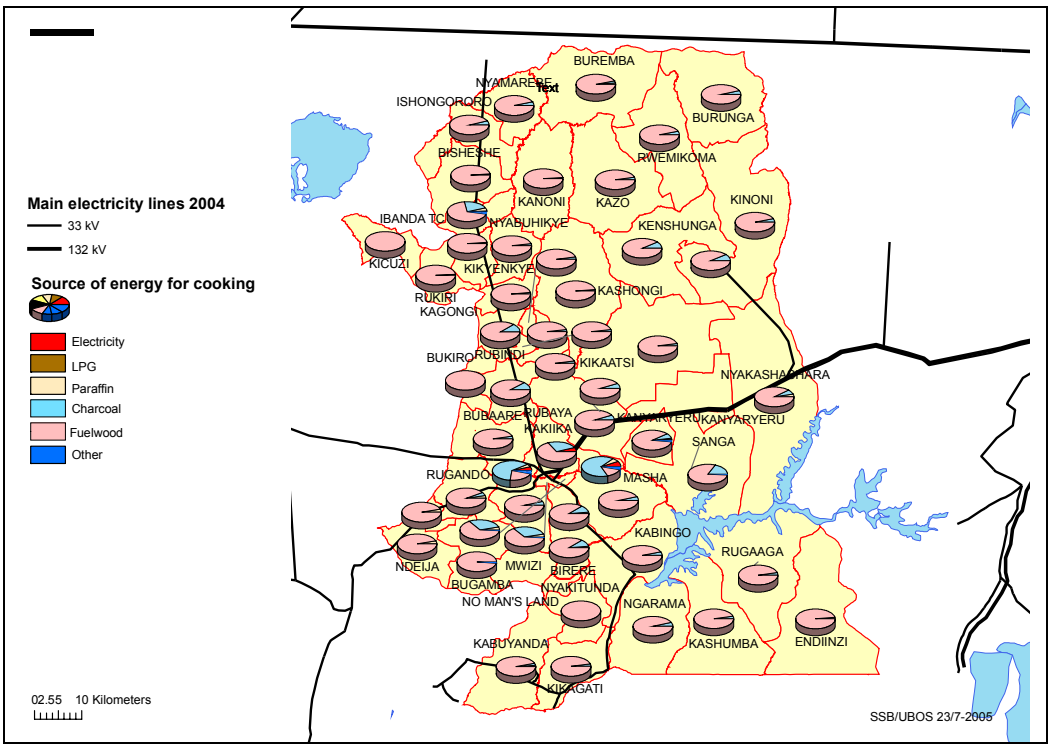
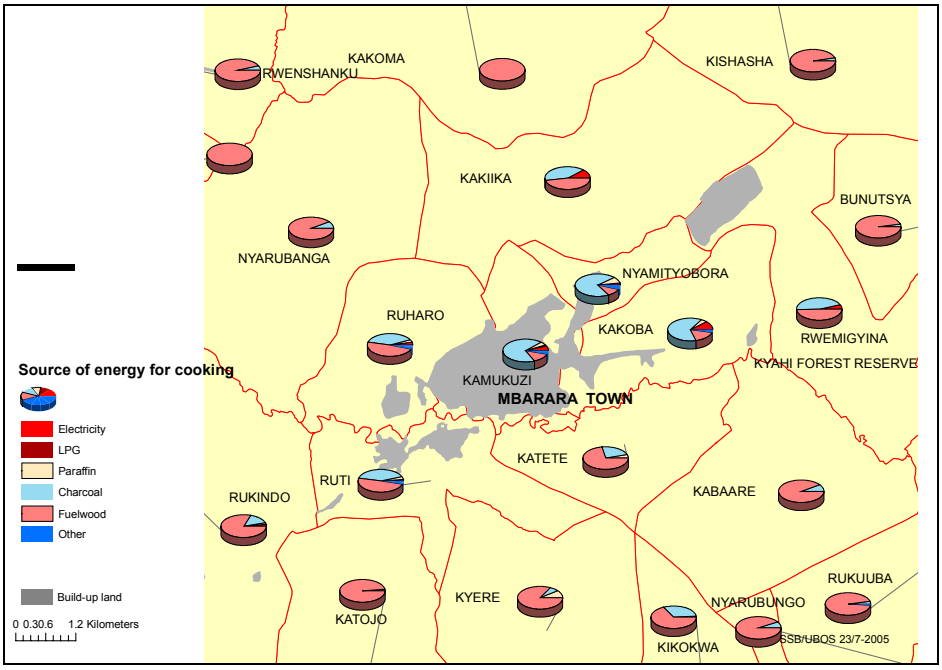


Figure 8.3.5 Households by primary source of energy for cooking. Percent of all households in the parish. PHC 2002



8.4 Summary of the case-study findings

The case-study, mainly based on data from the PHC 2002, clearly reveals that biomass-based energy is the main source for households cooking, while paraffin burnt in tadoobas is the main source for lighting in Uganda. However, the geographical inequalities in the household use become clearly visible when statistical information is distributed on maps. Electricity and charcoal use is strongly related to urban areas. When zooming in to parish level, it becomes clear that there is considerable variation in the household use of energy by source even inside the urban areas.

In the rural areas tadoobas for lighting and fuel-wood for cooking is dominant. Some interesting pockets of parishes are characterized by high share of fuel-wood as the main source for lighting in Masaka district. The same phenomena can be observed even at the district level in North-East Uganda.

For technical reasons, the case-study is mainly restricted to Mbarara district and the use of PHC2002. In future, the exercise could be expanded to more districts and further developed by introducing data from 1991. The focus should then be on regional changes.

9 Proposals for improvement of the energy statistics by source

9.1 Introduction

From the analyses and case studies described in chapter 5-7 above, we have identified some data gaps which should be bridged either by further processing and refinement of already collected information, by improving existing questions for future data collection or finally in a few cases by introducing some new questions. Chapter 8 comprises suggestions for amendment of existing systems for data capture in order to further improve the future statistics.

9.2 The Uganda National Household Survey (UNHS)

A few but important adjustments of the content of the socioeconomic questionnaire related to energy issues were introduced in the UNHS 2005/06. These changes are the new questions about hours spent for fetching fuel-wood, type of cooking technology used by the households and introduction of questions about purchased fuel for generators/lawn mower.

With the 2005 improvement of the UNHS questionnaire, the energy related part is directly linked to targets specified in the Plan for Rural Electrification and its corresponding indicators.

In order to adequately cover the indicators and the basis for analyses concerning households connected to grid electricity, the list of options for primary source of energy supply for lighting and/or cooking in the UNHS questionnaire should be considered expanded to comprise options for “grid based electricity”, “electricity from private

generator", and "PV based electricity" (the latter only for lighting). The present group "other" should be considered deleted since it does not contribute useful information in this context. Furthermore the UNHS should be expanded with a new question about which year the household started to use electricity and on what electricity is used for in the households.

During the UNHS2002/03 the socioeconomic questionnaire was extended with special forms covering different types of household based enterprises. Each of these attached forms contained a question about the enterprise purchase of "Water, electricity, fuel etc". For purposes of energy related analyses it should be considered for the future to split this question into "Electricity", "Gas/LPG", "Kerosene", "Generator/lawn mower fuels", "Fuel-wood" and "Charcoal". This will give more useful information for the small scale business energy use by carrier.

Unit prices and conversion factors for different measuring units for kerosene, charcoal and fuel-wood (bundles, baskets, sacks, jerry cans, bottles etc) should be established. A starting point could be that the total expenditure on each of the carriers of energy used by the households is available from the UNHS. The household are asked how much they spent on each of the energy items, and they were also asked to estimate the value of their usage of for example collected firewood. They report the quantity used which are given in various units. The units appear is in many variations, from kilos to sacks, bundles and bunches. These may also have different meaning in different regions or district, and one need to convert the units into one common unit to estimate quantities used of each energy type. As an example; the information on value of own consumption used in the welfare analyses in chapter 7 may be a bit shaky. However, if one derived a common unit for each energy source one could recalculate the value of own consumption by deriving local prices from the value of firewood bought, for example as an average over the prices reported in a parish or county.

9.3 The Population and Household Census (PHC)

In the context of energy related issues the most interesting variable derived from the PHC is the population size and its composition and the total number of households. This allows for determining an accurate figure for these variables at any regional level from Country total, via County, Sub-county, Parish and Enumeration areas.

Based on the PHC2002 and PHC1991, UBOS has extrapolated the population size for Uganda total and similar for each district for at least the years 2003 and 2004 (Statistical Abstract 2004). By using these estimates, annual updates for some key indicators on regional/district equality on access and use of electric energy can be determined with a fair quality, probably also for some more years to come. However, an extrapolation of population growth, especially the district level estimates, may introduce serious errors over time since there are limited possibilities for adjustments due to the in- and out flux of the population per district. It should be mentioned that a well designed population register with systems keeping track of birth and death as well as changes of

address/movement of people could improve substantially on the quality of population statistics.

The PHC2002 comprise the same questions concerning the household's primary source for energy to lighting and cooking respectively as the UNHS. Also for the PHC it should be considered to expand the corresponding list to comprise options for "grid based electricity", "electricity from private generator", and "PV based electricity" (the latter only for lighting).

Fuel-wood is foreseen to be the main source of energy for cooking for most of the Uganda populations for many years to come. The question about hours spent for fetching fuel-wood will indicate how this resource of energy will develop over years and this question/indicator is also related to gender issues. The question should be considered to be included in the future PHCs in order to capture the overall trends and to break the information down to sub-county and parish level to reveal possible pockets of extreme condition.

9.4 Digital maps and energy relevant thematic layers

The office for Cartography in UBOS has available digital maps with administrative boundaries down to Parish level for the year 2002. These maps still need data cleaning and coding with correct regional codes.

Digital maps for districts and counties for both 1991 and 2002 are available.

In addition to own digitized products the office receives thematic layers of polygons, points and lines like main roads, water, el. distribution grid, hospitals, schools, wells etc.

At the present, a layer of main (133kV and 33kv) electricity distribution lines are available for the whole country. If UMEME or other institutions also constructs and updates thematic layers of the remaining high voltage distribution net and/or geo-referenced transformation stations, this information can be combined with digital administrative boundaries in a GIS. This will be an alternative approach to determine sub-counties and parishes with physical access to grid electricity.

Also geo-referenced information about schools, hospitals, boreholes and even businesses combined with information of the distribution net could be used in GIS analyses and provide valuable additional information for community welfare analyses. This information already exists in UBOS, but again there is need for data cleaning and coding with correct regional codes/coordinates. It is also important to agree on standards for projections and co-ordinate systems with other producers of geo-referenced statistics.

The amount of information generated and stored in the office for cartography in UBOS is increasing and it is necessary to organize an appropriate storage and retrieve system for geo-data to make data more easily accessible.

9.5 Other energy related statistics in UBOS

The Uganda Business Inquiry (UBI) 2000/2001 contains questions about the business' purchase of electricity and purchase of fuel & lubricants in monetary values. UBI and other surveys should split-up some of these questions in order to make grid electricity, other sources of electricity, paraffin, fuel-wood and charcoal harmonized with the UNHS.

9.6 Energy data from UMEME

According to UMEME (Communication from Mr M. Sewagudde 27/5-2005) the central administration in Kampala has online communication with all the districts sales/service offices. The central database, with statistics on sales in monetary and physical values, is updated at regular intervals of time. So is also information about categories of subscribers. However, it seems that this database does not have the capacity of keeping track of the history i.e. it will be difficult to perform trend analyses if one need disaggregated statistics from the past. It is recommended that UBOS again approach UMEME to clarify this situation. Either UMEME or UBOS should take a backup of the disaggregated UMEME sales database at least annually to ensure historical statistics.

UMEME has updated hardcopy technical maps on all their power lines and transformers up to 33kV. They are now starting to digitize all this information to geographical thematic maps. When these maps are available, it is recommended that UBOS requests a copy for statistical use. UBOS Cartography office should establish contact with UMEME as soon as possible to discuss formats and projections and possibly also to share experience on digitizing work and data on administrative boundaries and population statistics.

9.7 The Ministry of Energy and Mineral Development (MEMD)

The Ministry of Energy and Mineral Development (MEMD) is the main user and provider of energy related information in Uganda. However, it seems that information on paraffin and LPG import and sales are difficult to get especially if sales at regional or district levels are requested (Communication from Mr J.B. Twodo MEMD, 2/6-2005). This is mostly due to the ongoing privatization process on the energy sector in Uganda.

A possible way forward would be for MEMD and UBOS to cooperate on collection of sales statistics from the private sector. The principle should be to collect statistics for public use once, and thereby also lessening the burden for the respondent.

9.8 The National Forest Authority (NFA)

The Biomass project established land cover maps for Uganda referring to the years around 1990. And update of these maps as well as a corresponding update of the point sampling based statistics for stock and growth of trees and bushes by main species is needed for determining the total production of biomass and for resource overview and planning at total Uganda and district level. Biomass is the main source of energy in Uganda, and close monitoring of the production and use of this energy carrier is recommended.

9.9 The Ministry of Water, Lands and Environment

The collecting system and completeness off the statistics on total production of round-wood timber and charcoal from the department is not assessed by the mission. Neither is the possibility for regional breakdowns of this statistics. Having the importance of biomass as source of energy in Uganda, it should be recommended that UBOS follow up on these matters.

9.10 Other

A variable indicating whether electricity is available for example at parish level could be derived by more work on the grid maps as discussed in chapter 6.4 in this report. This information will substantially improve the possibility for analyzing the effect of electrification on income generating / job creation.

During the analyses as presented in chapter 7, we were not able to look at the welfare effect in terms of service providers and it would be interesting for further analyses to get information on number of grid connected health/schools/community facilities.

From the available data sources we were also not able to discuss the impact of energy sources, and then in particular impact of electricity. It is, however, clear from the existing data that electricity usage mainly is associated with the wealthier lags of the population, but we are not able to look into whether the household that gets access to electricity get richer, or whether this relation solely is due to richer households that get electricity. To get in depth in this issue one need time series. The Ministry of Finance together with The World Bank is this moment conducting a comprehensive baseline study concerning aspects on energy and poverty, which will be followed up over time. This will be an important contribution to learn more about the impacts of electricity.

10 Proposal for improvement on UBOS web site

10.1 Introduction

Whereas chapter 9 comprises suggestions for a series of actions to be taken in order to improve the future energy statistics of Uganda, chapter 10 goes into a detailed suggestion for improvement of UBOS web-site dissemination of energy statistics.

10.2 The website

After assessment of the present UBOS energy statistics and all the different data sources available it is clear that these energy data are scattered in time, formats and localization of storage.

To make the existing information more available for the stakeholders with a minimum of cost implications, the mission recommends that UBOS revitalizes its thematic energy sub site and presents the most relevant energy data in a harmonized context. This could then work as a multi source system (MSS) for dissemination of energy statistics where mainly own produced statistics but also some key figures from other institutions are presented. Justification for establishing a database on energy related information can be found in the Section 67 of The Uganda Electricity Act of 1999 where the legal basic for database for energy statistics is found.

The main advantages of using the internet is that is it cheap compared to producing paper publications, data can be updated frequently, possible errors can easily be corrected and the number of potential users is high, since all major national and international stakeholders have access to the web.

Another important advantage of using the internet is that hyper-links to other major producers of energy statistics would make supplementary information even more available without too much UBOS resources spent on updating.

The objective of the MSS should be to provide users with easy access to energy statistics. The MSS should comprise all relevant data on energy statistics compiled by UBOS and it should also have links to other organizations in order as far as possible to obtain a one stop centre effect.

Three five main data sources for data on energy compiled by UBOS are as for now:

- PHC 1991 and 2002 (update every then years)
- UNHS 1999/2000 (next update 2005/06)
- UBI (update frequency unknown)
- CPI
- Statistical Abstract (annually updated statistics based partially on information from other institutions than UBOS)

The UBOS data sources contain information on access and use of energy for households (PHC and UNHS) for communities (UNHS) and for industries (UBI). The UBOS annual statistical abstract comprises statistics collected from other institutions on production, import and exports of energy. The statistics on the web site will be updated at different intervals of time and at different possibilities for regional breakdowns of the data. This should be reflected when the energy website is designed and the routines for updates are established.

The 11 Indicators for which UBOS will be the main provider should be calculated and updated at country total level and with regional (district or lower if possible) as often as the data source allows. An updated version of the complete indicator-sheet (48 indicators) as produced by MEMD as well as the MEMD energy balance sheet calculations should in agreement with the producer(s) either be copied onto the UBOS website or alternatively a hyperlink to MEMDs statistics should be established. Efforts should be made to visualize trends by using graphics.

Final extracts of key information about status and changes of stock of biomass resources for energy use should be included as they become available.

The strategy for construction of a thematic site should be, whenever feasible, to load all detailed data into the National Statistical databank (NSD), and create thematic pages with graphs and maps based on the NSD data. For every graph or map, there are direct links to the source data in the NSD. Data download to users should be optional as Excel or PC-Axis files. A metadata catalogue should be made with core definitions and access to pdf-format manuals for details on how the data were compiled.

A rough calculation of the costs of a project where SN and UBOS cooperate with the purpose of improving the sub-site for energy statistics in UBOS is given in Annex 3. The budget is based on a visit from SN to UBOS by two consultants (an energy statistics specialist and a technical web designer) each with two work-weeks in Uganda. UBOS should provide counterparts both on energy statistics and on the web design and do the necessary preparatory work compiling data from external and internal sources.

11 Summary recommendations for further work

11.1 Introduction

The objective with this chapter is to summarize what the mission would like to recommend as the most urgent actions to be taken for short- and medium term improvements of the energy statistics seen from an UBOS perspective.

11.2 Suggestions for improvements/projects:

1) Update the UBOS energy website.

2) Quantification of selected indicators.

3) Get formal agreement and established routines for data access from UMEME.

4) Work together with the appropriate ministries to improve statistics on fuel-wood and charcoal production and use.

5) Joint work with MEMD, address the private petroleum companies for better access to import and sales statistics – explore the possibilities for annual district sales figures on paraffin and LPG.

6) Further in-depth studies on the relation between poverty and energy access/use.

7) Support to NFA for update of forest cover maps and biomass stock calculations. Calculate and disseminate statistics on status and changes in the biomass resources.

8) Promote standardization and harmonization of data formats, timing and definitions – including increased national influence on ad-hoc in-depth studies.

9) Support to digitize the electricity supply grid in cooperation with UMEME and secure updating routines an access to updated digital information.

10) Finish coding of parish polygons in the GIS section of UBOS.

11) Cleaning of coordinates of thematic map layers (hospitals, boreholes, schools, small industries etc).

12) Produce an energy use map-based publication/CD (lighting and cooking) at parish level for all districts of Uganda 2002 including comparison with urban areas 1991.

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Annex 1 Abbreviations

CPI	Consumer Price Index
EA	Enumeration Area
GDP	Gross Domestic Product
GIS	Geographical Information System
GoU	Government of Uganda
GTZ	German Technical Co-operation
IEA	International Energy Agency
kV	kilo Volt
kW	kilo Watt
LC1	Local Council 1 (Village)
MEMD	Ministry of Energy and Mineral Development
MoFPED	Ministry of Finance, Planning and Economic Development
MSS	Multi Source System
NFA	National Forest Authority
NOK	Norwegian Kroner
NSD	National Statistics Database
NSDS	National Service Delivery Survey
NSS	National Statistics System
PHC	Population and Housing Census
PV	Photo Voltaic
SN	Statistics Norway
UBI	Uganda Business Inquiry
UBOS	Uganda Bureau of Statistics
UEDCL	Uganda Electricity Distribution Company Ltd
UEGCL	Uganda Electricity Generation Company Ltd
UETCL	Uganda Electricity Transmission Company Ltd
UNHS	Uganda National Household Survey
USD	United States Dollars
UShs	Uganda Shillings
W	Watt

Annex 2 Fact Sheets on available energy statistics

SOURCE:	**National Service Delivery Survey (NSDS)**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Objective of survey 2004	-To provide up to date information about the performance and impact of selected public services at local government and national level poverty monitoring -To measure changes in service by delivery in selected sectors -To identify constraints and gaps in the provision of selected government services by selected sectors -To provide recommendations for improvement in service delivery -To generate and disseminate information about services offered by selected government sectors
Relevance for energy access/use monitoring	-information on household expenditures to energy in monetary and physical units -information on electrification projects implemented in the sub-county
Basis for data	Sample survey
Frequency of update	Year 2000 and year 2004
Sample design and size for the 2004 survey	**Two modules covering all the 56 districts in 2004:** 1) Household survey with 18 000 households selected (17 608 actually covered). At least 30 Enumeration areas (EA) were selected in each district and distributed on sub-counties proportional to the population size. As a result, 729 out of a total of 956 sub-counties had at least one EA selected. A total of 10 households were randomly selected for in-depth interview in each selected EA. 2) Service providers survey is conducted at the sub county administration for all the sub counties with selected EAs.
Variables of special interests	**1) House hold survey questionnaire 2004:** Section 10: Household consumption expenditure last 30 days PART A #306/(3) Paraffin unit of quantity #307/(3) Charcoal unit of quantity #308/(3) Firewood unit of quantity Services <u>purchased</u>: #305/(5) Electricity (Value) #306/(3) Paraffin unit of quantity, #306/(4) Quantity, #306 (5) Value #307/(3) Charcoal unit of quantity, #307 (4) Quantity, # 307 (5) Value #308/(3) Firewood unit of quantity, #308 (4) Quantity, # 308 (5) Value Services <u>home produced</u>: #307/(6) Charcoal quantity, #307 (7) Value #308/(6) Firewood quantity, #308(7) Value Services <u>free</u>: #305/(8) Electricity, #305 (9) Value #306/(8) Paraffin quantity, #306 (9) Value #307/(8) Charcoal quantity, #307 (9) Value #308/(8) Firewood quantity, #308(9) Value #305/(10) Electricity unit price <u>Unit price</u> #306/(10) Paraffin unit price #307/(10) Charcoal unit price #308/(10) Firewood unit price Section 10: Household consumption expenditure last 365 days PART C <u>Purchases value</u> #421/(3) Electric iron/Kettles etc #422/(3) Charcoal and kerosene stoves #423/(3) Electronic Equipment (TV etc) <u>Consumption out of household enterprise stock value</u>

	#421/(4) Electric iron/Kettles etc #422/(4) Charcoal and kerosene stoves #423/(4) Electronic Equipment (TV etc) <u>Free value</u> #421/(5) Electric iron/Kettles etc #422/(5) Charcoal and kerosene stoves #423/(5) Electronic Equipment (TV etc) **2) 9.5c Service Providers Questionnaire 2004** Project implementation in the Sub-County for the financial year 2002/03 #9.5c/(3) Code 3 Electrification #9.5c/(4) Donor type #9.5c/(5) Co-funder #9.5c/(6) Money spent on the project (Ushs) #9.5c (7) What is the current status of the project
Sample design and size for the 2000 survey	For each of the 45 districts existing at the time of the survey a list of villages constituted the sampling frame (LC-1). A minimum of 30 villages were randomly selected for each district. A total of 10 households were chosen systematically in each selected LC-1. The realized sample size was 13 604 households. Figures could be provided for service delivery indicators at district level. No community questionnaire was used.
Variables of special interests	**1) Household questionnaire** Section 2 #2.01/(ix) What is the main source of lighting fuel in this household? 1.Paraffin, 2. Gas, 3. Electricity, 4. Candles, 5. Firewood, 6. Other #2.05 Does your household own any of the following items in working order? 1.Electric iron, 2.Refrigerator, 3.Television, 4.Video deck, 10.Modern stove, 14. Fan
Publication of NSDS 2004	2004 National Service Delivery Survey. Report. UBOS April 2005. 185 pages
Publication of the NSDS 2000	2000 National Service Delivery Survey. Final Report. Ministry of Public Service
Comments	Section 10: 2004 Household consumption expenditure last 30 days PART A + B + C was captured from the field, but during data processing the data was rejected due to low quality. These data are unfortunately not for use.

SOURCE:	**National House Hold Survey (UNHS)**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Objective of survey 2002/03	(a) To provide information on the economic characteristics, of the population aged 5 years and above, that is their Economic activity status, employment, unemployment and underemployment situation. In addition, a separate section that deals with the participation of children aged 5-17 years in economic activity is attached to the Labourforce questionnaire. (b) To generate data for calculating gross output, value added, and other economic indicators from the informal sector, which is required for National Accounts purposes. (c) To integrate household socioeconomic and LC 1 level community surveys in the total survey program to provide an integrated data-set so as to understand the mechanisms and effects of government programs and other policy measures on a comparative basis over *Uganda National Household Survey 2002/3 Manual of Instructions* (d) To fill in gaps in socioeconomic data to serve needs of planning and building social and economic indicators to monitor the progress towards social and economic development goals of the country; and (e) To consolidate efforts being made in building a permanent national household survey capability in UBOS
Relevance for energy access/use monitoring	-information on household expenditures to energy in monetary and physical units
Basis for data	Sample survey
Frequency of update	Year 1993/94, 1995/96, 1999/2000 and 2002/03. Currently the UNHS 2005/06 is conducted
Sample design and size for the 2004 survey	**Three modules covering all the 56 districts in 2002/03:** 1) The socio economic survey has about 10 000 households located in 1 000 selected EAs. The UNHS sample covers the entire country and was selected in such a way that it will generate estimates for the whole of Uganda, for urban and rural Uganda, and each of the four (statistical) regions: Central, Eastern, Northern and Western, and for some selected districts. The districts where key variable figures can be produced for 2002 are: Mbarara, Lira and Mbale. There is a over sampling in urban areas in orer to better capture for a labor force survey. 2) The community survey comprises one LC-1 in which the selected EAs are located and the community officials are interviewed.
Variables of special interests	**1) Socio economic survey questionnaire 2002/03** 5b Housing conditions (1) What fuel does this household mainly use for lighting? 1.Electricity, 2. Gas, 3.Paraffin (lantern), 4.Paraffin (Tadooba), 5.Candle wax, 6.Firewood, 7.Cowdung or grass, 8.Other (2) What fuel does this household mainly use for cooking? 1.Electricity, 2. Gas, 3.Paraffin (lantern), 4.Paraffin (Tadooba), 5.Candle wax, 6.Firewood, 7.Cowdung or grass, 8.Other (11) Does this household own any of the following? 1.Television Section 6b: Household consumption expenditure last 30 days PART B #306/(3) Paraffin unit of quantity #307/(3) Charcoal unit of quantity #308/(3) Firewood unit of quantity Services <u>purchased</u>: #305/(5) Electricity (Value) #306/(3) Paraffin unit of quantity, #306/(4) Quantity, #306 (5) Value #307/(3) Charcoal unit of quantity, #307 (4) Quantity, # 307 (5) Value #308/(3) Firewood unit of quantity, #308 (4) Quantity, # 308 (5) Value Services <u>home produced</u>: #307/(6) Charcoal quantity, #307 (7) Value #308/(6) Firewood quantity, #308(7) Value Services <u>free</u>: #305/(8) Electricity, #305 (9) Value

	#306/(8) Paraffin quantity, #306 (9) Value #307/(8) Charcoal quantity, #307 (9) Value #308/(8) Firewood quantity, #308(9) Value #305/(10) Electricity unit price Unit price #306/(10) Paraffin unit price #307/(10) Charcoal unit price #308/(10) Firewood unit price Section 6c: Household consumption expenditure last 365 days PART C Purchases value #421/(3) Electric iron/Kettles etc #422/(3) Charcoal and kerosene stoves #423/(3) Electronic Equipment (TV etc) Consumption out of household enterprise stock value #421/(4) Electric iron/Kettles etc #422/(4) Charcoal and kerosene stoves #423/(4) Electronic Equipment (TV etc) Free value #421/(5) Electric iron/Kettles etc #422/(5) Charcoal and kerosene stoves #423/(5) Electronic Equipment (TV etc) Section 7. Household and enterprise assets #006/(5) Electronic equipment eg TV, Radio, Cassette etc. Value 2) Section 9 Enterprise particulars of the household during the last 12 months (3) Type of questionnaire (additional questionnaires 1-5 depending on household based enterprises) 1. Agriculture Section 4 Value of input other than labor during last 30 days 5. Water, electricity, fuel etc. Value of purchases, expenses 2. Forestry Section 4 Value of input other than labor during last 30 days 5. Water, electricity, fuel etc. Value of purchases, expenses 5.a Total sales and other income during last 30 days 02. Wood for firewood (3) Unit, (4) Quantity sold, (5) Value, (6) Quantity consumed or gifted, (7) Value, (8) Current stock (quantity) 3. Mining Section 4 Value of input other than labor during last 30 days 5. Water, electricity, fuel etc. Value of purchases, expenses 4. Trade Section 4 Value of input other than labor during last 30 days 5. Water, electricity, fuel etc. Value of purchases, expenses 5. Hotels Section 4 Value of input other than labor during last 30 days 5. Water, electricity, fuel etc. Value of purchases, expenses **3) Community Survey Questionnaire 2002/03** Section 3 Community history and major events #8/Availability of electricity within the LC-1 (3) Currently (2002), (4) 1996, (5) 1992 Section 8 Health infrastructure #21 Is there any cooling storage with back-up power supply 1. yes with back-up supply, 2.yes without back-up supply, 3.No
Sample design and size for the 2005/6 survey	Basically same as 2002/03. Sampling frame constructed from the PHC2002.
Variables of special interests	**1) Socio economic survey questionnaire 2005/06** Section 7b Activities of Household Members

	For each person in the household (7) During the past 7 days, how many hours did you spend fetching firewood for the household including travel time? Hours Section 11 Housing conditions: 11. What is the main source of lighting in your dwelling? (same as 2002/03 but in addition distributed on a. now and b. 2001) 12. What type of fuel do you use most often for cooking? (same as 2002/03) ? (same as 2002/03 but in addition distributed on a. now and b. 2001) 13. What type of cooking technology do you use in your household? (new 2005/06 including a. now and b. 2001) 1. Traditional metal stove (Sigiri), 2.Traditional 3-stone stove, 3.Improved charcoal stove, 4.Improved firewood stove, 5.Gas stove, 6.Paraffin stove, 7.Saw-dust stove, 8.Electric plate, 9.Other Section 14b Household consumption expenditures Purchased during the last 30 days 306 Electricity (3)-(10), Paraffin(3)-(10), Charcoal (3)-(10) and Firewood (3)-(10) same as 2002/3. 307 (3)-(10) Generators/lawn mower fuels (new 2005/06) Section 14c Household consumption expenditures During the last 365 days 421 Electric iron/kettles, 422 Charcoal and kerosene stoves and 423 Electric equipment (same as 2002/03)
Sample design and size for the Intergrated Household Survey 1992/93 and the First Monitoring Survey 1993/94 survey	Based on the EAs from the PHC 1991 and covering all districts. Since mapping work was not conducted in all districts, parishes was used as the first stage sampling unit where EAs did not exist. A total of 5040 household were actually surveyed.
Variables of special interests	Section 5 Part b Purchased during the last 30 days 304 Electricity (3)-(10), 305 Paraffin(3)-(10), 306 Charcoal (3)-(10) and Firewood (3)-(10) same as 2002/3. Section 5 Part c Household consumption expenditures During the last 365 days 421 Electric iron/kettles, 422 Charcoal and kerosene stoves and 423 Electric equipment (same as 2002/03)
Publication of NSDS 2002/03	2002/03 Uganda National Household Survey. Report on the socioeconomic survey. Uganda Bureau of Statistics. November 2003

SOURCE:	**Uganda Population and Housing Census PHC**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Objective of PHC 2002	To take a full census of population an housing condition in Uganda
Relevance for energy access/use monitoring	-information on household use of energy
Basis for data	Complete enumeration
Frequency of update	Year 1911, 1921, 1931, 1948, 1959 1969, 1980, 1991
Sample design and size for the 2002 Census	**Four sections covering all the 56 districts existing in 2002** 1) Particular of Household members 2) Housing Conditions 3) Household conditions 4) Agricultural module
Variables of special interests	**Section 3 Household conditions 2002** Fuel/Power H12 What type of fuel does this household mainly use for cooking. 1. Electricity, 2.Gas, 3.Paraffin, 4.Charcoal, 5.Firewood, 6.Cow dung or grass, 7. Biogas, 8. Other H13 What fuel does this household mainly use for lighting? 1.Electricity, 2. Gas, 3.Paraffin (lantern), 4.Paraffin (Tadooba), 5.Candle wax, 6.Firewood, 7.Cowdung or grass, 8.Other H20 Does this household owe any of the following? 2 Television **Section 4 Agricultural questionnaire** Section 3: Investments on land What kind of tree crops does this parcel have? For each parcel up to 3 types of species could be specified by Number of plants since March 2001 and Number of trees now.
Sample design and size for the 1991 Census	**Three Sections covering all the 38 districts existing in 1991** 1) Demographic characteristics of the population 2) Socio-economic characteristics of the population 3) Household and housing conditions
Variables of special interests	**Section 3 Household conditions 1991**
Comments	Difficult to compare PCH 2002 with PHC 1991 below country total level due to changes in the number of districts from 38 in 1991 to 56 in 2002. A possibility to compare at county level should be explored, since the shapes/outlines of the counties may have been fairly stable in the period from 1991 to 2002 (Communication from B. Muwezi, UBOS 1/6-2005).

SOURCE:	**Consumer Price Index (CPI)**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Objective of PHC 2002	To take account of status and changes in consumer prices for services and commodities in Uganda
Relevance for energy access/use monitoring	-consumer price on energy by energy carrier
Basis for data	Collection of marked price data from selected spots of observation in Uganda
Frequency of update	Monthly
Variables of special interests	Monthly consumer price on electricity, paraffin, charcoal and fuel wood as an average for Uganda

SOURCE:	**Office for Cartography**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Relevance for energy access/use monitoring	-possibility to visualize the geographic dimension of the energy information -deriving new statistics from digital maps
Basis for data	-Own work on digitizing administrative boundaries -Database with thematic layers received from cooperation institutions
Frequency of update	
Variables of special interests	-digital administrative boundaries for 2002 (country, districts, counties, sub-counties and parishes. Digital administrative boundaries for 1991 (country, districts and counties). Major Towns (representation point). Other thematic layers: -Main roads (Source: NFA) -Lakes and major rivers (Source: NFA) -Land cover 1991 for Mbarara district (Source: NFA) -Agricultural production zones (Source: MAAIF) -132kV and 33kV electric grid 2004. (Source: IT-power and Afcon)
Comments	Coding and final cleaning of thematic layers with administrative boundaries 2002 is in process.

SOURCE:	**Permanent Agricultural Statistics Survey (PASS)**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Objective of PASS 2005	To provide statistics on agricultural production at district level for crops, livestock etc as well as sales in physical and monetary values.
Relevance for energy access/use monitoring	-information on number of trees on the small scale holdings and annual sales of trees for fuel wood/charcoal in physical and monetary values.
Basis for data	A rotating sampling survey covering all districts in Uganda in three years
Frequency of update	An update for each district every 3^{rd} -4^{th} year. PASS started 2004. However, forestry relevant questions were introduced onwards from 2005.
Sample design and size for the 2005 PASS	720 small and medium scaled holdings selected per district. The agricultural module of the PHC2002 is the sampling frame and EAs used in PASS is picked from PHC. For 2005 a total of 10 districts with 7200 small and medium scale holdings are included in the survey. There is a complete enumeration of large scale private and institutional farms.
Variables of special interests	Form 3a Questions 6. What trees/bushes were grown on the Holding this Agricultural Season and how were they used? (1)Tree type (by a list of most common species) (2) Total number of trees (5) Of which cut for fuel-wood/charcoal production

	Question 7 Production and sales characteristics (5)-(6) Actual production in the season (unit and quantity per species) (9)-(10)-(12) Sales in the season (unit, quantity and value) (13)and(15) last sale unit price and where the last sale took place
Comments	Funding for continuation of PASS is secured up to 2006.

SOURCE:	**Sales statistics and 33kv grid net information from Uganda Electricity Distribution**
INSTITUTION	Uganda Electricity Distribution Company Ltd/UMEME
Address of institution	UMEME Ltd Amber house Plot 29/33 Kampala Road PO.Box 23841 Kampala
Type of data	Administrative
Relevance for energy access/use monitoring	1. Consume of electricity (kWh and values) by main type of customer activity and sales district 2. Technical and geographical information on the status and changes in the distribution grid with 33kV or less.
Basis for data	Local distribution offices sales database Central mapping (per 2005 only engineer diagrams of the grid available) of status and changes in the grid with capacity 33kV or less
Frequency of update	Sales statistics monthly reports online from local distribution offices to the central administration in Kampala. Update frequencies of technical information not known (2/6-2005)
Variables of special interests	- Value and kWh sold and number of customers per main type of activity per sales district and year - Status and changes of the extend of the distribution grid
Comments	The distribution is privatized onwards from 2005 (UMEME). Agreements on how and when to for UBOS to receive data has to be agreed through a memorandum of understanding.

SOURCE:	**Uganda Business Inquiry (UBI)**
INSTITUTION	Uganda Bureau of Statistics (UBOS)
Objective of UBI	The inquiry shall provide vital information on the performance of the main sectors of the Uganda economy and on their contribution to the Gross Domestic Product (GDP) The UBI shall also update Input-Output tables for the industries both in formal and informal sector
Relevance for energy access/use monitoring	The inquiry captures information about the industries purchase of electricity as well as purchase of fuel and lubricants
Basis for data	12 questionnaires (each for a specific industry) covering about 4000 establishment
Frequency of update	A total of 10 surveys conducted since 1989 with the most recent published results covering 2000/2001
Sample design	The Uganda Business Register was used as sampling frame followed up by a listing
Variables of special interests	Details of "Other business expenses" Electricity cost (monetary value Purchases of goods and services. Electricity (in monetary values) 1. For the latest year 2. For the pervious year Fuel & lubricants (in monetary values) 1. For the latest year 2. For the pervious year
Comments	According to comments in the final report, Agriculture, Mining/Quarrying, Construction Transport sector may not be comprehensively enough collected to make a valid conclusion.

SOURCE:	**The National Biomass Study**
INSTITUTION	The National Forest Authority (NFA)
Address of institution	National Biomass Study, NFA. Po Box 1613 Kampala, Uganda
Objective of the National Biomass Study (Phase III)	1. to establish a firm framework for continuous dynamic monitoring of land cover/use and woody biomass in Uganda; partially through establishing up to 6000 fieldplots in a regular grid covering the whole country in 1995-98, and starting to remeasure them in 1999 2. To maintain and update the Environmental Information System 3. To transfer responsibility for some of these sets to other agencies while ensuring continuous user access to quality and develop new channels for information dissemination enabling users in the public and private sectors to have easy and affordable access to updated and reliable information in analogue or digital form. 4. To collaborate with other professional groups within or outside the Forestry department in research and analysis, aiming at maximizing the use of the biomass data sets for various purposes.
Relevance for energy access/use monitoring	-digital and analogue information status and (partially) change of land covered by forest and woodland/bushland. -analogue information on status and change of stocked volume of forest and wood/bush by main species at country, region and partially on district level.
Basis for data	1) SPOT satellite images from early 1990s were used to interpret 12 classes of landcover/use. These classes were digitized to a digital baseline map of land cover for all Uganda. Updating of this digital map based on LANDSAT satellite imageries from 2000+ has started with the objective to quantify changes and recalculate status for land cover. Maps normally published in a scale of 1:50 000. 2. Point sampling survey based on ground observations of species and volumes of trees/bushes as well as other land use/cover parameters.
Frequency of update	For both sources, the update should be done at least every 10-15 years.
Sample design and size for the Biomass Survey	More than 4000 sample plots located at 5 by 10 km grid intersections marked on the ground when the survey was established. Sub samples of these plots are revisited for periodic measurements of tree parameters in order to determine the biomass from undisturbed plots and monitor biomass dynamics (removals/growth)
Variables of special interests	-Area and extend of land cover -Biomass stock -Growth and dynamics

INSTITUTION	**The Ministry of Energy and Mineral Development (MEMD)**
Address of institution	Amber house Plot 29/33 Kampala Road
website	www.energyandminerals.go.ug
Relevance for energy access/use monitoring	Data can contribute to determine the supply and use of paraffin and LPG
Basis for data	Administrative data received from private fuel and gas companies operating in Uganda
Frequency of update	Annual
Variables of special interests	Import and sales in terms of vale and volume per type of energy carrier (Paraffin and LPG)
Comments	Due to privatization of the market, it has become less easy for MEMD to obtain high quality and timely information on import and sales of petroleum products (communication from Mr J.B. Twodo, Acting Commissionar, 2/6-2005).

Miscellaneous Research and Market Studies on Energy Access and Use in Uganda 2002-2005 (this list is not exhaustive)

PROJECT/ INSTITUTION	**The Energy Advisory Project in MEMD** Supported by German Development Cooperation (GTZ)
Address of institution	Amber house Plot 29/33 Kampala Road PO Box 10346 Kampala Uganda
Selected study(ies):	1. Energy-Poverty in Masindi District. Baseline study. Summary report March-July 2003 2. Energy-Poverty in Bushenyi District. Baseline study. Summary report March-July 2003
Comments:	In-depth study of approximately 40 urban and rural households in each of the two districts. Database available for use by UBOS
PROJECT/ INSTITUTION	**IT-Power in cooperation with Africon Ltd**
Address of institution	IT-Power Grove House Lutyens Close, Chineham Hampshire RG24 8AG, UK
Study(ies)	1. Household based market study for connecting Kalangala islands to the electric grid 2004. Unpublished. 2. Digitalization of existing (2004) and planned 132kV and 33kV electric grid lines in Uganda
Comments:	In-depth market study of approximately 600 households in the district of Kalangala, Moroto, Soroti, Moyo, Ntungamo, Gulu, Mubende and Kyenjojo. Database available for use by UBOS
PROJECT/ INSTITUTION	**Electricité de France (EDF) Energy Survey**
Address of institution	The main objective of this Survey was to generate relevant data/statistics necessary for studying accessibility to electricity by the rural people of Uganda and in Kalangala district specifically
Objective	The main objective of this Survey was to generate relevant data/statistics necessary for studying accessibility to electricity by the rural people of Uganda and in Kalangala district specifically. (a) Providing information on economic characteristics of the population and their economic activity status (b)Providing information on energy sources, types and cost in the district (c)Determining the levels of interest in electricity Service of the community and willingness to pay for the service. (d) Meeting other special data needs of main user, Electricite-de-France as enshrined in the questionnaire.
Study(ies)	A Study in Kalangala District comprising 600 households in 2003
Sampling frame	PHC 2002 and simple random sample
Comments	Database available for use by UBOS

Annex 3. Supplementary figures and tables for the analyses on welfare and energy use

Table A3.1 Headcount ratios in Uganda.

	1992/93	1993/94	1994/95	1995/96	1997	1999/00	2002/03
Urban	27,8	20,6	22,3	19,5	16,7	9,6	12,2
Rural	59,7	56,7	54	53	48,7	37,4	41,7

Source: National household surveys, UBOS.

Table A3.2 Headcount ratios in Uganda, 2002/03

	Rural	Urban
Central	27,6	7,8
East	48,3	17,9
North	65	31,4
West	32,7	16,9

Source: UBoS, UNHS 2002/03

Table A3.3 Household Consumption of Energy for Cooking as a Percentage of Total Energy for Cooking

Year	1992/93		1994/95		1995/96		1997		1999/2000		2002/2003	
Type of energy	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
(Cooking)	%	%	%	%	%	%	%	%	%	%	%	%
Firewood	98,54	27,16	96,86	31,27	94,23	28,64	89,80	21,08	95,46	19,91	90,23	21,62
Charcoal	3,46	62,15	2,29	56,10	5,09	58,90	7,25	65,59	4,05	70,25	8,15	67,36
Kerosenee	1,48	4,51	0,71	5,78	0,50	6,64	1,09	5,24	0,28	5,34	0,81	5,44
Electricity	0,25	5,19	0,16	5,42	0,04	3,29	0,30	3,12	0,04	2,92	0,15	2,5
Gas	0,09	0,32	-	0,03	-	0,18	0,09	0,34	0,01	0,65	0,05	0,53
Others	0,17	0,68	-	1,40	0,14	2,35	1,47	4,64	0,19	0,93	0,2	3,03

Source : *UBoS. Uganda National Household Survey Data*. The figures in this table, except for 2002/03 is taken from Kyokutamba (2002)

Table A3.4 Household Consumption of Energy for Lighting as a Percentage of Total Energy for Light

Year	1992/93		1993/94		1995/96		1997		1999/2000		2002/2003	
Source of energy	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Kerosenee/ Tadooba	78,09	45,74	83,74	46,57	81,39	35,68	76,67	29,78	80,16	28,74	78,2	30,5
Kerosenee/ Lantern	6,21	16,19	2,45	9,96	11,39	30,26	10,32	27,43	10,88	29,46	13,39	25,23
Candle (Wax)	0,41	1,41	0,28	0,90	0,42	0,72	0,16	0,84	0,38	1,22	0,45	2,97
Electricity	1,75	34,91	2,15	41,02	1,94	33,06	2,28	37,94	1,15	40,28	2,94	40,59
Others	13,53	1,75	11,38	1,55	4,85	0,28	10,57	4,00	7,43	0,30	5,03	0,71

Source : *UBoS. Uganda National Household Survey Data*. The figures in this table, except for 2002/03 is taken from Kyokutamba (2002)

Table A3.5 Household consumption of energy for cooking as percentage of total energy for cooking, by region. Rural 2002/03

Energy	Central	East	North	West
Electricity	0,55	0	0	0,03
Gas	0,16	0,05	0	0
Paraffin	1,48	0,45	0,28	0,96
Charcoal	14,34	5,06	5,52	7,56
Firewood	82,94	93,95	93,64	90,6
Cow dung or grass (reeds)	0,2	0,22	0,4	0,14
Others	0,34	0,28	0,17	0,71

Source: UBoS, UNHS 2002/03

Table A3.6 Household consumption of energy for cooking as percentage of total energy for cooking, by region. Urban 2002/03

Energy	Central	East	North	West
Electricity	3,56	0,84	0,04	1,03
Gas	0,8	0,15	0	0,07
Paraffin	7,42	2,14	1,13	2,81
Charcoal	71,88	74,24	55,6	46,8
Firewood	13,5	20,4	41,2	47,38
Cow dung or grass (reeds)	0	0,05	0,41	0
Others	2,84	2,19	1,62	1,91

Source: UBoS, UNHS 2002/03

Table A3.7 Household consumption of energy for light as percentage of total energy for light consumption, by region. Rural 2002/03

Energy	Central	East	North	West
Electricity	8,2	1,51	0	1,73
Gas	0	0,03	0,11	0
Paraffin (Latern)	16,2	9,23	7,27	19,76
Paraffin (tadoba)	73,79	86,61	74,96	76,07
Candle wax	0,55	0,6	0,22	0,36
Firewood	0,85	1,7	13,97	0,74
Cow dung or grass (reeds)	0	0,19	3,09	0,69
Others	0,42	0,12	0,36	0,66

Source: UBoS, UNHS 2002/03

Table A3.8 Household consumption of energy for light as percentage of total energy for light consumption, by region. Urban 2002/03

Energy	Central	East	North	West
Electricity	50,69	23,68	11,21	31,75
Gas	0,22	0,06	0	0,17
Paraffin (Latern)	26,02	23,73	16,94	28,4
Paraffin (tadoba)	18,85	51,51	66,64	37,66
Candle wax	4,16	0,87	0,99	1,08
Firewood	0,01	0,02	2,07	0,32
Cow dung or grass (reeds)	0	0	1,41	0
Others	0,04	0,12	0,74	0,62

Source: UBoS, UNHS 2002/03

Table A3.9 Probability of sickness due to respiratory problems. Rural

Response variable:	dummy for sickness due to respiratory problems			
Frequency				
Sick	4822			
not sick	826			
Likelihood ratio	0,033			
Parameter	Estimate	Std. Error	Chi-Square	P-value
Intercept	1,03	0,18	0,69	<.0001
Firewood	-0,25	0,08	-0,41	0,0018
+ district dummies				

Data source: UBoS, UNHS 2002/03

Table A3.10 Probability of sickness due to respiratory problems. Urban

Response variable:	dummy for sickness due to respiratory problems			
Frequency				
Sick	3537			
not sick	525			
Likelihood ratio	0,038			
Parameter	Estimate	Std. Error	Chi-Square	P-value
Intercept	1,45	0,27	0,91	<.0001
Firewood	-0,19	0,06	-0,31	0,0008
+ district dummies				

Data source: UBoS, UNHS 2002/03

Table A3.11 Type of energy for cooking, by expenditure quintiles. Percent. Rural

Energy	average over all households	1.quintile	2. quintile	3. quintile	4. quintile	5. quintile
Electricity	0,15			0,04	0,08	0,61
Gas	0,05				0,07	0,2
Paraffin	0,81	0,28	0,84	0,38	0,74	1,81
Charcoal	8,15	1,82	2,7	3,32	9,11	23,95
Firewood	90,23	97,35	95,84	96,04	89,61	72,11
Cow dung or grass (reeds)	0,23	0,35	0,49	0,03	0,16	0,11
Others	0,39	0,19	0,13	0,19	0,22	1,21

Data source: UBoS, UNHS 2002/03

Table A3.12 Type of energy for cooking, by expenditure quintiles. Percent. Urban

Energy	average over all households	1.quintile	2. quintile	3. quintile	4. quintile	5. quintile
Electricity	2,5	0,14	0,03	0,33	2,63	9,54
Gas	0,53	0	0	0	0,63	2,07
Paraffin	5,44	0,33	3,19	3,74	6,44	13,8
Charcoal	67,36	49,6	65,16	80,81	77,9	63,87
Firewood	21,62	49,63	29,52	14,17	8,05	5,53
Cow dung or grass (reeds)	0,04	0,04	0,08	0,02	0,02	0,05
Others	2,51	0,27	2,02	0,93	4,33	5,14

Data source: UBoS, UNHS 2002/03

Table A3.13 Type of lightening energy normally used, by expenditure quintile. Percent. Rural.

Energy	average over all households	1.quintile	2. quintile	3. quintile	4. quintile	5. quintile
Electricity	2,93	0,05	0,65	0,62	2,55	10,78
Gas	0,03	0	0	0,15	0	0
Paraffin (Latern)	13,46	2,16	4,88	9,55	19,5	31,18
Paraffin (tadoba)	78,11	81,45	90,68	87,4	76,66	54,39
Candle wax	0,47	0,49	0,04	1,37	0,33	1,5
Firewood	3,73	13,1	2,61	0,84	0,72	0,84
Cow dung or grass (reeds)	0,87	2,55	0,8	0,07	0,14	0
Others	0,4	0,19	0,33	0	0,1	1,32

Data source: UBoS, UNHS 2002/03

Table A3.14 Type of lightening energy normally used, by expenditure quintile. Percent. Urban

Energy	average over all households	1.quintile	2. quintile	3. quintile	4. quintile	5. quintile
Electricity	40,79	9,33	21,19	36,84	59,6	76,89
Gas	0,16	0	0,07	0,05	0,12	0,59
Paraffin (Latern)	24,91	21,01	30,01	35,69	24,05	13,73
Paraffin (tadoba)	30,29	66,39	45,01	22,69	14,72	2,74
Candle wax	3,32	1,33	3,48	4,62	1,33	5,85
Firewood	0,22	1	0,13	0	0	0
Cow dung or grass (reeds)	0,12	0,59	0	0	0	0
Others	0,19	0,35	0,11	0,11	0,18	0,2

Data source: UBoS, UNHS 2002/03

Table A3.15 Type of lightening energy normally used, by expenditure quintile. Percent. Western Rural

Energy	average over all households	1.quintile	2. quintile	3. quintile	4. quintile	5. quintile
Electricity	8,2	0	0,28	0,32	1,59	5,27
Gas	0					
Paraffin (Latern)	16,2	2,95	4,75	14,29	24,64	42,47
Paraffin (tadoba)	73,79	92,35	93,58	83,58	72,22	48,5
Candle wax	0,55	0	0,17	0	0,36	1,42
Firewood	0,85	1,89	0,63	0,35	0,88	0,36
Cow dung or grass (reeds)	0	2,81				
Others	0,42		0,6	1,46	0,32	1,99

Data source: UBoS, UNHS 2002/03

Table A3.16 Probit model for whether a household uses tadoba or lantern. Central, rural

		Frequency		
Response variable:				
1 if household use tadoba		278		
0 if household use lantern		1142		
Likelihood ratio	0,28			
Parameter	**Estimate**	**Std.Error**	**Chi-Square**	**P-value**
Intercept	-3,16	0,18	303,2	<.0001
Paraffin expenditure	0,0008	0,0001	48,1	<.0001
Hh owns radio	0,65	0,12	27,3	<.0001
number of hh members	0,067	0,018	13,9	0,0002
Maximum education in hh	0,074	0,015	25,2	<.0001
log expenditure	0,000013	1,90E-06	47,4	<.0001

Data source: UBoS, UNHS 2002/03

Table A3.17 Share of household expenditure on the type of energy, by expenditure quintile. Rural

	Total	**Electricity**	**Paraffin**	**Charcoal**	**Firewood**	**Others**
average	7,7	0,2	1,8	0,4	5,3	0,03
1. quintile	9,8	0,1	2,1	0,0	7,6	0,02
2. quintile	8,4	0,1	2,0	0,2	6,1	0,02
3. quintile	7,5	0,1	1,9	0,2	5,3	0,01
4. quintile	7,2	0,1	1,8	0,7	4,7	0,01
5. quintile	5,8	0,5	1,5	1,0	2,7	0,10

Data source: UBoS, UNHS 2002/03

Table A3.18 Share of household expenditure on the type of energy, by expenditure quintile. Urban

	Total	**Electricity**	**Paraffin**	**Charcoal**	**Firewood**	**Others**
average	7,5	1,5	1,5	3,3	1,2	0,04
1. quintile	10,0	0,6	2,2	3,9	3,3	0,01
2. quintile	8,4	0,9	2,0	4,0	1,6	0,02
3. quintile	7,4	1,2	1,5	4,0	0,5	0,05
4. quintile	6,4	2,1	1,2	2,7	0,2	0,02
5. quintile	5,3	2,7	0,7	1,7	0,1	0,09

Data source: UBoS, UNHS 2002/03

Table A3.19 Share of households using electricity for lightening, by household expenditure, 2002/03

		1.quintile	2.quintile	3.quintile	4.quintile	5.quintile
Rural	**no electricity**	99,95	99,35	99,38	97,45	89,22
	electricity	0,05	0,65	0,62	2,55	10,78
Urban	**no electricity**	90,67	78,81	63,16	40,4	23,11
	electricity	9,33	21,19	36,84	59,6	76,89

Data source: UBoS, UNHS 2002/03

Table A3.20 Expenditure to electricity for electricity users, as share of total household expenditure, 2002/03

	1.quintile	2.quintile	3.quintile	4.quintile	5.quintile
Rural	8,2	6,3	6,8	4,2	5,2
Urban	6,6	5,3	3,9	4,1	3,9

Data source: UBoS, UNHS 2002/03

Annex 4. Draft budget

Draft Budget for a joint UBOS/SN project on improvement of the UBOS energy web site

Item	Unit	# Units	NOK per unit	USD per unit	Total NOK	Total USD
UBOS consultant I rate	days	10		100	6 400	1000
UBOS consultant II rate	days	35	-	80	17 920	2 800
UBOS drivers allowances	days	10	-	3	192	30
Fuel	liters	400	-	2	5 120	800
Contingency (10% of the above total)	percent	-	-	-	2 963	463
UBOS Overhead (10%)	per cent	-	-	-	3 200	500
Data acquisition					3 200	500
SN work in Uganda (20 days)	hours	160	703	-	112 480	17 575
Daily allowances in Uganda	Days	26	1 120		29 120	4 550
SN work in Norway (6 days)	hours	45	703	-	31 635	4 942
SN travel days (4 days)	hours	32	703	-	22 496	3 515
SN travel cost	trip	2	11 000	-	22 000	3 438
Total	-	-	-	-	256 726	40 113

Preconditions for the budget:
8 work hours per day in Uganda and for travel
7.5 work hours per day in Norway
2005 tariffs
NOK/USD=1/6.4
UShs/USD=1840/1

Annex 4. Terms of Reference

SN Division for International Consulting April 21, 2005

A proposal for a feasibility study:

Assessment of statistics on the Ugandan households access and use of energy by source and over time related to poverty eradication.

The main objective with the suggested study is to provide information and recommendations for possible improvement of the statistics for monitoring of the private consumption sectors access and use of energy by source and region within the framework of the PEAP in Uganda.

Based on existing indicators developed for the energy sector (MEMD 2003), an assessment of existing and potential sources for data should be conducted focusing on quality, completeness, timeliness and accessibility of these sources. It is essential to review the possibility of linking selected indicators concerning energy access and use at national/regional/sub-regional level, to socioeconomic characteristics at household or aggregated levels.

Strengths and shortcomings in availability of existing data should be identified. Suggestions, including cost estimates for how to improve the data coverage and quality on short and medium term should be made.

The final output of the proposed project should be a documentation report and if agreed by all parties, a workshop for discussion of the findings and recommendation for possible scenarios for further work.

The project should be conducted and concluded at the latest within the third quarter of 2005, organized as a joint venture between Statistics Norway and Uganda Bureau of Statistics.

The total estimated cost for the study is USD 54 000. -*

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1. Background

Monitoring of the effects of changes in the energy sector on poverty has not been systematically done on a countrywide basis in Uganda. This can be explained by lack of data, lack of suitable methods, and it can also be due to traditional over focus on monitoring input factors more than output factors.

However, more data on outputs and effects of energy use are becoming available, not at least due to the expected outputs from the Uganda Population and Housing Census (PHC) 2002 and the increasing availability of geo-coded data and digital maps. There is also an

increasing demand from donors on objective monitoring of impacts on poverty eradication of each unit invested. It should therefore be timely to conduct an initial study with the objective to harmonize and combine data from different sources to prepare for analyses and possibly to recommend for a permanent sustainable statistical system for continuous monitoring with user friendly and timely dissemination. Possible geographical differences and characteristics for those regions and households that change their use of energy compared to those who do not change should be looked into.

2. Objective

The overall objective for the proposed project is to contribute statistical information on energy feeding into the work on eradication of poverty in Uganda.

The operational objectives are as follows:

- Documenting, analyzing and presenting relevant information on access to and use of energy from various sources across regions/sub-regions and socio-economic groups of households in Uganda.
- Presenting a proposal for improvement of statistics to monitor changes in access to- and use of various energy sources in Ugandan households in relation to poverty. Proposals for possible modeling approaches should be included.

In the view of the above objectives, the project should assess possibilities and recommend a way forward for establishing a cost-efficient, permanent, multi source information system. At the end of the study, it should be possible to update regularly the statistics in order to monitor effects of changes in the households' consumption of energy in relation to poverty.

3. Tasks to be dealt with

3.1. Module I:

1. Organize SN and UBOS officers in order to agree on a detailed work plan including tasks, milestones and clear responsibility ensuring commitment.
2. Review existing relevant studies/indicators available and further develop the scope of the study in cooperation between SN and UBOS.
3. Review relevant data and sources in UBOS and extract data needed for the project.
4. Review administrative data sources and others from institutions outside UBOS, of which data from the Ministry of Energy and Mineral Development (MEMD), UMEME, and The National Forest Authority (NFA) are considered as the most important, and extract data needed for the project.
5. Identify possible gaps in data sources.
6. Conduct a Module I review with the donor and decide if a workshop should be held or not.

3.2. Module II

1. Present findings and recommendations on a Stakeholders Workshop for further discussion and possible decisions on the way forward.

3.3. Outputs

1. A draft project report for Module I with documentation of sources, methods, findings and recommendations for further work as well as examples of regional/sub-regional statistics should be available as tables and graphics/maps. More specifically the project report should include:

- A draft framework/building blocks for a statistical system designed for monitoring changes in access and use of energy by source and geographical distribution.
- List of selected indicators and suggestions for output products for different frequency of dissemination.
- Suggestions for modules for piggybacking or other adjustments to already existing UBOS surveys.
- Suggestions for how to improve the data compiled by external organizations with the objective to better feed into a monitoring system.
- Rough estimates of resources needed for further work on a monitoring system/improvement of data.
- Suggestions for how to ensure national ownership and formal anchoring of a monitoring system.
- Compile and process example statistics from some selected available sources.
- Suggestion for possible modeling approaches relating changes in energy use and/or availability to poverty.
- Link examples of the energy access/use information compiled from the PHC 2002 to ongoing work on poverty mapping and discuss possibilities for methodological research and outputs.

2. A final project report for Module I+II including results of the discussion on the stakeholder workshop
3. A Power Point presentation for the workshop

4. Organization and timing

The two sister organizations UBOS and SN have positive experience from several years of cooperation organized as twinning projects in order to develop and drift statistics and mutually to build capacity. This implies in short that UBOS has the formal lead and economic responsibility for the project and contributes with permanent staff work hours and expertise. SN contributes with experts on short or medium term presence in Uganda.

However, the character of the hereby-suggested initial study should for pragmatic reasons be organized with SN in the lead with desk working in Norway and SN conducting a fact-finding and expert mission visiting Uganda. This mission should be hosted, prepared and backed up by UBOS counterparts in the Directorate of Production Statistics (D/PST). Cooperation before and after the mission should be based on communication by e-mail.

The project should, if further work is decided, position UBOS with a key role to play as an objective and professional institution also for harmonizing, compiling and disseminating of statistics covering access to and use of energy bridging over to research on effects on poverty eradication.

It is suggested to conduct one SN subject matter consultancies of 15 workdays for two officers for fact finding and, if findings allow, also to conduct a stakeholders workshop. In addition comes 6 days for deskwork in Norway and 4 travel days.

A total of up to 40 days of work from UBOS permanent staff with most of the work in the second and third quarter of 2005 is envisaged. The UBOS contribution will mostly be preparation and being counterpart to the visitors giving substantial input to fact finding

and subject matter discussions as well as arranging meetings and taking care of logistics during the SN visits.

The logistics around the planned workshop and copying/spiro-binding of the draft reports will be UBOS responsibility. However, also practical work on compiling and processing of internal and external data making them easily available for use is foreseen for UBOS engagement, as well as giving substantial inputs such as part of text and statistics to the planned study and report. The UBOS work is partially to be done in the period before the visit and communication with SN by e-mail is envisaged.

Provided that funding is available, the project could start as soon as data from the PHC 2002 are available for further analyses and the cooperating partners could allocate time i.e. in second or third quarter of 2005. The decision on a workshop should be taken when findings or results from the first phase becomes clearer.

Final documentation from the project in the form of a printed report should be available within end of November 2005 at the latest. The report should be published in the SN series Documents, as a joint SN and UBOS work. Results should be presented as explanatory text, tables and graphs including use of maps.

5. Budget*

Item	Unit	# Units	NOK per unit	USD per unit	Total NOK	Total USD
UBOS consultant I rate	days	5		100	3200	500
UBOS consultant II rate	days	35	-	80	17920	2800
UBOS drivers allowances	days	20		3	384	60
Fuel	liters	450	-	2	5760	900
Cost for int./ext. data capture/use	-	-	-	-	6400	1000
Copying and spiro-binding	-	-	-	-	1280	200
Stakeholders Workshop	#	1	-	-	11520	1800
Contingency (10% of the above total)	percent				4646	726
UBOS Overhead (10%)	per cent	10	-	-	5113	799
					0	0
SN work in Uganda (30 days)	hours	240	703	-	168720	26363
Daily allowances in Uganda	days	40	1 120		44800	7000
SN work in Norway (6 days)	hours	45	703	-	31635	4943
SN travel days (4 days)	hours	32	703	-	22496	3515
SN travel cost	trip	2	11000	-	22000	3438
Total	-	-	-	-	345874	54044

* Budget for both phase I and II
Preconditions for the budget:

8 work hours per day in Uganda and for travel
7.5 work hours per day in Norway

NOK/USD=1/6.4
UShs/USD=1750/1

6. Formalities

1. Provided formal approval from UBOS, SN and possibly the Uganda Ministry of Finance, The Royal Norwegian Embassy in Kampala (and/or other Donors) is kindly requested to fund the project with a total sum of up to USD 54 000 (NOK 345 874).

2. The cooperation between SN and UBOS should be outlined in a separate contract signed by SN and UBOS. The contract should include agreement on how transactions of payments to UBOS should be done.

Previously issued on the subject

Rapporter (RAPP)
2004/20: Wold, Bjørn K., Stein Opdahl, Estrellita Rauan, Randi Johannessen and Ingvar T. Olsen: Tracking Resource and Policy Impact. Incorporating Millennium Development Goals & Indicators and Poverty Reduction Strategy Paper monitoring across sectors
Documents
2002/8: Wold, Bjørn K., Olsen, Ingvar and Opdahl, Stein: Basic Social Policy Data. Basic Data to Monitor status & Intended Policy Effects with Focus on Social Sectors incorporating Millennium Development Goals
2004/4: Gulløy, Elisabeth and Bjørn K. Wold (eds.): Statistics for Development, Policy and Democracy. Successful Experience and Lessons Learned through 10 years of statistical and institutional development assistance and cooperation by Statistics Norway
2004/17: Wold, Bjørn K., Dag Roll-Hansen, Astrid Mathiassen and Stein Opdahl: A Sustainable Household Survey Based Poverty Monitoring System A Poverty Monitoring System Based upon Household Survey Estimation of Total Consumption. A Preliminary Paper Asking for Cooperation
Discussion Papers
415: Mathiassen, Astrid: A Statistical Model for Simple, Fast and Reliable Measurement of Poverty
Økonomiske analyser (ØA)
2/2005: Wold, Bjørn K.: Fra ressursinnsats til velferdsvirkninger

Recent publications in the series Documents

2003/7 B.A. Holth, T. Risberg, E. Wedde og H. Degerdal: Continuing Vocational Training Survey (CVTS2). Quality Report for Norway.

2003/8 P.M. Bergh and A.S. Abrahamsen: Energy consumption in the services sector. 2000

2003/9 K-G. Lindquist and T. Skjerpen: Exploring the Change in Skill Structure of Labour Demand in Norwegian Manufacturing

2004/1 S. Longva: Indicators for Democratic Debate - Informing the Public at General Elections.

2004/2 H. Skiri: Selected documents on the modernisation of the civil registration system in Albania.

2004/3 J.H. Wang: Non-response in the Norwegian Business Tendency Survey.

2004/4 E. Gulløy and B.K Wold: Statistics for Development, Policy and Democracy. Successful Experience and Lessons Learned through 10 years of statistical and institutional development assistance and cooperation by Statistics Norway

2004/5 S. Glomsrød and L. Lindholt: The petroleum business environment.

2004/6 H.V. Sæbø: Statistical Metadata on the Internet Revised.

2004/7 M.Bråthen: Collecting data on wages for the Labour - pilot

2004/8 A.L. Brathaug and E. Fløttum: Norwegian Experiences on Treatment of Changes in Methodologies and Classifications when Compiling Long Time Series of National Accounts.

2004/9 L. Røgeberg, T. Skoglund and S. Todsen: Report on the Project Quality Adjusted Input Price Indicies for Collective Services in the Norwegian National Accounts. Report from a Project Co-financed by Eurostat.

2004/10 A-K. Mevik: Uncertainty in the Norwegian Business Tendency Survey.

2004/11 A.G. Hustoft, J. Linnerud and H.V. Sæbø: Quality and metadata in Statistics Norway.

2004/12 E. Engelien, R. Klæboe and Margrete Steinnes: Neighbourhood sonoscapes. Context sensitive noise impact mapping .

2004/13 Petter Vegard Hansen: Regional electricity spot price responses in Norway.

2004/14 A.G. Hustoft and J. Linnerud: Development of a variables documentation system in Statistics Norway. International Statistical Conference "Investment in the future", Prague, Czech Republic, 6-7 September 2004.

2004/15 J.L. Hass: Compilation of data on expenditure in Environmental protection by businesses. Report to the European Commission DG for Environment.

2004/16 A. Raknerud, J. Rønningen og T. Skjerpen: Documentation of the capital database. A database with data for tagible fixed assets and economic data at the firm level.

2004/17 B.K. Wold D. Roll-Hansen A. Mathiassen and S. Opdahl: A Sustainable Household Survey Based Poverty Monitoring System. A Poverty Monitoring System Based upon Household Survey Estimation of Total Consumption. A Preliminary Paper Asking for Cooperation

2004/18 T. Karlsen, D. Quang Pham and T. Skjerpen: Seasonal adjustment and smoothing of manufacturing investments series from the quartely Norwegian national accounts

2005/1 V. Skirbekk: The Impact of a Lower School Leaving Age and a Later Retirement on the Financing of the Norwegian Public Pension System.

2005/2 H. Utne: The Population and Housing Censushandbook 2001.

2005/3 J. L.Hass and R. Straumann: Environmental Protection Expenditure: Methodological work for the Oil and Gas Extraction Industry. Report to Eurostat.

2005/4 L. Hobbelstad Simpson: National Accounts Supply and Use Tables (SUT) in Constant Prices SNA-NT "SUT/CONSTANT"

2005/5 L. Hobbelstad Simpson: National Accounts Supply and Use Tables (SUT) in Current Prices. SNA-NT "SUT/STARTER"

2005/6 S. Todsen: SNA-NT User's Guide for Supply and Use Tables in Current and Constant Prices.

2005/7 E. Ugreninov, T.M. Normann and A. Andersen: Intermediate Quality Report EU-SILC 2003 Statistics Norway.

2005/8 H.V. Sæbø: Metadata strategy in Statistics Norway. Eurostat Metadata Working Group Luxembourg, 6-7 June 2005.

2005/9 J.L. Hass, K.Ø. Sørensen , K. Erlandsen and T. Smith: Norwegian Economic and Environment Accounts (NOREEA). Project Report 2002.