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Energy services for rural institutional supply and demand (ESRI)
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The views presented in this report are not necessarily those of DFID

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Glossary

CHAK	Christian Health Association of Kenya
EAA	Energy Alternatives Africa, Kenya (ESRI Project Partner)
ESRI	Energy Services for Rural Institutions (this project)
ESA	Energy Service Advisor
DFID	Department for International Development
CER	Certified Emission Reduction Unit, a unit of carbon dioxide equivalent, specifically denominated for CDM projects within the Kyoto Protocol
C*f*BT	Council for British Teachers, Kenya (ESRI Project Partner)
CDM	Clean Development Mechanism under the Kyoto Protocol, one of three 'flexible mechanisms' to achieve certified emission reductions (CERs)
CSIR	Scientific Research and Industrial Council, South Africa
DEAT	Department of Environmental Affairs and Tourism, South Africa
DME	Department of Minerals and Energy, South Africa
EDRC	Energy and Development Research Centre, South Africa (ESRI Project Partner)
EIA	Environmental Impact Assessment
ESD	Energy for Sustainable Development Ltd
EU	European Union
GBP	Pounds Sterling
GIS	Geographic Information Systems
Green house gases (GHG)	carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFC's), perfluorocarbons (PFC's), and sulphur hexafluoride (SF6)
GWh	Gigawatt hour
ICT	Information and Communication Technologies
IDZ	Industrial Development Zone
INEP or NEP	Integrated National Electrification Programme, South Africa
kW	Kilowatt
Kyoto	The Kyoto Protocol, signed in 1997, which sets out targets for greenhouse gas reductions worldwide
MW	Megawatt
MWh	Megawatt hour
NER	National Electricity Regulator, South Africa
O&M	Operations and Maintenance
PPA	Power Purchase Agreement
RE	Renewable Energy
RAPS	Rural Area Power Solutions, South Africa (ESRI Project Partner)
REDC	Renewable Energy Development Centre, Uganda (ESRI Project Partner)
RSA	Republic of South Africa
SHS	Solar Home System
KZN	KwaZulu Natal Province
ZAR (or R)	South African Rand

Executive summary

Background

This report documents a project which has sought to explore and demonstrate a rural business orientated approach to improving energy services to rural health and education institutions.

Parallel activities were undertaken in Kenya, South Africa and Uganda. The intention was to establish rural, sustainable businesses that could offer services to schools and clinics. Although it is conceivable that such businesses could be fully independent, the context of each country affected the approach taken.

For instance in South Africa, parallel developments were taking place on a larger scale for off-grid energy service provision, whereas in Kenya, large scale rural energy service provision was largely driven by non-government activities. In the Uganda context, significant government and donor activities in the energy sector were underway, but with limited reach and capacity at the rural level.

The project had at its core three main outputs:

1. Develop **increased awareness** and understanding amongst institution staff of energy efficiency, demand-side management, and new energy technologies.

2. Develop **Energy Service Advisors** (ESA's) operating to support rural institutions in dealing with issues of energy supply and demand. Ideally, these ESA's would remain as a sustainable legacy of the ESRI project.

3. Develop a set of **Guidelines**[1] for energy management and improved energy services at rural institutions. This would form a body of knowledge for use by practitioners in the health, education, energy and development sectors.

In order to achieve these goals, the following two issues were assessed:

a) Understanding the **target market** (rural schools and clinics) and identifying opportunities for energy related interventions
b) Exploring the **potential models for Energy Service Advisors** (ESAs), in a form to be defined, to undertake energy audits, and to develop practical action plans for institutions. This would include defining appropriate training materials, selecting individuals for training, support of energy survey and audit activities and determination of the sustainability of the models defined.

Key client institution types were defined and in most cases there were opportunities for improvements to energy services, or more efficient use of energy. Issues/opportunities identified included items such as (i) better maintenance of energy supply equipment or of energy appliances; (ii) use of more efficient fluorescent lighting rather than incandescent bulbs; and (iii) provision of better energy management information to users (e.g. how to reduce diesel consumption).

[1] See Annex D

ESA Models

Three ESA models were developed in the course of the ESRI project, namely:

1. "Institutional ESA" - Kenya
2. "ESA Customer Training Agent" – South Africa
3. "Independent ESA" – Kenya, Uganda

The organisational diagrams for these models are shown in figures 1, 2 and 3 below.

Figure 1 Institutional ESA

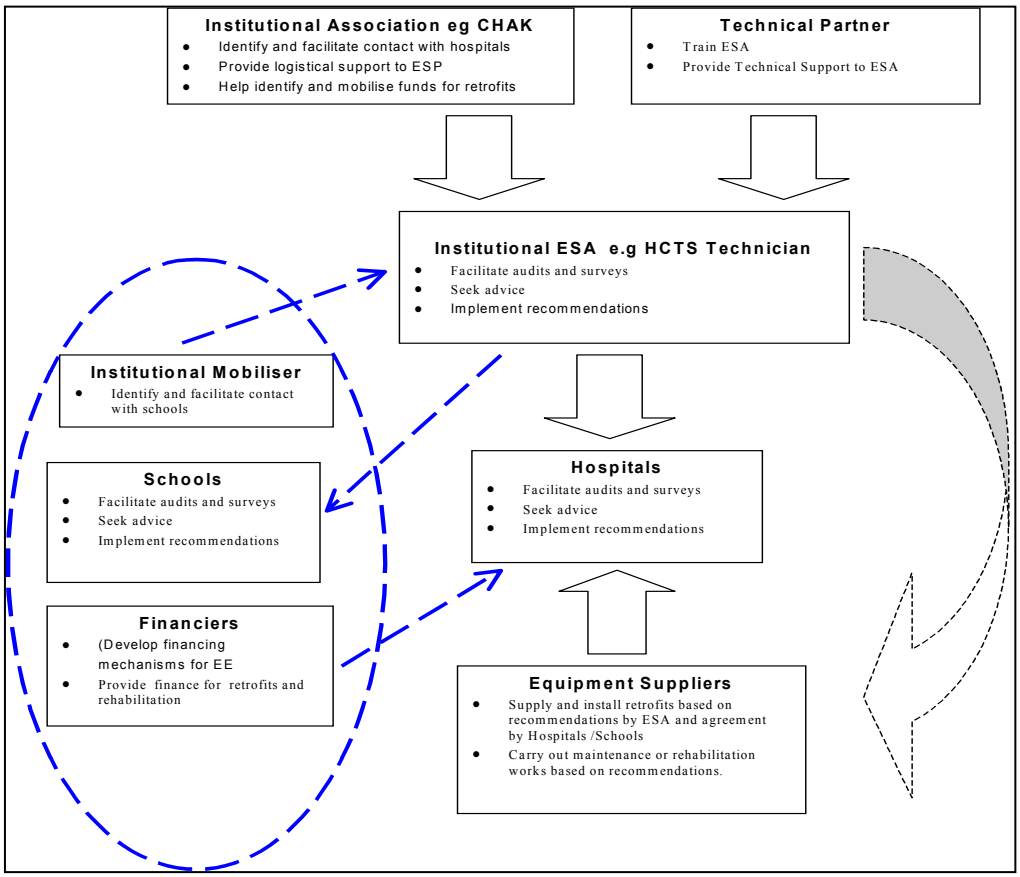


Figure 2 ESA Customer Training Agent

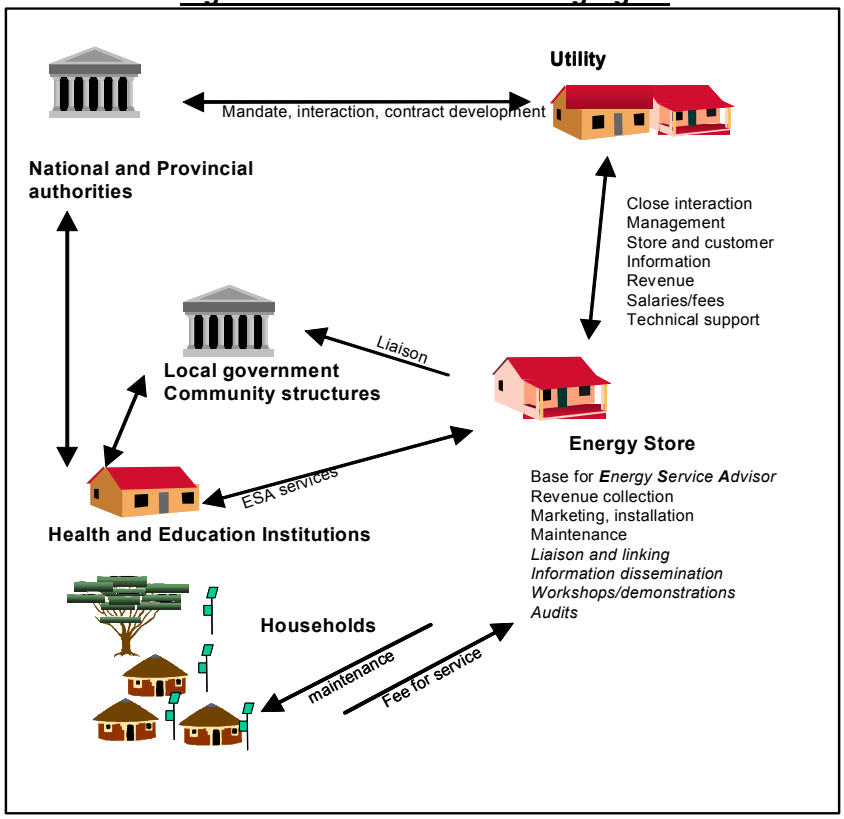
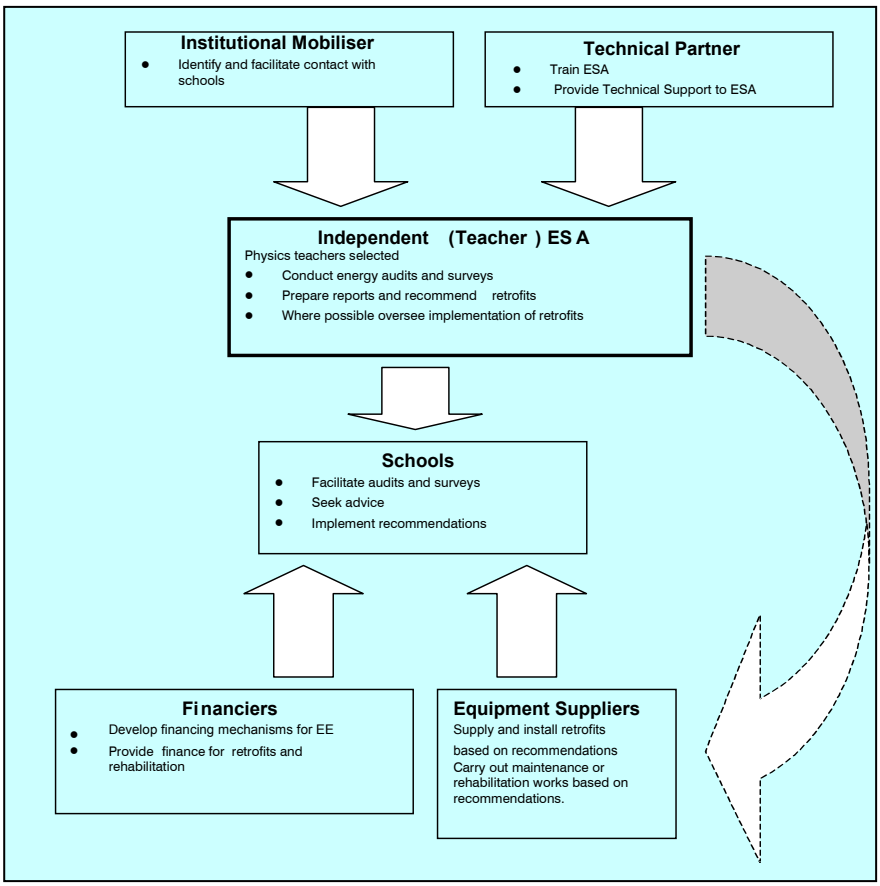


Figure 3 Independent ESA



This project has sought to close a gap between potential demand for rural institutional technical support by producing a number of practical recommendations for policy makers. Some of the issues in this report and the final Guidelines document (Annex D) will be of relevance when considering future policy interventions both in the three countries examined under the ESRI project, but also in other countries around the world.

Benefits

The benefits achievable through appropriate energy management are well documented. It was typically found in ESRI that the ESA approach to energy service delivery can achieve positive benefits, such as:

- Annual energy savings in schools of up to 30% (Kenya, South Africa, Uganda)
- Annual energy savings in health institutions of 10-20% (Kenya, South Africa, Uganda)
- Improved user knowledge and management of energy (South Africa)

The most important issue for sustained intervention and support is the type of model used. Related success factors are described below.

Findings: Kenya[2]

Unlike South Africa, designated rural "utilities" do not exist in Kenya. The national electricity service provider in Kenya is Kenya Power & Lighting Company Ltd (KPLC), which due to a number of long term issues, is not in a position to effectively service the rural areas of the country. Thus, in the Kenya component of ESRI, it was necessary to search for appropriate frameworks that could potentially offer rural services to institutions.

As a result of the first phase of analysis, two models were ultimately tested in Kenya:

a) The "Institutional" model, where an existing institutional framework, such as a functioning technical health service network, is available and able to adopt energy management practice; and

b) The "Independent" model, where entrepreneurs develop skills to generate income from energy management opportunities at various institutions.

For both of these approaches, training materials were developed, individuals were trained in energy management, energy audits were carried out, action plans were developed and interventions were completed.

Of these two models tested in Kenya, by far the most sustainable and replicable is the Institutional model. The potential for the independent model to be replicated is quite restricted due to the need for quite specific personal skills and a supporting, enabling environment. In addition, the opportunity to maintain a market is limited, due to the dispersed nature of rural institutions.

The benefit of improved overall service management by existing well managed frameworks (such as CHAK) has been thoroughly explored and recognised in ESRI and forms one of the most useful outputs of the project. Such frameworks are relatively limited in Kenya and other sub-Saharan countries, yet they represent the best potential for the approach that ESRI had adopted.

[2] See Annex A

Findings: South Africa[3]

In South Africa, the ESRI project was conducted under the framework of the relatively new non-grid concession utilities. With this structured service delivery mechanism already in place it was possible to test, under ESRI, a number of hypotheses about energy management support. For instance, the concession had already established local Energy Shops, which served as the sales and customer service point for small scale solar home systems (SHS).

It was determined that audits would be better conducted as part of a structured programme, undertaken and managed by professional staff, and feeding directly into provincial or national decision making programmes.

The simpler/lower cost interventions identified are reasonably generic, and could be conveyed through **structured seminars or workshops** – without requiring a preliminary full audit. It thus seemed more efficient and practical to train the energy store staff (and provide them with the necessary supporting documentation) so that they could conduct seminars or workshops at rural institutions. In fulfilling a role as 'Energy Service Advisors' (ESAs), described as falling within a "Customer Training Agent" model, they should achieve four main outcomes, below.

1. Staff and community members gain an increased awareness of energy issues and options; how they are affected by their energy practices; and how they can improve these practices in terms of safety, efficiency, economy and usefulness.
2. Staff are encouraged to play an active and informed role in energy management, finding solutions to maintenance problems, and identifying unmet needs related to energy use.
3. Utility Energy Service Advisors (ESAs) have a better understanding of energy-related needs at clinics and schools. ESAs establish useful links which enable them to provide assistance themselves (where possible) or help make the appropriate contacts to other staff within the utility or with other service providers (local government, government departments, Eskom, etc.).
4. Information about Utility products and services is disseminated.

The workshop approach was developed through training energy store staff, and then tested in workshops with teachers and nurses from different areas. Responses from the workshop participants were generally positive, and the Utility is reporting enquiries from schools in particular regarding energy service options, indicating that the linkages referred to in point .3 above are being established. Furthermore, it was observed that the workshop participants had many questions about the services offered by the Utility, indicating that objective (4) was being met.

If Utility energy store staff are to continue interacting with schools and clinics on a sustainable basis, then it is critical that a sound rationale be put forward to motivate the private sector utility to support and authorise this engagement. In analyzing the opportunities, we identified several motivations for continued engagement by the utility with rural institutions such as schools and clinics. These include:

- Additional income from increased sales of utility products (to staff and associates of rural institutions)
- Potential for the Utility to participate in additional projects as a result of these activities (e.g. school electrification, maintenance of institutional energy systems, provision of energy services to institutions)
- Accrual of 'social and political income' – as a private sector company operating in a development context, it is important for the utility to clearly demonstrate a social commitment. This can facilitate access, reduce marketing costs and may even help improve revenue collection rates on the mainstream household utility services

[3] See Annex B

An unfortunate aspect of the South African component of this project is that the rural utility that the team partnered with (the Nuon RAPS Utility) was only able to commence operations in September 2001, due to delays in the national off-grid programme, leaving only ten months for practical collaboration. This also required the collaboration to occur at the same time as the utility was starting up its main operations. The initiative discussed in this report should, however stimulate the other South African utilities to look more closely at their own potential for engaging with rural health and education institutions.

Findings: Uganda[4]

As with Kenya, and unlike South Africa, rural "utilities" do not exist in Uganda. There is also a lack of rural institutional support networks of all kinds, including in the energy sector. There are recent and forthcoming initiatives through the World Bank financed Energy for Rural Transformation (ERT) programme and other donor financed initiatives. However, none of these interventions have established a form of rural technical support in the energy sector.

The national electricity service provider in Uganda is the Uganda Electricity Board (UEB), which is not in a position to effectively service the rural areas of the country. In the Uganda component of ESRI, it was necessary to search for appropriate frameworks that could potentially offer rural services to institutions.

As a result of the first phase of analysis, one model was ultimately tested. This is the "Independent" model, where entrepreneurs develop skills to generate income from energy management opportunities at various institutions. The reason for development of this approach is the lack of rural service structures either within the private, public or NGO sectors.

Training materials were developed in parallel with the Kenya component of ESRI. Individuals were trained in energy management; energy audits were carried out; action plans were developed and interventions were completed.

The potential for the independent model to be replicated is quite restricted due to the need for quite specific personal skills and a supporting, enabling environment. In addition, the opportunity to maintain a market is limited, due to the dispersed nature of rural institutions. Follow up work in Uganda has focused on the opportunity to learn from the "Institutional" model as developed in Kenya.

Recommendations

Three delivery models for energy management were considered in this project. The most successful of these is the "Institutional" model. This success is due to the clear advantages in attaching an energy management approach to another support or service framework, such as CHAK (see section on Kenya (Annex A).

The main recommendations of the project are below.

1. **Institutional support is important.** It is clearly easier to market the service, travel to sites, prepare report and share notes if institutional support is available. Independent ESAs will find it difficult to cover travel costs, which are significant in rural areas. Experience to date shows that the success rate of ESA practising after training is 100% for "Institutional ESAs" in contrast to approximately 30% "independent" ESAs.

[4] See Annex C

2. **Planning and timing**. Even though resources and expertise may be available to carry out audits and surveys, few were carried out as planned, the main reason being "shortage of time". Since the first priority is to keep hospital equipment, running, little focus is made on actual audits on site. This indicates that the subject should be incorporated into their work programme. Independent ESAs have a similar problem in that time availability (during school holiday), often conflicts with availability of the school administration.

3. **Payment to ESA and awareness** – Independent ESAs will experience extreme difficulty in getting paid for their services. Managers are used to paying for hardware rather than for advice. One common factor experienced is that well informed administrators did not have problems paying for the service. It can therefore be said that with increased awareness, payment for energy advice services to the ESA will be more acceptable to the mangers.

4. **ESA capability** – In general, ESAs whose experience is grounded in practical technical disciplines will be more suited for the work than other ESA backgrounds. This must be balanced against the very clear advantages that come with entrepreneurial spirit and management skills. This selection criterion also depends on the model type. Potential factors limiting the performance of ESAs are time management, finances for logistics (report preparation, stationary etc), knowledge of appropriate energy supply options, costs, and supplier details and contacts, overseeing implementation of recommendations, and installation skills for retrofits.

5. **Reporting** and other documentation may be considered a barrier to change since it is often associated (in rural institutions) with additional bureaucracy and work. Interestingly, low and no-cost interventions can happen with little or no documentation. There are significant issues tied up in this, concerning the prospect for thorough surveying, auditing, planning, and intervention, since records are so crucial for energy management.

6. **Demand side management and energy efficiency** are generic opportunities that will be applicable to most institutions. These present serious challenges in the case of schools where the management may have vested interests in the supply of energy (fuel wood sometimes supplied by friends or relatives of the management). Hospitals tend to be more professionally managed in this respect and keen to implement change. Large scale energy efficiency benefits in the case of hospitals will be tied to planned improvements or facility improvement plans. Renewable energy options will be applicable to off-grid locations and in case of on grid institutions where cooking is biomass fired.

7. **Planning at regional or association level** will be effective at reaching the institutions. A countrywide ministry level approach is preferable, but demands finance and support.

8. **Financing ESA and sustainability** – Given the low awareness and understanding of energy issues among institutional management, to kick-start the energy management activities, it is essential to provide financial support to initial audits as a market priming activity. Once institutions appreciate the value of energy service, it has been shown that ESAs can achieve self-sustainability. Consequently institutional associations may mainstream audits and energy management as part of core activities.

9. **Livelihoods** – ESRI was designed in such a way as to specifically tackle energy issues in rural areas of developing countries. There was therefore a preconception that energy issues are relevant and important for the improvement of well-being or livelihoods in the community concerned. This is certainly the case in a number of examples, but only through full community consultation can real priorities be determined. Consideration of Energy Management for rural development must be taken within an overall livelihoods analysis.

The project web site can be found at: http://esri.energyprojects.net.

1 SUMMARY OF PROJECT

1.1 Project Background

The idea for the ESRI project was conceived as a result of the energy problems confronted by the many schools and hospitals in Eastern and Southern Africa who face increasing demand for energy services and a need to address environmental issues, but who currently lack specialist energy knowledge.

To address the energy problems they face, it was proposed that a need exists for rural institutions to find energy solutions building on their own understanding and locally available resources. Such solutions would combine demand-side management, energy efficiency measures and careful investment in new, appropriate technology. In this regard, a niche exists for energy service advisors (ESAs) to exist as sustainable businesses supporting rural institutions.

The ESRI project planned to enable local community based organisations to develop capacity as ESAs. The project itself would support the selection, training and monitoring of ESAs in selected regions of each country as well as identifying and supporting the "business framework" in which such ESAs would operate.

The ESAs would work with institutions like schools and clinics to improve the efficiency of their energy services. The increased access to such services contributes to poverty alleviation through improved access to education and healthcare. In addition, this type of energy service brings clear environmental and local economic benefits.

1.2 Project Objective

The overall objective of the ESRI project:

Deliver more reliable and cost effective energy services to selected rural health and education institutions in Kenya, Uganda and South Africa in order to improve the standards of health and education in rural communities

The specific objectives of the project are:

1. Achieve increased **awareness and understanding** amongst institution staff of energy efficiency, demand-side management and new energy technologies;
2. Develop new **Energy Service Advisors** (ESAs), locally trained and supporting rural institutions in dealing with issues of energy supply and demand;
3. Produce **Guidelines** for energy management and improved energy services at rural institutions to pass on the lessons learned from the project.

The above guidelines are available as a separate document[5], and draw on the experience from all three countries. This report presents additional detail on activities and findings on all three countries in order to document the experience, and to provide more specific information on the particular approach followed in ESRI. This should assist in

a) Facilitating continued use of this approach by the host organisation; and
b) Providing a resource for other agencies such that they could replicate the model.

2 METHODOLOGY

This project was conducted as a partnership between

- Energy for Sustainable Development Ltd (ESD, UK),
- Energy Alternatives Africa (EAA, Kenya),
- Council for British Teachers (C*f*BT, Kenya),
- Renewable Energy Development Centre (REDC, Uganda),
- RAPS Consulting Pty Ltd (RAPS, South Africa),
- Agama Energy (Pty) Ltd (South Africa),
- Energy and Development Research Centre (EDRC, South Africa).

Contact details for these partners can be found in Annex D.

The partners have a combined experience in energy research and development issues in African countries, including poverty alleviation, energy management, health, education and cross sector analysis.

Training and capacity building were a core component of the work, to ensure that rural institution staff, energy service providers (ESAs) and country co-ordinators could communicate views effectively.

Participatory approaches were adopted to maximise accuracy of data collected and to minimise bias. Energy audit methodology was flexible in order to gather both quantitative/qualitative data. Information gathering and verification of initial findings continued during energy planning, through the continued participation of rural institutions. The development of the Guidelines from the experiences gained widened applicability of results.

[5] Guidelines for Energy Management and Improved Energy Services at Rural Institutions: Advice to policy makers and development stakeholders based on the experience of the ESRI project in Kenya, South Africa and Uganda. ESD, 2003. See Annex D

A document, "Guidelines for energy management and improved energy services at rural institutions", was prepared. This document is targeted at all organisations in the development community associated with improvement of the management and efficiency of rural institutions in developing countries. Principally these will be international and local stakeholders related to the education and health sectors such as:

- National Government Health and Education Departments in developing countries
- National Government Departments of Energy in developing countries
- International Development Agencies (eg The UK government's Department for International Development, Canadian International Development Agency, The United States Agency for International Development, Directorates of the European Commission etc.
- Organisations with an interest in the financing of energy business establishment. These include UNDP, The World Bank, The Shell Foundation and UNEP's African Rural Energy Enterprise Development programme (AREED)
- Rural Energy Service Utilities and Concession holders
- Development Consultancies
- Research Institutes

The Guidelines Document is to be found in Annex D of this report.

The continued, sustainable activity of the energy service providers will itself be a method of disseminating the findings of the project to other rural institutions.

3 COUNTRY REPORTS

The main body of this technical report comprises the individual country reports on Kenya, South Africa and Uganda. These reports have been generated by the ESRI team and they detail the project experience in each country. Each of the reports reflects the country context and the experience gathered during the ESRI project.

It is important here to recognise several key issues associated with each of the countries that were participating in the project.

- The countries listed have quite differing development indicators, for instance their Human Development Index rankings (HDI)[6]: Kenya 123: South Africa 94 Uganda: 141 (out of 162 countries)

- The infrastructure associate with rural development is significantly different in South Africa, compared to Uganda and Kenya. For instance, in South Africa, rural concessions for energy services have begun operation and the electricity network has reached a large number of rural schools and clinics.

- Socio-political factors are significant in the make-up of rural service delivery. For example, in East Africa, there are a strong service networks based around social themes such as the church. Government owned utilities/parastals have largely failed to deliver any major benefits to rural communities over a number of years. South Africa differs from Kenya and Uganda in the political issues associated with transition to ANC rule during the 1990's. This has focused significant resources on the development of rural areas.

It is for these reasons that the experiences collected in the country reports demonstrate a breadth of valuable information, which can be used to guide programmes and activities in other countries around the world.

4 CONCLUSIONS (GUIDELINES DOCUMENT)

This project has culminated in a document which summarises the project team's conclusions about the applicability of the ESI approach in other geographical, institutional and social contexts. These conclusions are best accessed by reference to the Guidelines Document in Annex D.

[6] HDI rankings taken from UNDP Human Development Report 2001

Annex A - COUNTRY REPORT: KENYA

Annex B - COUNTRY REPORT: SOUTH AFRICA

Annex C - COUNTRY REPORT: UGANDA

Annex D – GUIDELINES DOCUMENT