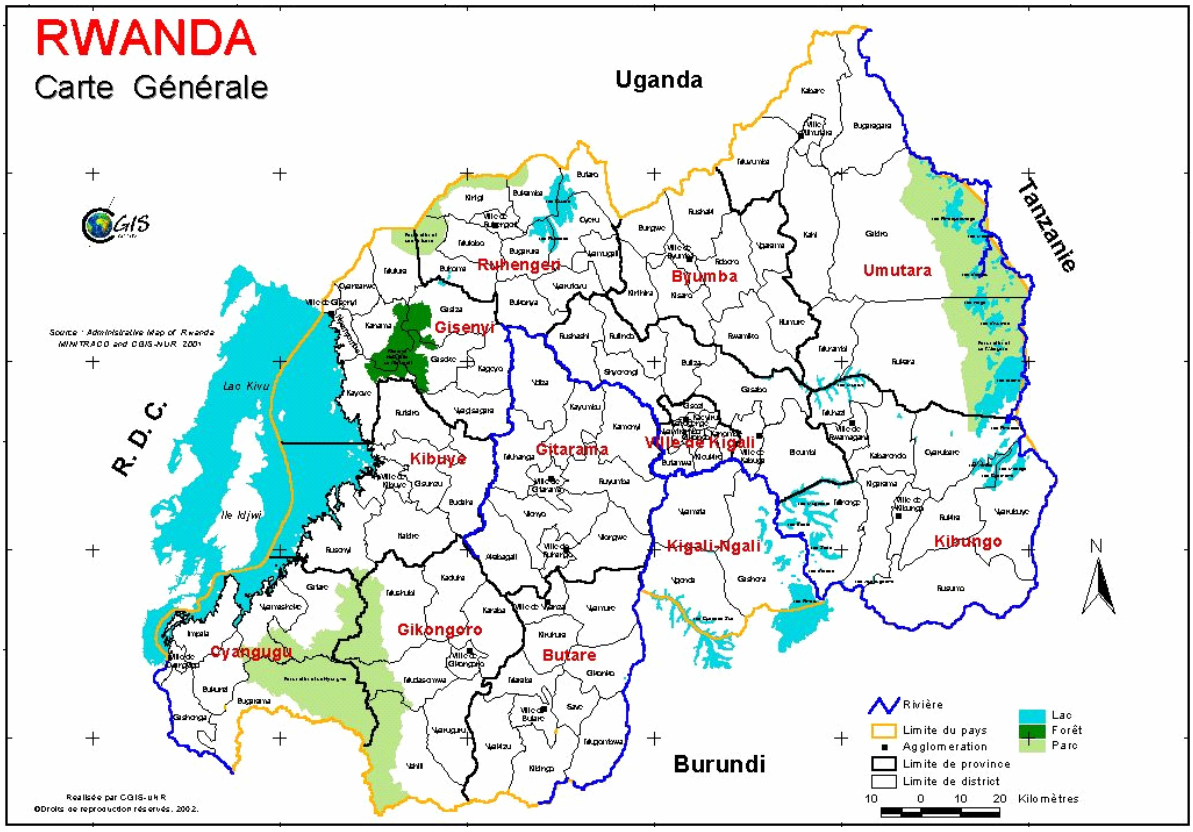
Mainstreaming environment in energy Strategies to address poverty in Rwanda

CONCEPT NOTE



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EXECUTIVE SUMMARY

Objective
This concept note aims to inform decision-makers on linkages between energy initiatives to address poverty and environmental concerns, with a focus on Rwanda. It provides the background for developing a policy brief concerning the integration, or mainstreaming, of environmental issues into energy initiatives around poverty alleviation. The concept note fits within Rwanda's PRSP framework, and is guided by the MDGs.

Background
The overall approach to energy planning must start with identifying the needs of people to alleviate poverty and promote development. It is important to note that this is primarily not an energy question, but energy nevertheless has a clear role to play. . To impact on poverty, two thrusts are necessary – one in meeting the needs of the poor directly, and the other in economic stimulation, such that people can gradually lift themselves out of poverty. In terms of energy, the most critical and direct needs of the poor are for cooking. Staple foods need to be cooked, and thus the very survival of the poor is linked to energy and the environment from which the energy source comes.

In Rwanda, as in much of Africa, the environmental implications of meeting the needs of the poor are severe; in the short to medium-term the poor will have few alternatives but to gather woodfuel from an ever-decreasing natural resource base. Efforts to promote sustainable biomass resources thus have a very direct environment and energy link, as well as being central to poverty alleviation.

Energy is also needed to provide adequate health care and education (e.g. clinic and school electrification), and to facilitate adequate water supply and sanitation to populations where only the minority have access to these services. These are central to the MDGs. Energy also has a role in supporting agricultural productivity (e.g. irrigation pumping or mechanisation), as well as powering the transport that enables people to participate in the economy more fully (agriculture is a priority area of the PRSP). Energy supply must cater for the needs of mainstream business as well as meeting the needs of small and informal enterprises, which are critically important in terms of raising the income generation levels of a country. Through such efforts, an increasing proportion of the population can afford modern, commercial energy services, which is not only central to the MDGs, but can ease environmental pressures on woodlands over time.

Key issues for Rwanda
It is clear that Rwanda will continue to rely on the natural environment to fuel growth, but the environment is currently under severe stress, and needs attention in order to continue to play its role in underpinning development. Mainstreaming environmental concerns into energy planning, far from *adding* to the burden of ambitious implementation targets, such as the MDGs, is a *necessity* for meeting these targets and sustaining development.

Although the key area where energy use links with poverty and environment relates to the likely continued dependence on ever decreasing biomass resources, other energy strategies vary significantly in terms of their links to both poverty and environmental issues. Key strategies to be considered around the poverty-environment-energy nexus include:

- *Promoting a sustainable woodfuel supply* - which supports the serious environmental concerns around deforestation (strong poverty and environment links).
- *Greater access to electricity by households and communities* - this will have little impact on biomass demand and air pollution (weak environmental link), but can have a significant impact on improving water provision, health care and education, as well as supporting small businesses and farming productivity (potentially strong poverty link).

- *Promotion of the more efficient burning of biomass and charcoal production* - this is likely to have a small impact on wood supply shortages (weak environment link, potential health link).
- *The provision of affordable modern energy* – which is likely to benefit poor women in terms of health and education (strong poverty link).
- *Promoting use of LPG in households* – which offers a potential solution to both indoor air pollution and biomass dependency, but the challenge is to make it affordable and accessible (potential environment and poverty link).
- *Focusing on energy to stimulate economic growth, both for small and large-scale businesses* – this can improve the incomes of the poor and enable them to afford modern energy services, thus serving the objectives of the MDGs as well as providing an alternative to complete biomass dependency in the long-term (strong poverty links, potential environment links in the long-term).
- *Improved mobility of the poor* – which can help improve their livelihoods, and contribute to raising income levels and therefore facilitate fuel substitution for biomass in the long-term (medium poverty link, potential environment link).

But energy interventions in isolation will usually have little impact on poverty, economic growth or related environmental issues. Effective implementation to address these issues requires a coordinated approach, as they are of necessity multi-sectoral. Strategies thus need to include the involvement of communities, strong coordination between government institutions and initiatives, and developing structured frameworks for the assessment and prioritising of investments in rural energy provision, amongst others. In particular, the need for close links between the various sectors needs to be emphasised in order to obtain better synergies towards meeting Rwanda's development goals.

Introduction

This concept note addresses mainstreaming environment in energy strategies to reduce poverty. The links between poverty, energy and the environment have been explored and substantiated especially since the development of the Millennium Declaration (2000). Eradicating extreme poverty and hunger and ensuring environmental sustainability are Millennium Development Goals (MDGs), which 191 countries are committed to achieving. While energy is not a MDG on its own, appropriate and affordable energy is essential for achieving each of the MDGs 1-7, and a lack of energy is a severe constraint to development. The Rwandan Poverty Reduction Strategy Paper (PRSP) provides a framework for meeting the MDGs and identifies the following priority areas within this:

- Rural development and agricultural transformation (including environment policy and forest resources)
- Human development (including education and health)
- Economic infrastructure (including energy for the formal sector, poor households and rural enterprise)
- Good Governance, and
- Institutional Capacity[1]

Rwanda has made substantial progress towards meeting these goals, which include the three elements of poverty, environment and energy. However, as noted in an internal report, the goal of environmental sustainability needs strengthening. [2]

[1] The Government of Rwanda, Poverty Reduction Strategy Paper. 2002. National Poverty Reduction Programme, Ministry of Finance and Economic Planning.
[2] Poverty Reduction Strategy Annual Progress Report. 2004. Ministry of Finance and Economic Planning. Rwanda.

Meeting the MDGs requires integrated planning, and many planners perceive a conflict between reducing poverty through greater access to energy sources and mainstreaming requirements for a sustainable environment. The approach of this paper is that investing in the environment and using local and renewable energy services can be used to support poverty reduction. Another concern expressed by planners is how to implement comprehensive policy with limited resources and capacity. Indications of possible strategies are provided here, these will be elaborated in a follow-on paper on integrating poverty-environment-energy linkages into energy sector planning.

Poverty, environment and energy

This section briefly defines each of the components of the nexus, and then analyses the linkages.

Poverty

International definitions of poverty have become very elaborate, recognizing the complex interaction between economic factors (consumption levels, income), socio-political factors (access to food, education, health care, water opportunities), and inherent disempowerment when it comes to decision-making, and perceptions of vulnerability and exclusion. All these aspects of poverty are present in Rwanda which is amongst poorest countries in the world, with about 60% of the adult population living in poverty (can't afford basic goods and services), and 42% living in *extreme* poverty (can't afford even basic food). In terms of households, 57% are below the poverty line. There is a higher incidence of poverty in rural areas (66% below poverty line) than in urban areas (12% in Kigali and 19% in other urban areas). Access to a safe water supply is generally low (41%), and while most urban households have safe drinking water (73%), the figure for rural households is low – 16%.[3] Since there is no single cause of poverty there is no single intervention that will address it. This is why it is important to target many dimensions of poverty simultaneously, addressing energy poverty is just one of these.

Environment

Environment is usually defined as the biophysical environment (water, vegetation, soil, minerals, air etc). A *sustainable environment* must include the interaction between the natural, socio-economic and political components of the environment.[4] This is the complex task, particularly in Rwanda where livelihoods are closely linked to the environment, and where variable rainfall which affects agricultural output significantly exacerbates the vulnerability of the poor. The prevalence of subsistence agriculture combined with the high population density has contributed to unsustainable use of resources, resulting in deforestation, land degradation and soil erosion. The resulting reduction in agricultural productivity makes it increasingly difficult for Rwandans to meet their nutritional needs, and 12 to 15% of households suffer from acute food insecurity.[5]

One of the most significant natural resources in Rwanda is the woodland, which is now in crisis, with forest area reducing from 26% to 18% in the last 12 years. Deforestation is due to land clearing for agriculture and settlement, building, and the high dependence on wood for fuelwood in households.[6] In recent years, the Government has been more actively focusing on issues related to environmental degradation. Reforestation efforts, however, still fall far short of redressing the huge deficit in supply.

[3] Information source for the section is from Millennium Development Goals Status Report, Republic of Rwanda, United Nations, 2003.

[4] Riley C. 2002. Linkages between Poverty and Energy from an Environmental Perspective: A review of the evidence. Draft report for DfID/KAR

[5] Poverty and Environment in Rwanda – UNEP website.

[6] Bush G, Kanobayita A, Rukingama E and Masozera A. 2005. Mainstreaming Poverty-Environment Linkages in the European Community's Development Assistance. Draft Report for World Wildlife Fund Macroeconomics Program Office Rwanda Environment Management Authority.

Energy
Energy is not required on its own, but is used in order to achieve some other purpose (such as having good light). This is why energy is often 'invisible' to users and planners, and why many people refer to the *energy services* that are needed, rather than simply energy.

The Rwanda energy picture is dominated by traditional fuel use, with biomass (firewood 92.8%, charcoal and agricultural residues) making up 95% of total national energy requirement, 1% by electricity and the rest (4%) by petroleum and other products.[7] Most of the energy used is by households, followed by industry, commerce and agriculture. The agricultural sector uses very little energy, and there may be scope to promote productivity here via energy services for irrigation, ploughing and agro-processing, as well as improving access to markets. Petroleum products are imported, and largely used for the transport sector, although industry and households between them account for one quarter of total demand.

Households: Approximately 90% of households are dependent on wood for cooking and kerosene for lighting. In urban areas charcoal is used for cooking. Access to electricity is low, with overall about 4% of households being connected; in the rural areas this is much lower – under 1%.[8] Even where available, electricity is considered expensive, and is too costly for household cooking use. In urban environments, biomass is one of the first resources to be depleted thereafter forcing the poor (especially) to pay cash for fuel which was previously associated with the opportunity costs of women's labour time.

Industry: The use of energy by industry is inefficient due to outdated technology. Commerce and industry are also significant users of woodfuel, with 40% of their energy needs coming from wood.[9] An objective is to bolster commerce and industry to improve economic growth. To do this it will be essential to improve energy supply and ensure that energy is used efficiently. If economic growth relies on increased energy supply without increased energy efficiency, this will impact negatively on economic growth and human health. Negative consequences will include unhealthy work environments and climates, dust and air pollution including increased NO_x and SO_2 emissions, noise pollution, smells, hazardous waste. These costs can be ameliorated through integrated energy and environment planning and taking advantage of funding such as the Clean Development Mechanisms to ensure increasing energy services can attract carbon credits rather than produce green house gases.

Poverty-environment-energy linkages

Poor people do not necessarily talk about energy and the environment *per se*, but their perceptions of their well being are often strongly linked to both:

"*Water is life, and because we have no water, life is miserable.*" (Kenya)[10]

"*It costs as much to cook the food as to fill the pot*". (West Africa)[11]

[7] The Government of Rwanda Poverty Reduction Strategy Paper. 2002. National Poverty Reduction Programme, Ministry of Finance and Economic Planning.
[8] Country Presentation: Rwanda. East African Energy Scale Up Initiative. Nairobi 24-25 June 2005.
[9] Pilot project on Poverty-Environment Mapping, Phase II. Feb 2005. Government of Rwanda and UNDP.
[10] DFID. 2002. *Energy for the Poor: Underpinning the Millennium Development Goals.* London
[11] International Labour Organization. 1987. Linking Energy with Survival. A guide to Energy, Environment and Rural Women's Work. ILO, Geneva

"The natural resources that constitute our natural environment are the only sources of means for us to fight against our poverty". (Rwanda)[12]

In such statements people recognise their dependence on the environment for their livelihoods and the importance of conserving it.

Poverty ↔ Environment linkages

The key link between poor people and the environment is the extreme dependence of the poor on natural resources in their immediate environment. These resources are often all that stand between the poor and starvation. The thinner and more depleted the resource base (eg little rain, polluted water, few trees, soil erosion), the more meagre their livelihoods and the more insecure their food supply.

Poverty ↔ Energy linkages

Energy, although not categorized as a basic need, is essential for everyday living and getting work done. The key links between the poor and energy have been described in terms of the quality and quantity of fuel used. Generally poor people use traditional fuels such as biomass, and do not have high-tech equipment (electric stoves, computers). 'Fuels of the poor' - biomass (wood, crop waste and dung) and to some extent kerosene and coal - are inefficient, expensive and hazardous to health.

Inefficient: traditional fuels are far less efficient that modern ones, for example candles produce only 1%, and kerosene wick lamps only 2% of the luminosity of electricity per kilowatt hour of energy used. Generally kerosene is considered to be 3-5 times more efficient than wood and Liquid Petroleum Gas (LPG) 5-10 times more efficient for cooking.[13]

Expensive: the poor spend a far greater proportion of their income on energy than the wealthy. Whereas better-off household spend between 3-7% of their income on energy services, the poor spend 15-28% of their incomes on energy services.[14]

Unhealthy: Traditional fuels are unhealthy. The World Health Organization (WHO) is concerned about the high levels of Acute Respiratory Infections (ARIs) and eye infections caused by smoke inhalation by women and children while cooking over wood and dung fires.[15] People with compromised immune systems (such as those with HIV/AIDS) are especially vulnerable.

The expression 'energy poverty' has been coined to describe one of the facets of poverty as that state in which the poor have insufficient energy for daily living requirements such as:

- cooking staples such as grains and beans for the length of time required to ensure adequate nutrition,
- keeping warm,
- boiling water so that it is safe for drinking or washing.

Energy → Environment linkages

The negative impacts of the extraction of energy are well documented and include land use changes, deforestation, air pollution and land degradation (soil erosion, river silting and water pollution). The combustion of energy sources is responsible for greenhouse gas emissions and global warming, leading to changed patterns of rain and drought, and threatening food and social security. Africa because of its poverty will be especially vulnerable to the impacts of climate change.

[12] Mainstreaming Poverty-environment linkages in European Community's Development Assistance – RWANDA. Draft report, May 2005. WWF & Rwanda Environment Management Authority.
[13] Barnes DF & Floor WM. 1996. "Rural Energy in Developing Countries: A Challenge for Economic Development" in *Annual Review of Energy and Environment*, Vol 21
[14] Eberhard A & van Horen C 1995. *Poverty and Power: Energy and the South African State*. Pluto, London
[15] Energia News. 2001. Special focus on Gender, Energy and Health. Vol 4, Issue 4 pp1-23.

Key Issues for Rwanda

The key poverty-environment-energy linkages are discussed above in general terms. This section clarifies the implications for energy planning in Rwanda.

Summary of the energy context

Core to the country's environment, poverty and energy situation is the use of woodfuel for most of Rwanda's energy requirements, contributing to deforestation, land degradation and air pollution (both indoor and local) This paper takes the position that the global environmental concerns around carbon emissions, while important, should be a secondary consideration for Rwanda at this stage of its development since its overall carbon contribution is negligible. Renewable energy interventions (where suggested) are therefore motivated by the benefits of the energy supply rather than on carbon savings. However the approach of the paper is also that environmental degradation should not be the result inefficient energy use. Steps should be taken to ensure energy efficiency.

Current national energy supply situation

Currently the demand for energy in Rwanda outstrips supply, with critical levels of deforestation, electricity generation capacity under stress and petroleum prices at all time highs. The lack of investment in electricity sector for the past 20 years has led to supply shortages, poor quality and reliability of supply, and there are high technical and non-technical losses on the system. The destruction of hydro facilities and transmission systems during 1994 means that major initiatives to rehabilitate and upgrade the national electricity supply and distribution system are necessary. These have recently been formulated for urgent implementation.[16]

Electricity generation capacity is 41.75 MW, most of which is hydro-based, with approximately 15 MW cross-border import capacity. Electrogaz is the national utility for the supply of electricity and municipal water in Rwanda, currently managed by Lahmeyer International GmbH under a contract with the Government of Rwanda. Electrogaz owns and operates hydroelectric (26.75MW) and oil-based generation plants, and the transmission and distribution network. It also imports electricity from Sinelac, a generating utility owned by the governments of Rwanda, Burundi and the Democratic Republic of Congo (DRC), and SNEL, the national utility of the DRC.

Electrogaz is currently suffering from severe curtailment of generation from its traditional hydroelectric sources due to overuse in preceding years as well as a lack of maintenance, increased population density pressure and climatic factors. It has to rely increasingly on high-cost thermal power generation based on diesel, currently about 15 MW and this is expected to increase by another 20 MW or so in the next year or two. Over the longer term, relatively cheaper domestic generation resources using methane gas from lake Kivu and rehabilitated and new hydropower plants are expected to ease the supply constraints. Unconstrained peak demand on the national grid runs at about 60 MW. Total demand served was about 160 million kWh in 2004. The dilapidated network results in some 25% physical losses.

Deforestation and the likely continued dependence on woodfuel

The major environmental problem regarding energy and poverty relates to the reducing availability of woodfuel because of deforestation. While woodfuel collection for direct use and for charcoal production is one of the contributing factors to deforestation, it should be noted that it is not the major cause, agricultural clearing and unsustainable land use practices are more significant contributors.[17]

[16] Urgent Electricity Rehabilitation Project, World Bank

[17] Bush G, Kanobayita A, Rukingama E and Masozera A. 2005. Mainstreaming Poverty-Environment Linkages in the European Community's Development Assistance. Draft Report for World Wildlife Fund Macroeconomics Program Office Rwanda Environment Management Authority.

The almost complete dependence of the poor on woodfuel is likely to continue into the medium-term. There is no other feasible alternative for their cooking needs, and in general the poor will not be able to afford modern energy services in the medium-term without heavy subsidies. This dependence will exacerbate the already critical state of deforestation unless a sustainable supply of woodfuel is ensured. Women and children are generally the most affected by having to walk longer distances and carry heavier loads as a result of decreasing supplies. Even if the MDG objective of ensuring that 50% of those using traditional fuels have access to modern energy services by 2015 is achieved, the majority of Rwanda's population, particularly the poorest, will remain largely dependent on woodfuel.

Areas of opportunity for intervention

Some of the core opportunities where energy can impact on environment and poverty issues are listed below.

Opportunity 1: Addressing land use and the woodfuel shortage

Efforts to promote a sustainable woodfuel supply support the serious environmental concerns around deforestation (strong poverty and environment links).

Rwanda has an extensive reforestation programme which should be supplemented, supported and enhanced. A full cycle approach is required; although growing trees does not offer an immediate solution to woodfuel shortages, it does address aspects of the challenges (environmental, jobs and forest products) and must be continued. Changes in land use have to be planned to have least impact on the environment and the resources of the poor. This points the need for close links between forestry, agricultural, construction and energy institutions and strategies.

Opportunity 2: Efficient charcoal production and other technologies

Promotion of the more efficient burning of biomass and charcoal production is likely to have a small impact on wood supply shortages (weak environment link) but may produce fewer emissions (potential health link).

Efforts to improve charcoal production efficiency are potentially important, as are improving the stoves in which it is used. This will have an impact on biomass harvesting to service the urban market with charcoal, and may also improve air quality. However, the overall impact on biomass resource demand may not be significant, and thus other efforts will be necessary to ensure a sustainable supply of woodfuel and charcoal.

Other opportunities include:

- Decreasing the use of wood fuel and charcoal in households and institutions:
- Promoting the use of methane gas in households and community institutions,
- Promoting the development and use of biogas as cooking energy in the community institutions.

Opportunity 3: Switching to LPG

More extensive use of LPG in households offers a potential solution to both indoor air pollution and biomass dependency, but the challenge is to make it affordable and accessible (potential environment and poverty link).

LPG offers an excellent substitute for woodfuel and electricity for those who can afford it. It reduces pressure on wood stock, burns relatively cleanly, and is thermally efficient (cooking and heating). However oil products in Rwanda are currently imported and put a severe strain on the budget. [18] Lowering taxes and costs of LPG may be feasible to encourage greater use thereof.

[18]Poverty Reduction Strategy Annual Progress Report. 2004. Ministry of Finance and Economic Planning. Rwanda.

Opportunity 4: Improving electricity supply

Greater access to electricity by households will have little impact on biomass demand and air pollution (weak environmental link), but can have a significant impact on improving water provision, health care and education, as well as supporting small businesses and farms (potentially strong poverty link).

There are plans to increase Rwanda's generation capacity to 125MW by 2010. Rwanda has identified significant potential for micro-hydro generation (160 sites with between 20 and 600 MW potential), which can support localised development. Feasibility studies for potential hydropower sites within Rwanda include Nyabarongo (27.5 MW), Rukarara (9 MW) and Mukungwa II (3 MW). Boundary hydropower sites from which Rwanda has a quota of 1/3 capacity include Rusumo Falls (60 MW) and Rusizi (500 MW from which 72 MW are currently exploited). Between 30 MW and 700 MW could be obtained from the methane gas and 170-340 MW from geothermal resources.

Energy supplies from local renewable resources would be favourable to the economy. Rwanda has peat reserves estimated at 152 millions tons of exploitable dry peat and a daily sunshine of 4-6 kWh/m^2 suitable for solar energy exploitation.

Electrification can contribute to improving the lives of the poor and extending opportunities for income generating activities. However there are several factors to be considered:

- Electrification should not be considered a feasible substitute for cooking energy in the medium-term. Even where households are connected to electricity it is seldom used for cooking.
- Provision of electricity and other modern energy services is likely to be more viable in urban areas, as cash incomes are generally higher, and infrastructure provision costs are lower per customer, and this is therefore likely to be a sensible starting point for such programmes. The planned initial programme to rehabilitate existing poorly maintained distribution systems seems appropriate.
- Even where electricity infrastructure is provided, the cost of accessing it is prohibitive to most households (connection costs, deposits, and electrical appliances). This leads to poor financial and social returns on infrastructure capital investment, and strategies to facilitate connection by more households are thus important.
- Rural electrification is not cost-effective in the majority of cases, and while there are clear benefits, these need to be carefully weighed against the substantial costs involved and compared with other investments. Because of this, it makes sense to focus rural electrification efforts on areas where the potential benefit to communities and businesses is greatest, and to connect community facilities such as local government offices (to improve services and to develop ICT), schools and clinics, water supplies and sanitation. In this way, the benefits of the electricity investment reach even those that cannot afford to connect or use electricity in their houses. Decentralised energy services, rather than grid extension, could be efficient supply options in remote areas.

Opportunity 5: Energy and economic development

Improving incomes of the poor, partly so they can afford modern energy services, is important both in terms of the MDGs as well as providing an alternative to complete biomass dependency in the long-term (strong poverty links, potential environment links in the long-term).

The Rwanda PRSP emphasises that poverty alleviation is more likely to occur through small business and agro-processing development than through direct interventions with households. Energy is only one of the inputs required to stimulate economic growth. Nonetheless it is an important factor in the sustainability of many informal, small and mainstream businesses. A particular focus should be where the poor benefit from employment creation and enabling livelihoods. To this end, the following are important:

- Maximising development of local energy resources where economically justifiable, such as methane, peat, geothermal, solid waste energy biomass and micro-hydro. Many of these options will have positive environmental impacts for Rwanda (reducing the pressure on woodfuel, reducing landfill and potentially emissions), as well as boosting the economy and reducing reliance on imports.
- Developing new and rehabilitating existing micro-hydro facilities where economically justifiable – whether grid-connected or independent.
- Focusing on improving the productivity of commercial agriculture, both small and large-scale. Given agriculture's contribution to export earnings, energy for mechanisation and irrigation pumping is important here.
- There are various potentially viable small energy businesses which could be further investigated. Studies show that briquetting solid waste from landfills for energy use may be financially viable, and improved charcoal kilns will benefit charcoal businesses. In addition, businesses to sell peat are feasible.

It needs to be stressed that energy interventions without other support for small businesses are often of limited benefit, and thus coordination with other initiatives to support business is necessary. This is particularly the case in poor areas, where business skills and access to finance and markets is limited. There is also a need to relieve women and children of the burden of wood and water collection so that girl-children can also attend school (become literate) and so that women have time to engage in more productive activities.

Opportunity 6: Transport and the economy
Improved mobility of the poor can help improve their livelihoods, raise incomes, and thus potentially facilitate fuel substitution for biomass in the long-term (medium poverty link, potential environment link).
Cheap transport is important to facilitate access by small farmers and businesses to markets, and for householders to access employment opportunities. This involves promoting the distribution of transport fuels, as well as promoting cheap and convenient public transport in cities. This will reduce traffic congestion and ameliorate the demand for less efficient, more environmentally polluting private transport modes.

The construction of roads in remote areas can be undertaken as labour intensive components of public works programmes and used to a) teach skills of road construction and maintenance, b) provide short term jobs and income during the construction period, c) open up routes and markets for agricultural produce and trade.

Environmentally friendly fuels must be promoted in order to reduce dependence on imported petroleum products and reduce pollution. Currently there is insufficient standardisation and quality control of oil products (eg additives such as lead are permitted). The enforcement of safety measures is inadequate and uncoordinated. There is also inadequate control over vehicle engine efficiency. Old and badly maintained cars, buses and trucks cause of toxic emissions, air and noise pollution.

In Conclusion

The above sections clarify the links between poverty, environment and energy. It is clear that Rwanda will continue to rely on the natural environment to fuel growth, but the environment is currently under severe stress, and needs attention in order to continue to play its role in underpinning development. The apparent conflict lies not in *whether* to take care of the environment, but *how*. Bringing the environment into mainstream planning and adopting a multi-

pronged strategy will facilitate meeting the challenges which these interdependencies pose. Some poverty reduction strategies address environmental concerns, for example care of wetlands will ensure the clean water essential for healthy living. Certain energy strategies, such as using renewables and switching to modern energy services are associated with health benefits and can reduce pressure on woodfuel over time.

Environmental sustainability will also have to be more directly addressed with regard to increasing the area covered by forests, protecting biodiversity, changing land use patterns and tenure rights (according to the Rwandan PRSP and MDGs). Strategies which involve an energy component and contribute to poverty reduction include:

- Ensuring a sustainable supply of wood fuel and improving conversion efficiencies
- Improving access to modern energy services through cost-effective supply and affordable access costs
- Stimulating economic growth to raise incomes and enable increased access to modern energy
- Increasing use of local energy resources such as methane and micro-hydro
- Focusing rural electrification investments on high-return areas, with an emphasis on small businesses, agro-processing and irrigation, and community facilities
- Exploring measures to reduce air pollution: reducing smoke with improved stoves and chimneys and fuel substitution.

Moving to effective implementation to address these issues requires a coordinated approach which will be addressed in the next paper on integrating poverty-environment-energy linkages into energy sector planning. In particular, the need for close links between the various sectors will be emphasised in order to obtain better synergies towards meeting Rwanda's development goals.

Overview of Rwanda

Rwanda is a landlocked, characterised by an equatorial climate and terrain ranges from undulating to mountainous. The country supports a reasonable biodiversity due to the existence of a variety of habitats, and vegetation varies from savannah to mountain tropical forest. The population is 8.3 million, predominantly rural, with 16% urbanised (in 2000)[19]. Population growth is 2.5% p.a., and GDP per capita is US$212 p.a. It is a poor country, with an HDI rating of 159. The age profile of the population is heavily skewed towards youth - 67% is under 25 years old. Agriculture is the economic mainstay, as well as supporting over 90% of the population (97% of women and 86% of men[20]) and contributes 40% of the GDP and over 68% of export earnings. In spite of the critical role of agriculture for subsistence as well as economic activity, the average family land for farming is small - approximately 0.6ha. The rural population constitutes 83% of total. The 1994 genocide set the country back in terms of poverty alleviation, economic growth, service delivery, and environmental sustainability. Since 1994 there has also been a dramatic increase in the prevalence of AIDs. The main industries are construction, and food, drink and tobacco manufacturing, which together contribute 20% of the GDP.

Millennium Development Goals:

1. Eradicate extreme poverty & hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

[19] Millennium Development Goals Status Report, Republic of Rwanda, United Nations, 2003.
[20] UNEP website - Poverty and Environment in Rwanda