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Exploring the links between rural energy, health and SME development

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Biofuels, Renewable Energy for Public Health, and Enterprise Development

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Introduction

- To what extent can modern energy services be provided on a commercially viable basis by domestically owned, small-scale businesses?
- Is a commercially oriented approach to tackling the link between energy, poverty and health possible?
- In SA, connection to the national grid increased from about 36% in 1993 to 66% by 2002. However, access to the grid will not solve all energy needs of the poor, and widespread demand for other energy sources will continue.
- A number of key constraints to enhancing the role played by small and medium enterprises in providing energy services to the poor, include:
  - most enterprises of that size require targeted **business development support**;
  - such enterprises find it difficult to **access capital** from financial institutions;
  - a big limitation of effectiveness of a market-driven approach to energy distribution is the end users' **affordability**.
- One clear conclusion is that the delivery of rural energy services has to be designed with **productive** and **economic end uses** in mind – otherwise more modern services remain out of grasp, and development is doomed to failure

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Context

- Emerging theme of “sustainable livelihoods”, which recognises the concept of promoting sustainable livelihoods as a means to combat food insecurity and rural poverty.
- This approach focuses on the means, activities, entitlements and assets by which people make a living. For poor rural people this means:
  - being able to improve their livelihoods
  - maintaining and enhancing their material and social assets, and opportunities
  - conserving the natural resource base
- One element of this approach is to improve access of the rural poor to basic and facilitating infrastructure, with energy being a key component.
- Improved energy services can assist more broadly in rural development as well as in ensuring food security. By appropriate investment in physical and human capital, the development of rural enterprises can be stimulated by improved access to modern energy services e.g. for lighting, powering tools and other productivity-enhancing appliances.
- RE and, in particular, bioenergy projects can thus directly help to alleviate poverty by satisfying basic needs, creating opportunities for improved productivity and better livelihoods, and preserving the natural environment on which the rural poor depend.

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The conundrum

- Communities know what they want, and can envision the end result, but are unable to formulate the plans or access finance to achieve the result.
- People are presently relegated to ‘survival energy supply and consumption’
- A landscape of diluted regulation and management exists.
- Technology does not necessarily fail, often rather a combination of design, implementation and management factors.

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Cross-cutting issues

- Trade-off between poverty reduction and environment: provide better services to poor people, or promote the use of RE?
  - Provision of health and business development should be technology-neutral
  - Promote RETs only when it can be shown that they best meet the needs
  - Use of subsidies need to fully documented and in the public domain
- Rural energy policy and regulation: cannot be determined/implemented in isolation from agriculture, health, education, local economic development.
  - This integration increasingly taken into account by donor organisations
  - Local and national governments need to support this trend

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Rural energy - SMEs

- Key outcomes from donor-funded energy SME development in Africa:
  - Establishment of rural ESCOs has inherent high overheads
  - Capacity building of communities is essential for effective participation in projects.
  - The projects must be demand driven.
  - A particular technology should not be promoted in isolation but be part of the energy supply system
  - Project planners must inform the rural communities about the pros and cons of technologies before the communities can take part in technology choices.
  - High capital cost and lack of human capacity a barrier to wider uptake
- Additional requirements include:
  - Coordinated affordable financing
  - Clear policy
  - Tested procedures
  - Training and measurement
  - Innovative technology application
  - Standards

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PV ESCOs in Zambia

- Executing agency: Ministry of Energy and Water Development
- Implementing agency: Department of Energy assisted by Stockholm Environment Institute
- The aim is to provide solar electricity to households and small businesses.
- Three (initially four) companies were offered training and provided hardware.
- Hardware was given as a credit, terms for repayment to be determined and to commence after two years.
- After more than two years, most customers are satisfied with their systems, and keep paying their service fees.
- Each ESCO has several hundred prospective clients on their waiting list. However, the mechanism for supplying more systems has not yet been finalized.
- Start of credit repayment for the first ESCO was scheduled for August 2003.
- Project implementation experienced delays due to long-drawn tender procedures and long delivery times.
- The tender procedure to an extent reduced the capacity of ESCOs to operate as independent market actors, and excluded several local suppliers due to very strict regulations

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Rural energy - health

- Institutional – residential
- Improved service delivery – improved indoor air quality
- Institutional (health clinics)
  - Electrical and thermal energy, for lighting, refrigeration and hot water
  - Staff housing
  - Sanitation and waste water disposal
- Residential
  - Fuel switching away from woodfuel, paraffin
  - Reduced consumption of woodfuel e.g. PROBEC
  - Sanitation & waste water disposal

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Sanitation, energy and health

- Ecological sanitation
  - Nutrients in human excreta are recycled on farm or garden land in a hygienically and environmentally friendly manner
  - Dry (urine diversion) or water-borne sanitation
- Water-borne: anaerobic digestion of biodegradable materials, maximising either energy or sanitation effects
- Max energy = livestock wastes (+ human) [agricultural digester]
- Max sanitation = human wastes (+ other?) [waste-water digester]
- Impacts
  - Reduced labour, time for wood fuel collection
  - Positive environmental impacts: nutrients & resource recycling
  - Health: sanitation & indoor air quality e.g.. Maph.

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SME development: sanitation

- Current extension of fixed-dome digester technology in South Africa and Lesotho (LUPO design)
- Philosophy is to start with those with the demand and who can afford to pay. Then, extension over time to those who cannot (marketing, price reduction with economies of scale, government involvement)
- Focus should be on economic development: this could be measured in the sense of energy supplied, water recycled, surplus food production, time for other activities, etc
- Thus, technology marketed on a demand approach, resulting in a quality product.
- SURUDE in Tanzania has installed over 3,500 digesters through this type of commercialisation approach …
- Demand locally (SA and Lesotho) is primarily for wastewater digesters
- Potential in SA alone is 12,000 schools and 300,000 homes (with livestock)

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Research scenario: Employment potential of RETs

- Based on 15% of total electricity supply in 2020
- Technologies and % of mix:

RET	% contribution
Wind	50
Solar thermal	10
Solar PV	**0.5**
Biomass CHP	**30**
Landfill gas	10
TOTAL	95.5

Target	% total elec capacity in 2012	% total elec capacity in 2020
Target 1 / no local manufacture	0.15	0.3
Target 2 / 50% local manufacture	3.8	7.6
Target 3 / 100% local manufacture	7.7	15.0

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Research scenario: SWH & bioenergy

- The targets for solar water heating (SWH) and biofuels represent deployment levels that could be achieved (based on other studies). The figures in brackets reflect the TWh_{equiv} energy in meeting this level.

	% of houses with 2.8 m² SWHs in 2020	% of total ethanol consumption in 2020	% of total diesel consumption in 2020
Target	100% (13.6)	15% (9.4) [E15 blend]	15% (8.8)

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Biofuels – a sustainable livelihoods approach

- Employment analysis based on a small-scale, rural farmer approach
- Bioethanol (sweet sorghum)
  - Yield: 46 tonnes/ha/crop
  - Crops: 2/year
  - Area: 5 ha/farm
  - Ethanol yield: 54 l/t sweet sorghum
  - Farmer + 1 other worker
- Biodiesel (sunflower)
  - Feedstock: 4,800 t seed/ha/year
  - Yield: 1.2 t/ha/year
  - Area: 5 ha/farm
  - Farmer + 1 other worker
  - Process plant size: 2.9 Ml/yr
  - Process plant jobs: 15/plant

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Summary of biomass *direct* jobs potential (in South Africa)

- Biomass CHP (sugar and timber): 1,300 jobs
- Landfills: 1,900 jobs
- Bioethanol (sweet sorghum and existing molasses production from cane): 62,000 jobs
- Biodiesel (sunflower): 288,000 jobs
- Rural biogas (agricultural and wastewater): 600 jobs

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Other *direct* job potentials

- Solar PV (NGE/SHS only): 2,475 jobs
- SWH: 120,000 jobs

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Concluding remarks

- Renewables offer a win-win-win situation that stimulates rural economy by adding value to agricultural produce for which there is a local demand (e.g.. energy crops), improved quality of life (ethanol cooking stoves, biogas, better sanitation with solar heated water), and are decentralised because they do not depend on distant markets but can be processed locally (good for SME growth).
- Liquid renewables from oily crops (rapeseed, canola, Jatropha) will be in huge demand in the future which will stimulate rural economies. A proportion of the global hydrocarbon economy will migrate into rural areas, particularly in areas that are marginal for food production but where crops like Jatropha survive.
- Massive employment gains can be achieved quickly and easily in the SWH and biofuels sectors, and show good returns on a limited investment by government.
- There is a clear benefit to the environment, as well as to human health and socio-economic status through the planned and aggressive uptake of renewables.
- Policy makers have a responsibility to ensure that the needs of the rural poor are addressed through integrated policy development, cutting across government departments. South Africa has an Integrated Development Plan, and grid- and non-grid energy plans – but the onus is on local authorities to implement. Can this be effective?

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