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ENERGY ACCESS FOR RURAL COMMUNITIES IN SUB SAHARAN AFRICA

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ORDER OF PRESENTATION

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RURAL COMMUNITIES

- No international standard or agreed definition of urban and rural areas that would be applicable to all countries or even to countries in a single region.
- Indicators on human settlements are compiled by the UN Statistics Division.
- Rural population in North Africa is 47.6%, while in Egypt is 57.8%. This compares with Sub Saharan Africa at 61%, while in Ethiopia it is 82.6% and Nigeria is 48.3%.
- The rural numbers do not rise considerably from 2004 to 2010 due to the general trend of migration to urban areas. The proportion of rural people actually decreases over this period, but people in rural areas still make up more than half of total developing country populations

ACCESS TO ENERGY SERVICES

Energy for rural areas is often considered in terms of provision of electricity or “bringing in the power grid” . *This is inadequate*.

Different forms of Energy, like direct light, heating, cooling, shaft power , electricity, and for a **number of different tasks** (cooking, lighting, water pumping, refrigeration and communications) and **end-users** (domestic, businesses, basic social services, transportation etc.).

Because energy is just “**ability to work**”, demand for energy is a “**derived demand**”; people do not want energy in itself *but* the “**energy services**” provided.

This wide range of services is made possible by **different fuels and technologies** and can **improve quality of life**.

ENERGY SERVICES AND THE MDGS

Energy services are essential ingredients of all three pillars of sustainable development (economic, social and environmental,), they can be an input to all MDGs:

To halve extreme poverty – access to energy services facilitates economic development – micro-enterprise, livelihood activities beyond daylight hours, locally owned businesses, which will create employment – and assists in bridging the "digital divide".

To reduce hunger and improve access to safe drinking water – can improve access to pumped drinking water and 95 per cent of staple foods need cooking before they can be eaten.

To reduce child and maternal mortality; and to reduce diseases – for a functioning health system, eg. lighting operating theatres, refrigeration of vaccines and other medicines, sterilization of equipment and transport to health clinics.

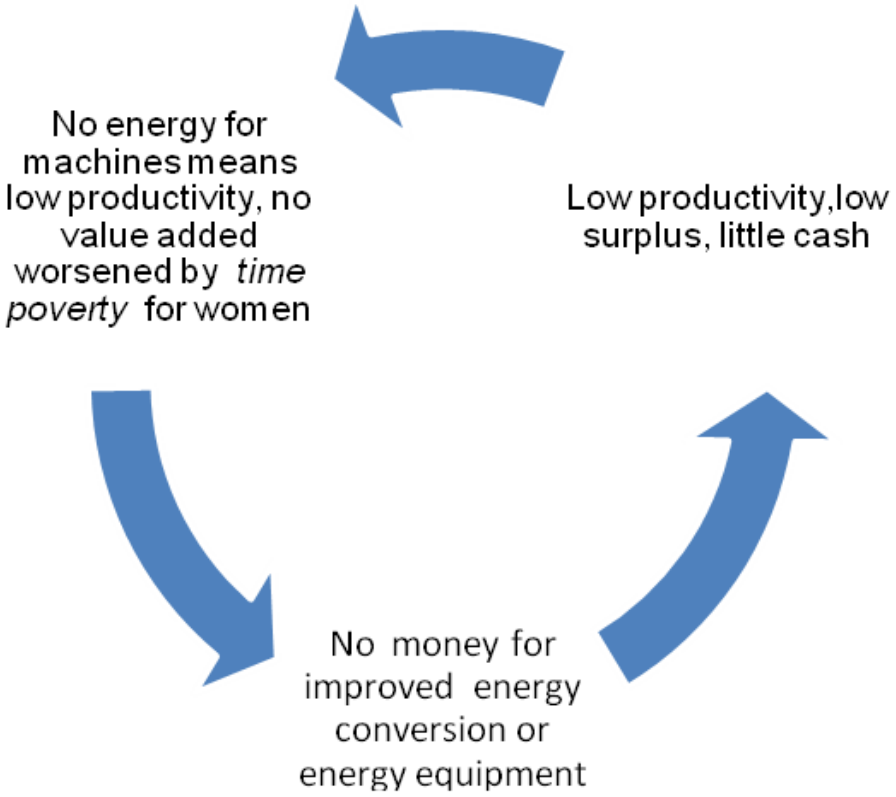
To achieve universal primary education; and to promote gender equality and empowerment of women – reduce the time spent by women and children (especially girls) on basic survival activities (gathering firewood, fetching water, cooking, etc.); lighting permits home study, increases security and enables the use of educational media and communications in schools, including information and communication technologies (ICTs).

Environmental sustainability – improved energy efficiency and use of cleaner alternatives can help to achieve sustainable use of natural resources, as well as reducing emissions, which protects the local and global environment.

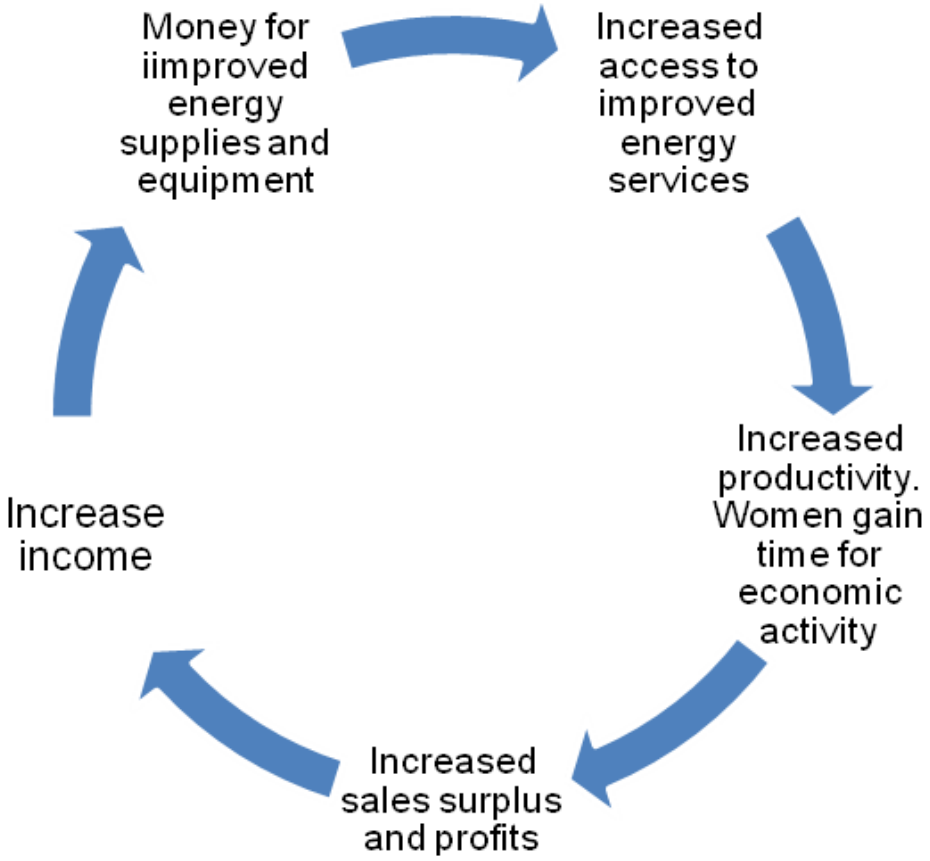
ENERGY TRANSITION LADDER

- As people become richer and proceed through" **the energy transition ladder**" that introduce new, more convenient and efficient sources of energy into their lives, Continue using the traditional energy sources as well.
- Partly **cultural reasons** and to **minimize the risk of interruption in supply** (eg back-up diesel/petrol generator to cover the risk of cuts in power from the electricity grid).
- **Multiple fuel use** implies impact of fuel switching and efficiency improvements is often not as substantial as sometimes considered.
- For instance in Uganda, a rural home gets electrified and graduates to LPG it will still use wood and charcoal to cook certain types of food eg. matooke or beans mainly, **because of the costs**.
- Even very poor households Eg in poor rural China it is common to find households with a solar water collector, biogas digester, and both coal and residue burning stoves.
- This implies that we have to consider the **use alternative technologies**, when planning for rural energy access.

PAYING FOR ENERGY SERVICES THE ENERGY POOR (VICIOUS) CYCLE



PAYING FOR ENERGY SERVICES (THE ENERGY RICH) VIRTUOUS CYCLE



CHALLENGE AND RESPONSIBILITY

- One of the challenges and responsibilities for governments, policy makers and academics is to:
- Formulate policies that **can break the cycle of energy poverty for the rural communities**, so that they join the **energy rich (virtuous) cycle**; which will promote development and prosperity of the rural communities in a rapid and sustainable manner.
- In order to achieve this, it is necessary **to review the existing policies and experiences** and especially the ***successes***, from **Case Studies** in Africa and elsewhere, suggest how they can be replicated in new interventions.
- These policies will be reviewed with respect to the i) the policy framework, ii) institutional iii) technology iv) financial mechanisms. They include off grid and grid connected solutions.

CASE STUDIES: MALI WATER SUPPLY

- **Solar Diesal Hybrid for Water Supplies**
- Extremely high solar irradiation and very limited grid access in remote areas. Access to water in warm Northern Mali is also a critical issue due to limited borehole capacity and Renewables, especially solar PV, provide a solution.
- BP Solar installs hybrid diesel/solar battery free pumping stations. Daily pumping is performed by the solar system while the diesel system allows for night pumping.
- Funding from KfW for part of the **Mali National Water Policy** aiming to develop rural infrastructures
- involving: i**) Community participation** ii) **Appropriate technology** iii) **Sustainable operation** and maintenance
- The project included different steps: - social information, campaign for acceptance, community water management board for water selling and systems operation, - Local private sector involvement ensuring skilled labour and spares at affordable price and distance.
- Water to 80,000 inhabitants, at120,000 litres/day. Over the 25 villages, this is more than 37 litres/inhabitant/day.
- *This is an off- grid renewable energy solar diesel hybrid solution, with both community participation and private sector participation within an appropriate water policy framework. Financing was from KfW (Development Partner).*

CASE STUDIES: MALAYSIA EDUCATION

- **Solar PV Diesel for Schools**
- The cost of fuel plus the delivery to each school was expensive and difficult to budget for each year. Off-grid solar is already cost competitive with diesel fuel in most places, without the need for additional subsidies or feed-in tariffs.
- PV-diesel genset hybrid systems (10-45kVA output power) were designed to allow for the daily use of trouble-free solar energy with the flexibility of additional energy from the genset. The inverter-battery chargers, smartly control the whole system.
- The Ministry of Education fully funded capital cost of the systems.
- 63 schools have access to clean, reliable electricity which will enhance their learning conditions and provide facilities such as computers and internet access via satellite in a safe and comfortable environment.
- *This is an off- grid renewable energy solar diesel hybrid solution, financed by the Government of Malaysia that will enable rural schools to be competitive in their performance in national examinations. This is supported by a policy to provide power to rural schools.*

CASE STUDIES: MAURITANIA WATER SUPPLY

- Electricity in remote areas is often provided by car batteries that are charged in a regional village. People have to carry their batteries for long distances which is extremely time consuming and expensive.
- By installing seven small wind turbines in different villages the people are now able to charge their batteries closer to home and therefore save on the cost of transport. surplus of energy is used to pump up water for a collective use.
- A 1400 W max wind turbine that is installed on a lattice tower. The electricity of this turbine is a standard deep cycle 24V dc voltage.
- Funded by the Dutch Government. Operational costs are paid by the revenues of the battery charging.
- At starti of the project, local technicians were trained in the installation and maintenance of the products. Meant more local knowledge on energy issues. Masts made locally.
- The locally produced electricity and available water helped to improve the living conditions of the inhabitants of the villages, and the sale of the electricity generates employment.
- *This is an off- grid renewable energy wind solution, financed by the Dutch Government (Development Partner) that built local technical capacity during construction and for maintenance, improved living conditions, generated employment and is sustainable.*

CASE STUDIES: MOROCCO: RURAL ELECTRIFICATION

The PERG ("Programme d'Electrification Rurale Global"- Global Rural Electrification Program) is a large rural electrification plan set up by the Moroccan authorities and has reached 97%.

Extremely favourable natural conditions for solar PV, wind and even hydro.

Several favourable financing schemes have been or are being set up. Also water pumping projects, PV desalination projects, PV grid connected projects and solar thermal projects.

The objective is to equip 9% 200,000 people of rural households with PV Solar Home System (SHS). Other technical solutions such as wind; mini grid and hybrid systems are being used but the core of the program is PV SHS. Funding was: AfD- JBIC - BID- BEI- FADES- FKDEA- KfW (MAD 7,5 B = € 667 M).

Collaborative public private entity, for which the Moroccan public company delegates the management of decentralized systems and services to specialist firms. The specialist firm employs local technicians who have undergone technical training. They collaborate with local installers, and this contributes to local employment and the strengthening of local businesses.

The main focus is solar pv and other renewable energy technologies such as wind and even hydro. It is a public and private partnership and the public entity delegates the management of decentralized systems to private management. The private company is responsible for supply, after sales service and fees collection. Local capacity has been built through the training of technicians, increased employment and growth of businesses. Support came from the Government of Morocco and several Development Partners.

CASE STUDIES: GHANA: RURAL ELECTRIFICATION

National Electrification Scheme (NES) in 1989 with the goal that electricity supply will reach all parts of the country over a 30 year period from 1990-2020. Goal is to build the transmission backbone to provide grid supply to all regional capitals and administrative regions. Project is supported by AfDB, IDA

One of the key success factors of the programme is **low cost and innovative technologies.**

- *i) Shield Wire Scheme (SWS)* is serving more than 10,000 households in 30 towns that may not otherwise have been served.
- *ii) Labour-Intensive Pole Erection Technique*.
- *iii) Use of Load Limiters instead of Energy Meters*: Eliminates or reduces the costs of the installation, meter reading, bill processing, printing and submission.
- *iv) Bonded Cashiers instead of Employees:* Saves on cost of collection and avoid situations where half of the revenue collected is expended in the collection process.
- *v) The Self Help Electrification Scheme (SHEP)* is a complementary scheme under the NES where *impatient* communities within 20 km distance from a 33kv or 11kv network suitable source of supply and who had taken the initiative to provide low voltage poles for their respective towns were assisted by the government to get connected to the national grid. The cost of implementing a shield wire scheme is only about 15% of the equivalent MV line.
- *This is a well financed public sector investment programme supported by development partners that uses low cost technologies and provides subsidies to rural communities who desire connections. By encouraging them to come forward and organize themselves, communities are empowered to take their destiny in their hands and this creates a sense of ownership, which promotes sustainability.*

CASE STUDIES: TUNISIA: RURAL ELECTRIFICATION

- Launched in the mid-1970s, only 30,000 (6 percent) of the country's rural households were electrified,. The Government made rural electrification a top priority in its social and economic development plans. Investment of more than 450 million Tunisian Dinars (MTD) between 1977 and 2000, most provided by the national government.
- The Tunisian Electricity and Gas Company (*Société Tunisienne de l'Electricité etdu Gaz*), STEG, was the primary implementer of rural electrification. A model enterprise, this public utility's high level of human and technical competence ntroduced efficient commercial, computer, and other technological innovations. Included the MALT (*Mise A La Terre*) threephase/ single-phase distribution system, dramatically reduced costs by nearly 30%, enabling connection targets to be exceeded repeatedly. Overall system losses of 13.4 percent (3.1 percent of them nontechnical) compare favorably with the utilities of developed countries.
- Since 1975, more than 600,000 rural connections were made, 7,700 with 50- 100 watt, solar photovoltaic (PV) systems. By the end of 2000, 88 percent of rural households and nearly 95 percent of all households had been electrified. Target is to achieve, by the year 2010, 97 percent household grid connection and 3 percent PV service.
- A unique feature is balancing a business oriented utility operation with substantial State financing and explicit support for rural development. Regional governments' close coordination of rural development zones and infrastructure has ensured the provision, maintenance, and staffing of rural electrification, along with the establishment of schools, clinics, roads, and public lighting systems, resulting in key development synergies. Tariff policies, negotiated with the Ministry of Industry (MI), have not diverged greatly from STEG's long-term marginal costs. Low-consumption and agricultural users have benefited from subsidized tariffs.
- *This is an example of strong government policy and financial commitment a proper institutional framework in terms of a well managed utility and decentralized implementation, private sector participation, gender and social equity, de corps, technical innovation robust finances, and an open and transparent system for selecting villages for electrification.*

CASE STUDIES: SOUTH AFRICA: ELECTRIFICATION PROGRAMME

- The National Electrification Programme (NEP) Phase I commenced in 1994 and was completed 1999 at a total cost of about R8 billion. Increased electrification from about 36% to 66 % nationally. Approximately 3 million households had been electrified by 1993, in cities and towns in time frame and successful.
- Mainly in previously disadvantaged and rural areas, as well as connecting all schools and clinics without electricity.
- Reduction of fires from reduced paraffin light and candle use, and potentially reduced local and indoor air pollution
- Improved health care, schools involved in evening adult education, improving the efficiency of school operation, use of photocopiers and computers.
- More workshops, food retailers, and entertainment venues.
- Operational costs are not always covered by revenue generated.
- *This is an example of a very large public sector rural electrification programme supported by appropriate national policies, extensive finance, implemented efficiently and successfully by a lead institution and others, that used a number of low cost technologies. It has had a significant impact on health, education as well as promoting small businesses.*

SENEGAL – BIOMASS MANAGEMENT

Senegal – PROGEDE Integrated Participatory Biomass Management

- Biomass contributes up to 60% of the country's total energy consumption

Energy Planning and Policy Making. vegetation cover and assessment, participatory rural appraisals monitoring and evaluation systems, capacity building and institutional development for stakeholders.

Sustainable Woodfuels Supply Management community base forest management system of 378,161 hectares supplying 67,400 tons of charcoal per year, technical support and extension services, community based micro enterprises, beneficiary-operated improved carbonization units, apiculture cooperatives, collective women and individual agricultural diversification systems, livestock, poultry, art and crafts units,comprehensive communication strategy Generating incremental revenues of US$ 12.5 million per year from 317 villages and benefited directly 250,000 people.

Demand Management and Inter-Fuel Substitutions; urban charcoal trade reorganized and modernized; rural communities contracts with the urban traders; assistance to the urban charcoal traders diversify their businesses, promotion of LPG and Kerosene, Inter-fuel substitution; the dissemination of improved stoves to 250,000 families in peri urban and urban areas; establishment of an energy data base and energy boutiques, research and pilot activities, renewable household cooking fuels

- *A transformation of the traditional energy sector from unsustainable form to a sustainably managed and socially progressive economic sector. Production and marketing of traditional biomass fuels can also be stabilized and arresting deforestation and contributing to ecological conservation; i changes in the woodfuel's supply system and chains; an integrated approach poverty alleviation and rural development in general; and gender potential essential*

CONCLUSIONS

In order to promote energy access to rural communities in Sub Saharan Africa we need:

- Appropriate policies and very strong political commitment like Ghana, Tunisia, South Africa
- Extensive financial commitments, Ghana, Tunisia and South Africa
- An effective institutional framework; a lead agency and several other implementers. Ghana, Tunisia and South Africa
- A sense of ownership generated through gender and stakeholder participation in the planning and implementation
- Appropriate Private Sector participation

CONCLUSIONS

- Use low cost and appropriate technologies and off grid and grid connected
- Encourage the productive use of electric power
- An open and transparent system for selecting beneficiaries, Ghana, Tunisia
- Promote renewable energy technologies
- Subsidize tariffs
- Promote innovative financing
- Build technical capacity for implementation and operations and maintenance.
- Promote sustainable biomass management

THANK YOU FOR YOUR ATTENTION