

**South Asia NGO Capacity Building for Poverty  
Reducing Sustainable Energy Solutions Project**

***Energy for Sustainable Development Sri  
Lanka - A Brief Report with Focus on  
Renewable Energy & Poverty Reduction***

**Submitted to:**

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## Status of the forms of energy that poor use in Sri Lanka

Sri Lanka does not have any fossil fuel resources. All fossil fuel resources are imported which cost approximately 15% of the export earnings. In the year 2003, the annual per capita total energy consumption was approximately 0.4 toe (16 GJ).



### National Final Energy Consumption

Biomass 56.8 %

Oil 34.3%

LPG 2.2%

Electricity 6.9% (43.5% Hydro)

(Source: Sri Lanka Energy Balance 2003, ECF)

43.5% Of electric power generation is from Hydro and the rest from oil-based power plants. Of total primary energy consumption over 60% is derived from renewable and indigenous resources.

Renewable energy potential.

Sri Lanka is an island having approximately 1000 km of sea boundary and land area of 65000 sq.km. Geographically it is located near the southern tip of India between 6<sup>o</sup> and 10<sup>o</sup> North latitude and between 79<sup>o</sup> and 82<sup>o</sup> East Longitude. The country receives satisfactory rainfall amounting to 5000 mm in the wet zone and 1000 mm in the dry zone averaging about 2000mm. A good portion of the central highlands with an elevation ranging from 300m – 2000m receives the highest rainfall and the rugged hilly terrain provide a suitable environment for harnessing hydro power at large, small and micro levels. The average solar insolation in most parts of the country exceeds 5120 watt hours /m<sup>2</sup> per day. Wind speeds of 12km/ hour (3.3 m/s) at 40 meters have been recorded in the southern coastal belt. However recent CEB investigations report average wind speeds around 6 – 6.5 m/s and notes that there is a mismatch between the wind speed variation and the daily as well as annual demand for additional generation. A recent consultant report has reported that commercially exploitable wind resources would amount to 250 MW of power. A 3 MW wind generating facility, which has been established by the Ceylon Electricity Board, has provided .04% of the total electricity generated in 2003.

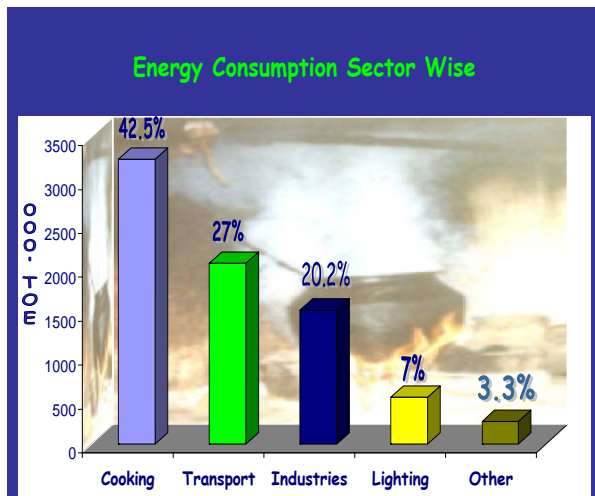
At present total power generated from hydropower is 1500 MW which is almost the maximum that could be exploited from large hydro resources. However a study done by the IT Sri Lanka estimates that the exploitable potential from small and micro hydro resources to be 100MW of which 81% of the sites identified are below 500 kW and the rest falls between 500 and 4000kW. Energy sector master plan (2004) projects a 10% increase in the renewable energy power generation by the year 2015 which includes 170 MW wind power, 250 MW hydro power and 80 Mw dendro power (wood fuelled power plants). However the master plan has disregarded the non-commercial energy needs of the 90 % of the population for cooking and rural industries, which accounts for nearly 58% of the total energy consumption.

### **Biomass**

The natural vegetation covers an area of 2047 million hectares which is 30.93% of the land area and Sri Lanka being a tropical country receives maximum solar insolation of 1000W/m<sup>2</sup>. Paddy, tea, rubber and coconut are major agricultural crops in Sri Lanka. Nearly 80% of energy from biomass resources are mainly derived from non-forests resources viz. tea, rubber, coconut plantations and home gardens. Sri Lanka Energy Balance report gives a total of 13 million tons of biomass (plant material) from vegetation and plantation crops in Sri Lanka. The total extent of degraded land is estimated to be around 2 million hectares which could be utilised to grow short rotation crops for power generation.

A study on the potential of biogas from biomass sources (Human waste, Municipal solid waste, Landfills, Livestock waste, Agricultural waste, plantation industries) in Sri Lanka carried out by Intermediate Technology Group (Sri Lanka) estimates a total power generation potential of 288 MW of which includes 86 MW from livestock waste. A report on biogas potential in Sri Lanka prepared by Ministry of Non Conventional Energy, India estimate 3600 million m<sup>3</sup>/annum with the possibility of 3 million family-sized bio gas plants.

### **Some features of the current energy balance**



## Energy Consumption Sector Wise (TOE)

Energy for cooking accounts for 42.5% of the total energy, 90% derived from biomass and 10% from Kerosene and LPG.

Energy for lighting accounts for 7% of total energy: 55% from Electricity, 45% kerosene.

Energy for industries accounts for 20.2% of total energy: 68.8% from biomass, 2.7% LPG, 29% oil.

The data above should give a clear picture of the importance and impact of biomass energy in the economy of Sri Lanka.

45 % of the population are below poverty line earning less than 2 US\$/day.

### Identification and grouping of problems with different forms of energy

**Biomass Supply:** Biomass is the major energy source. Nearly 80 % of the supply is obtained from non-forest resources coming from agricultural and plantation activities. About 70 % of the biomass are collected free and 30 % are purchased (mostly in urban areas). Nearly 50 % of the population are land-less making them dependent on biomass resources collected from land owned by others which causes multitude of social conflicts. Almost all biomass collection and processing are done by the women causing them severe social hardship and are subjected to mental and physical agony.

**Biomass Use:** 90 % of the population use biomass and 73 % of the biomass used is in the domestic sector mainly for cooking. Rural and small-scale industries use 27% of biomass. Biomass is the major energy source for cooking and industries. Nearly 80 % the household use inefficient cooking methods such as the open fire or traditional stoves. Only 20 % use "Anagi" stoves or other improved stoves. In addition to cooking, biomass in many cases is used inefficiently to sustain a wide variety of livelihoods and survival activities covering many cottage and small-scale income generating activities.

The inefficient use of biomass has caused several development problems:

- (1) Waste of a valuable renewable energy resource
- (2). Environmental and associated problems such as deforestation and land degradation
- (3) Major health hazards due to indoor air pollution
- (4) Climatic change due to emission of GHG (when plants for fuel are not replanted there is a net emission of CO<sub>2</sub>).
- (5) Gender issues: Strain on women.

## (6) Inconvenience and drudgery compared to use of modern fuels



The increasingly popular 2-stove "Anagi Stove" is the most successful improved cookstove.

Left: Production in a potter village

Right: Stove built into a chimney-hood for clean cooking in a rural kitchen.

**Kerosene** for lighting is used by a substantial percentage of the poor. Kerosene lamps used are very inefficient and dangerous causing health risks and environmental problems. Moreover it is a severe drain on foreign exchange.

**Decentralised electricity** is provided to about 250 villages using micro hydropower. Many more sites are available for development. Benefits of the technology are minimised due to poor planning, resource assessment and inefficiencies, frauds and shortcomings in community management of schemes. About 300000 households use batteries for lighting and watching TV. **Batteries** are charged using the nearby grid or using solar panels. It is reported that over 80000 PV panels are in use in the rural areas facilitated by the energy services delivery project sponsored by the World Bank.

### **Biogas**

Sri Lanka has considerable experience in biogas technology. Presently nearly 3000 units are supposed to be in operation almost all constructed by the private sector. 80% Of these units use cow dung and 20% are batch type digesters using paddy straw.

### **The barriers for increase use of sustainable energy**

#### **Policy**

Development thinking in the country promotes and favours only commercial and modern fuels. There is a lack of awareness and proper assessment of the role played by traditional fuels because traditional fuels do not fall within the cash economy. Despite the fact that the major energy-consuming sector is the cooking sector and biomass is the major energy resource there is no government policy to address the related issues. As a result there is no institutional mechanism or organisational structure to initiate and sustain any interventions other than the few isolated activities carried out by a few NGOs and GOs on a short term project basis.

Commercial Energy sector is powerful and focuses mostly at national level purely because of its commercially oriented perception. But Issues pertaining to SETs are mostly at micro level and therefore could be addressed only at a decentralised level, which calls for decentralised energy

planning which is at present non-existent in Sri Lanka. More over only a rural decentralised energy plan could address the realities of the energy requirements for sustainable livelihoods and survival activities covering cooking, lighting, food processing, domestic and rural industries and other income generating activities etc.

There are Energy ministries at provincial level but they do not have the vision or the mandate to think beyond rural electrification. Therefore advocacy has to be an important activity in the agenda for promoting SETs and a rural energy plan could provide the platform for integrating energy into the wide spectrum of development activities addressing poverty and provide seed funding for such activities. Such a plan could identify complementary roles of NGOS and GOs under a common plan and provide an opportunity for the NGOs to participate in the mainstream development efforts.

### **Consumer perception and CBOs.**

The social status associated with modern fuels, technologies and related conveniences offered, push the consumers to perceive traditional technologies as primitive and not keeping with the modern standards. However with a strong policy to support R & D activities to improve efficiencies and convenience of existing technologies using traditional fuels such as in wood gasifier stoves, Anagi stoves, biogas stoves, large improved stoves for commercial activities and improved combustion systems in thermal applications in brick. Pottery, limekilns etc, could help to change such perceptions and build confidence of the consumers. Lack of policy support in R & D and promotion activities is therefore a major barrier.

Lack of access to international experience and knowledge on proven strategies on dissemination, technologies and micro financing that could be adopted by concerned parties (NGOS) is a barrier for facilitating the implementation of SETs.

Many of the SETs have to be managed and maintained by individual consumers or communities. Lack of technical manuals for the facilitation of good management and technical maintenance can be identified as a barrier.

There are a large number of community based organizations (CBOs) working on poverty alleviation without the awareness of the importance of energy in their activities due to lack of awareness on integrated development approaches. In this respect the Kitchen Development Programme implemented by IDEA is a model of such integration which covers health, housing, gender concerns, income generation, micro financing, climatic change, energy, home gardens etc.

### **The Major GOs and NGOs involved in Sustainable Energy Technology**

There are a very few national organisations working full time on sustainable and renewable energy which could provide technical support services to a wider group of CBOs. Among the few are:

**Energy Conservation Fund.** A government organisation which has the statutory powers to facilitate promotion of renewable energy and provide policy support. It is in the process of formulating a biomass energy policy.

**Energy Forum:** Partner Organisation of ITDG. Mostly involved in the promotion of off grid power generation. Implements Networking for Promotion of Renewable energy technologies supported by Asia Pro Eco of the European Community.

**IDEA** serves as the national focal point of the ARECOP and a member of the INFORSE. Networking and capacity building of NGOs in the promotion of wood stoves and Kitchen Improvement, including the Anagi Stove. Promotion of improved combustion systems in brick kilns and bakeries and promoting large wood stoves for income generating activities. Off grid micro hydro Village Electrification. Capacity Building of NGOs and CBOs in proposal writing and sustainable development activities. Advocacy to promote rural energy planning and policy concepts.

**ITDG:** Regional Branch of Integrated Technology Development Group. Involved in several projects on SETs.

The National Engineering Research and Development (**NERD**) Centre has developed and adapted to local conditions several renewable energy technologies associated with solar, wind and biomass. Many organisations have now undertaken to popularise and commercialise this technology throughout Sri Lanka.

### **Details of some ongoing renewable energy interventions with a view to reduce poverty**

Improved wood stoves. Fully commercial production and marketing network with an output of over 300000 stoves annually established and monitored by the Integrated Development Association (IDEA), mainly "Anagi" stoves.

Kitchen improvement and fuelwood substitution and conservation in rural and cottage industries implemented by IDEA supported by the UNDP/GEF small grants programme and the Asian Region Cookstove programme (ARECOP).

Preparation of a Country strategy on the integration of energy and rural development policies and programmes. Implementation Energy Conservation Fund/University of Peradeniya supported by ESCAP.

Rural Electrification utilising micro hydropower. Presently 250 villages are electrified under the Energy Services Delivery Project facilitated by the World Bank with the participation of private sector small scale power developers.

Promotion of PV Technology for domestic uses by the energy services delivery project facilitated by the World Bank. Presently 60000 households are electrified with the participation of the private sector.

Capacity building of NGOs for poverty reducing sustainable energy solutions in South Asia implemented by IDEA coordinated by INFORSE (Europe) supported by Denmark Funding Agency

Promotion of gasifier stoves. About 3000 stoves are produced and sold annually by the private sector under license from the National Engineering Research and Development (NERD) Center.

Promotion of biogas digesters facilitated by the ITDG. Nearly 3000 plants are built with the participation of the private sector.

Networking for promotion of RET (NET-PRET) in Sri Lanka – Energy Forum/ITDG with assistance from Asia Pro Eco- European Commission

Dendro power (Gasification) pilot project for electrification of 100 off grid households – Energy Forum- UNDP/GEF project.

World Bank/ UNDP-GEF supported Renewable Energy for Rural Economic Development (RERED) Project which aims to expand the commercial provision and utilisation of renewable energy resources, with a focus on improving the quality of life and economic development in rural areas by providing access to electricity generated from such resources. The Project, which is being implemented over the period 2002-2007, follows the successful Sri Lanka Energy Services Delivery (ESD) Project that was implemented during 1997-2002.

Nearly 2000 households have been provided off grid electricity from 37 micro hydro power plants ranging from 10 to 100 kW totaling to 443 kW and solar PV electricity to 83762 households using 10 – 60 kW panels under the RERED project .

National Energy Research and Development Center(NERD). Involved in research activities on alternative and renewable energy technologies.

## **Overview of the political support and barriers.**

The main objective of Sustainable Energy Technologies should be to facilitate provision of energy to meet the requirements for cooking, cottage industries, small scale food processing and lighting of households not serviced by the grid. These could be assessed and appropriate technologies only under a well focussed rural energy plan, which has to be prepared and implemented at district levels. However the major barrier is the lack of awareness and knowledge both at national and local levels.

## **Points to note**

-The positive aspect of the energy scenario is that nearly 62 % energy consumed is renewable and indigenous.

-All fossil fuel requirements have to be imported.

-Focus of the government and commercial sector is only on commercial fuels and generating electricity. The dangers and -the social injustice perpetrated by the neglect of not addressing issues of the non commercial energy sector servicing the vital functions of cooking and small industrial activities are not seen by the politicians or the development officials.

-45 % of the population live below the poverty line and cannot afford the high prices of fuel

## **Challenge**

- To sustain or increase the present level of using renewable energy



● To meet the energy requirements of the poor not serviced by the present energy service infrastructure

(a) Cooking sector which accounts for 45% of the total energy consumption of which 90% is from biomass

(b) Domestic and rural industrial sector which consume 68% biomass

(c) Lighting requirements of nearly 25 % of the households who will not have access to the national grid

### **What needs to be done?**

(1) Advocacy to create awareness within the government administration to the dangers of not addressing the issues pertaining to non-commercial energy fuels

(2) To support the provincial energy ministries to see beyond the vision of rural electrification and establish mechanism to focus on total energy requirements and prepare a rural energy plan at district level. This would also provide an opportunity to identify the complementary role of NGOs that could be played within government development plans.

(3) Capacity building of NGOs who would participate in such a plan to implement the rural energy projects identified, which could be biogas, kitchen improvement, solar PV, village hydro, improved stoves, community forestry or any other.

### **SETs that may be of importance to meet the energy requirements of the poor.**

Improved Domestic Wood Stoves

Gasifier Stoves

Large Cook Stoves for income generation

Biogas for lighting and cooking.

Biomass and solar food and crop drying.

Solar PV.

Decentralised Power Generation using biomass gasification, micro hydro, community battery charging centers.

Improved Combustion systems for small scale thermal applications such as in various types of kilns.

### **References:**

An energy center for Sri Lanka: Dr H Jack Allison

Census of population and housing 2001

Sri Lanka Energy Balance 2002/2003 Energy Conservation Fund

Energy Sector Master Plan 2004

An assessment of the Small Hydro Potential in Sri Lanka: Sunith Fernando ITSL  
Study on the potential of Biogas in Sri Lanka; Ajith de Alwis ITDG South Asia  
Project document Energy Services Delivery Project