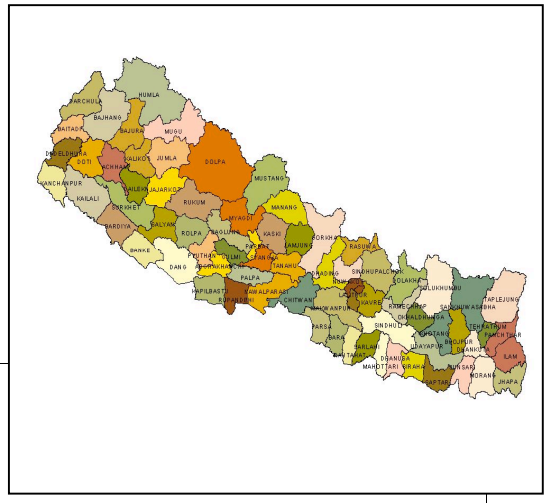
Nepal: Applications of renewable energy technologies

Alternate Energy Promotion Centre, Nepal

Country	**Nepal**
Population	23.1
Size (in km_)	147,181
No. of districts	75
No. of villages electrified	1600
No. of villages not-electrified	2313
% of population without electricity	60



Short description:

Share of RET (total primary energy):

Share of RET (total electricity): 7%

Target RET: (national or regional) 12% upto 2007

The National Agency responsible for RE programme: AEPC

	number of plants	Total installed capacity (MW)	Typical installation size	Main present funding mechanism	Short-term perspective (2005)	Mid/long-term perspective (2010)	Main barriers
Wind	NA	NA					
Wood biomass	50,000 Improved cook stove		Two pot hold For 6 to 10 family members	Funding for awareness and training for stove construction only	250000 ICS will be installed in 2007		Low level of education and economic activities in rural areas, which slow down internalise goodness of appropriate biomass technologies.
Biogas	121,000		4, 6, 8, 10, 15 and 20 m^3	Subsidy from government, loan from bank and equity contribution from individuals and community	installation of 200,000 biogas plants in next 6 years		lack of adequate funds for providing subsidy and credit
Other biomass							
PV Solar Home System Solar water Pumping Telecommunication	44,000 22	2.1 0.12 0.735	10 Wp to 75 Wp 500 to 40Kwp >300Wp		To install the 50 000 Solar home system and 100 Solar water pumping system		Lack of coherent policy and lack of adequate funds for providing subsidy and credit
Hydro <100	1246	6.54	1 kW to 100 kW	Subsidy from	Increase		Lack of coherent

	number of plants	Total installed capacity (MW)	Typical installation size	Main present funding mechanism	Short-term perspective (2005)	Mid/long-term perspective (2010)	Main barriers
kW				government, loan from bank and equity contribution from rural community	contribution on rural electrification from present 7 5 to 12 % by supporting projects equivalent to 10 MW		policy and lack of adequate funds for providing subsidy and credit

Wind

Background

Wind is a missing element in energy source development in Nepal. The first recorded effort to exploit wind energy in Nepal was made with American support in an agricultural farm in Rampur, Chitwan in the early seventies. Similarly a few wind turbines were installed in the outskirts of Kathmandu valley and Jomsom but these could not function properly. Most significant and systematic effort to harness wind energy was undertaken by Nepal Electricity Authority in 1989. Two 10 kW wind generators were installed and operated in Kagbeni of Mustang. The electricity thus generated was distributed to 60 houses in the village. However, these turbines also broke down after two month due to high wind speed and other technical flaws. So, it was felt that proper feasibility study as well as reliable wind data should be in place for promoting wind energy in Nepal. Recently, AEPC under SWERA project is collecting wind data at various locations in Nepal. Meanwhile, ITDG/Nepal has installed >1 Kw wind turbines in different part of Nepal

Important companies

Krishna Grill and Engineering, Lotus Energy Pvt. Ltd., and Powertech Nepal are the important companies for Wind Energy dissemination.

Other stakeholder & market actors in the region

Other main stakeholders are the Ministry of Science and Technology; AEPC; Center for Energy studies, Institute of Engineering, Tribhuvan University; ITDG/Nepal and some NGOs.

The main barriers & strategies to overcome them

- Lack of reliable data for wind energy resource
- Lack of awareness in rural area
- Lack of conducive government policy

Short-term perspectives (until 2005)

Collection of the wind data in different wind potential areas. Besides, prototype wind turbines will be installed in various places.

Biomass

Background

The Indian stove models, the Hyderabad and Magan Chulo, were the first Improved Cooking Stoves (ICS), introduced in Nepal, during the 1950s. In the 1960s, an agro-engineering workshop in the Department of Agriculture developed a mould-based stove model, which was disseminated through the mid-1970s, a number of NGOs and GOs (Peace Corps, Women Training Centre, RECAST, and UNICEF) were involved in ICS research and dissemination of the Lorena stove model. HMG (His Majesty Government, Nepal) initiated dissemination of ceramic pre-fabricated stoves, supported by FAO and UNDP. The ceramic inserts proved inappropriate to most areas of Nepal, since they were often breaking during long and complicated transportation in hill areas.

New initiatives for ICS dissemination have been underway since 1990s with new stoves design that can be built completely from cheap readily available local materials and changed approaches from top down, target oriented, subsidized approach to bottom up demand driven, self-construction approach.

To complement these efforts, National ICS Program has been initiated with the support of Energy Sector Assistance Programme (ESAP) of DANIDA and Alternative Energy Promotion Centre (AEPC) the government agency is supporting to further strengthen the ICS activities.

Efforts on promotion of other biomass technologies like gasification, cogeneration and biofuels are negligible. Activities on biomass briquetting is limited to pilot ones only.

The present

Till date, more than 50,000 ICS have been installed in eleven districts of Nepal under National ICS Programme (dissemination stated in December 2000). The current rate of ICS dissemination is around 25,000 per annum.

Important companies

Three NGOs: Centre for Rural technology, Nepal (CRT/N); Centre for Self-help Development (CSD); and Rural Community Development Society (RUCODES) and Department of Women Development are principal National level implementing partners of AEPC/ESAP. Other international NGOs e.g. REDP, Lutheran World Service (LWS), ECCA and Livelihood Forestry projects are also involved in ICS promotion.

Other stakeholder & market actors in the region

Government agencies (mainly AEPC), donor supported programmes/projects (ESAP, REDP, etc.) and SNV, RECAST, RONAST and TMB – Energietechnik are some other important stakeholders and Biomass market actors in Nepal.

The main barriers & strategies to overcome them

General

Ensuring that the devices that are being promoted/built are really need-based and appropriate for the individual household's needs and cultural setting. Integration with other social and economic sector development activities (health, education, and cottage industry, etc.). As such low level of education and economic activities in rural areas, slows down internalisation of benefits of appropriate biomass technologies.

Policy and institutional

- Standardisation
- Non-subsidy policy among promoting organisation
- Co-ordination and linkage strengthening with various partners, ministries, local government, civil societies, private sectors as well as donor agencies for adopting joint efforts in biomass promotion, dissemination and monitoring.

Short-term perspectives (until 2005)

- Capacity building at lowest appropriate level and continuation of the support to other interventions.
- Increasing availability of Information, Education and Communication (IEC) and awareness material.
- Focus on ICS saturation primarily in middle hills.

Mid/long-term perspectives (until 2010)

- Private sector as well as community taking over most of the initiatives including quality control.
- Hands-on manuals and IEC materials on biomass technologies readily available for rural mass .
- Increasing support for private sector development.
- Advocacy and lobbying of best practice model through National level Biomass Energy Forum.

Biogas

Background

Biogas was introduced in Nepal in 1955. However, His Majesty's Government of Nepal started official biogas programme in 1975. This programme took further momentum from 1992 following the establishment of biogas support programme (BSP) under the assistance of Netherlands Development Organization (SNV/Nepal). The installation of biogas plants is expanding very rapidly with the involvement of private companies as major actors in this sector. Biogas is mainly used for cooking (80%) and lighting (20%) The digested slurry is used mainly as fertilizer for crop and vegetable production and somewhere as feeding material for fish.

The biogas plant popularized in Nepal is of individual household type plant of GGC model 2047 (fixed dome type) with size 4, 6, 8, 10, 15 and 20 m^3. Subsidy is provided for the plants of size 4-10 m^3 only and the amount ranges form NRs 5,500 to 11,500. The biogas technology is found to be feasible only up to an altitude of 2100 meters. There is a potential of 1.5 milloin biogas plants in Nepal

The present

By the end of June 2003, altogether 121,000 biogas plants have been installed in the country covering 65 districts out of total 75 districts in the country, and 97% of them are in operation. The current construction capacity of biogas programme is about 30,000 plants per year. The majority of biogas plants installed are of 6m^3 size followed by 8, 10, 4, 15 and 20 m^3 capacity.

Important companies

Currently, 50 biogas companies are affiliated under BSP to work actively in the dissemination of biogas programme throughout the country. The largest and oldest is Gobar Gas and Agricultural Equipment Development Company Pvt.Ltd., commonly known as GGC, which was established in 1977. GGC has 24 offices in different districts of the country. The other larger companies are Rastiya Gobar Gas Tatha Prabidhi Bikash Company Pvt. Ltd. (GPC), Biogas Bistar Company Pvt. Ltd (BBI) and Jansewa Gobar Gas Company Pvt. Ltd (JAN).

Other stakeholders and market actors in the region

Besides private biogas companies, government agencies mainly AEPC, donor supported programmes (SNV /Nepal, KfW etc), development and commercial banks (ADB/N, RBB, NBL), NGOs (BSP, NBPG), biogas appliance workshops (13) and micro-finance institutions (50) are some other important stakeholders and market actors in biogas sector. United Nations Children Educational Fund (UNICEF), Save the Children USA,

Plan International, Food and Agricultural Organization (FAO) and Winrock International are also involved in promotion of biogas programme.

The main barriers and strategies to overcome them

The major challenges are addressing the following issues:

- Access for poorer people,
- Access to aggordable credit
- Reaching to remote & low temperature areas and
- Reduction of installation cost

Short-term perspectives (until 2005)

To extend the programme towards less- accessible regions and less privileged strata of the society (a) involvement of micro-credit institutions, (b) education of farmers in different aspects of biogas, (c) training of additional manpower involved in construction of biogas plants and (d) reliability of adequate after-sales- services some of the initiatives. Other strategies to disseminate biogas in a large scale include subsidy, technology improvement, and efforts for cost reduction through reaserch and development.

Mid/long-term perspectives (until 2010)

The mid/long tern perspectives for developing biogas as a mainstream renewable energy technology in rural areas of Nepal are as follows:

- Development of commercially viable and market oriented biogas industry
- Strengthening the institutions involved in biogas sector
- Easy access to credit
- Focus on the gender related impacts of the technology
- Installation of 200,000 biogas plants in next 6 years
- Continued operation of installed biogas plants
- Continued R& D in order to optimize plant operation

Photovoltaic

Background

The history of PV technology use in Nepal is rather short, around 15 years, and for Solar Home System - the most growing PV system in Nepal - it is even shorter. In last couple of years, dissemination of SHS has rapidly peaked up due to the integrated programme intervention of AEPC/ESAP. A vibrant private sector with an expanding sales and service network has been built. Besides SHS, telecommunication sector is another major user of PV technology in Nepal.

The present

Till date, around 44,000 privately owned SHS are estimated to have been installed in almost all districts of Nepal. The current rate of SHS dissemination is around 16,000 per annum. A typical SHS system has 40 Wp of solar panel with BOS (balance of system) sized adequately for 3 autonomy days.

Important companies

In total, 16 small and large private companies have been qualified to take part in SHS dissemination under AEPC/ESAP. The four largest companies in terms of their cumulative SHS installation are Lasersun Energy Pvt. Ltd., Solar Electricity Company Pvt. Ltd., Lotus Energy Pvt. Ltd. and Suryodaya Urja Pvt. Ltd. They deal with different brands of PV panels and other BoS imported from different parts of the world.

Other stakeholder & market actors in the region

Government agencies (mainly AEPC), donor supported programmes/projects (ESAP, REDP, etc.) and development and commercial banks (ADB/N, RBB) are some other important stakeholders in Nepal.

The main barriers & strategies to overcome them

- Political instability/adverse security situation due to insurgency
- Low purchasing power and low literacy of rural people
- Lack of access to credit for investment
- Lack of capacity with private sector to expand the PV sector rapidly.

Short-term perspectives (until 2005)

Increased capacity building and continuation of the support to other interventions, continued subsidy provision with increasing availability of credit, and gradual support to institutional/community PV systems as well.

Mid/long-term perspectives (until 2010)

Private sector taking over most of the initiatives including quality control. Credit available all over the country, with selective provision of subsidy. Little or no technical support for SHS dissemination, but increasing support for larger systems catering to institutions.

Small hydro (up to 100 kW)

Background

Nepal has feasible hydropower resources of 83,000 MW out of which so far 527.5 MW has been developed. The AEPC is responsible for developing micro-hydropower, which is largely used for rural electrification in the areas not covered by the national grid or the isolated system built by the Nepal Electricity Authority (NEA).

In 1911, the 500 kW plant was the first hydropower installation to be commissioned in the country.

The present

There are two types of institutional frameworks to support rural electrification. The AEPC is responsible for micro-hydro (up to 100 kW). The micro-hydropower projects are implemented in rural area presently not being covered by the NEA grid. The Government has made a provision of subsidy to encourage the private and community participation on the programme implementation.

The Nepal Electricity Authority is responsible for maintaining of national grid and extension of electrification. It also owns some of the small hydropower schemes in rural Nepal.

Important companies

The micro-hydro programme executed by the AEPC is implemented by the private sector including the manufacturers, NGOs and rural communities. There are 20 private companies registered with AEPC for providing services on manufacturing and installations of micro-hydro projects and 30 consulting companies for providing services on survey, design and studies. Apart from these institutions, there are significant numbers of non-governmental and international non-governmental organisation to support the programme.

Other stakeholder & market actors in the region

Energy Sector Assistance Programme of Danida; and the World Bank jointly with Rural Energy Development Programme of United Nations Development Programme are presently supporting the micro-hydro programme in Nepal. Both of these programmes are executed through the AEPC. The private companies, international NGOs, and local NGOs are other important stakeholder in the sector.

The main barriers & strategies to overcome them

The main barriers on the sector are:

- Lack of coherent national policy
- Inadequate funding to support subsidy and credit
- Inadequate institutional framework to support the programme implementation in rural areas.

Another barrier is that the off-grid and the on-grid electrification programmes are planned and implemented through two separate institutional frameworks adopting separate planning and policy approaches.

The main strategies as reflected in the government plan documents are to facilitate economic development by the development of rural energy system, raise living standard of rural people and to increase the employment opportunities.

Short-term perspectives (until 2005)

During the 10th Five Year plan period (2002/03 to 2006/07), the government envisions to increase the share of electricity from the present 7% to 12% from the alternative energy sources wherein the development of micro-hydro is the most prominent. The government has targeted to support implementation of micro-hydropower equivalent to 10 MW during the plan period. The Government is committed to review and improve the existing laws, rules and polices in order to make the alternative energy development more effective.

Mid/long-term perspectives (until 2010)

The government has targeted to make contribution of alternative energy for rural electrification from present 7% to 17% at the end of 12th Five Year plan, covering the period from 2011/12 to 2016/17.