Capacity Building in Developing Countries – Bringing Renewable Energy to the People

General

"More than half the world's population lives in rural areas, nearly 90 % of them – some 2.8 billion – in the developing countries. The vast majority of these people is dependent on the traditional fuels of wood, dung and crop residue, often using primitive and inefficient technologies. For many, this combination barely allows fulfilment of the basic human needs of nutrition, warmth and light, let alone the possibility of harnessing energy for productive uses which might begin to permit escape from the cycle of poverty" (World Energy Council 1999, p. 7).

The international postgraduate study "SESAM-Sustainable Energy Systems and Management" at Flensburg University in Germany with nearly 20 years of international experience is offering a MSc course for participants from developing countries to tackle the global challenge of using renewable energy systems. The course is partially carried out in Germany and partially with partners overseas, like United Nations Development Programme (UNDP) in Nepal, and has produced graduates in more than 50 countries worldwide and numerous international co-operations in Africa, Asia and Latin America.

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Energy and Development

Although energy is still not considered as a basic human need it is required for meeting all of the basic needs such as food and health, and in this context also agriculture, education, information, and other infrastructure services and shows clear correlation with the Human Development Index HDI.

In order to tackle the core problems of environmental degradation, diminishing natural resources and increasing poverty an important "tool" in this process is the use of sustainable energy systems which represent an essential precondition for social and economic development of a country – together with the changing of attitudes, community mobilisation and transfer of knowledge.

"Among the key lessons learned in the provision of modern energy services in the developing world (particularly in rural areas) is that the services must give rise to greater productivity if they are to be sustainable. The facilitation of new productive activities is what creates sustainable livelihoods for poor people and makes the energy projects financially viable. Productive services include a wide range of activities such agro-processing, transport provision, battery charging, and small-scale manufacturing. Very often, particularly in dry areas, power is needed for water pumping to supporting agriculture. Various options, ranging from manual and animal power to photo-voltaics or wind pumps should be considered against the dual criteria of sustainability and affordability" (Khennas 2002, p.10).

Indeed – energy and development are closely related and energy was a prerequisite two

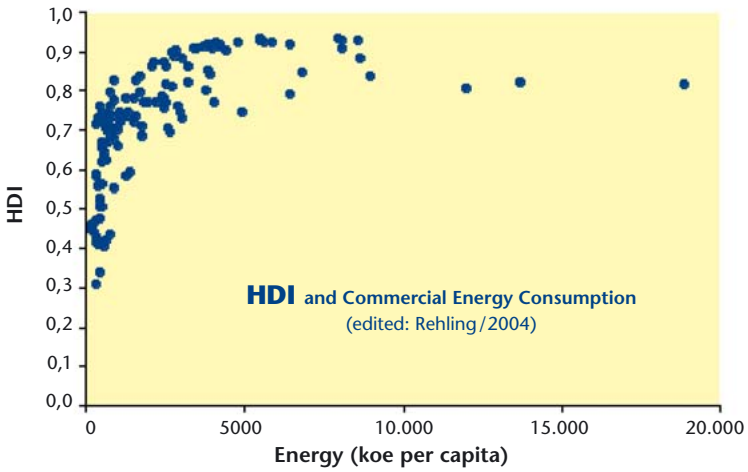


Figure1
HDI and Commercial Energy Consumption

Figure 2
Micro hydro station

centuries back for the breakthrough in economy and productivity in the nowadays industrialised countries. This interrelation of energy and development might be the base for the view that "Energy has many links with sustainable development, notably through productivity, income growth, environment, health, education, gender issues, macroeconomic stability, and governance" (Interview with Jamal Saghir, World Bank, in: Morales / Johnson 2002, p.3).

But how to make best use of that interdependancy of energy and development? What is the role of human resources? Learning lessons of various countries, organisations and projects can help to understand the mechanism….

A typical Example: Renewable Energy for Rural Electrification (SESAM 2002)

The Government in an Asian country commissioned a project in a village in 1991 and after installation it was handed over to the local Agriculture Collective to manage and operate it. The unit operated from 6 pm to 10 pm every day. Six years later in 1997 failures of the system were visible which seemed to be technology based:

- No frequency control equipment was installed on the existing system.
- Wooden poles were rotten and aluminium conductors were undersized, resulting in low voltage.
- Quality of the power was so low that the system lost paying customers and income revenue.
- Revenues from the sale of power were used to pay for projects unrelated to the operation and maintenance of the turbine system. Thus no funds were available when maintenance or repairs were required.
- The operators were insufficiently trained to do anything more than start up and shut down the plant.

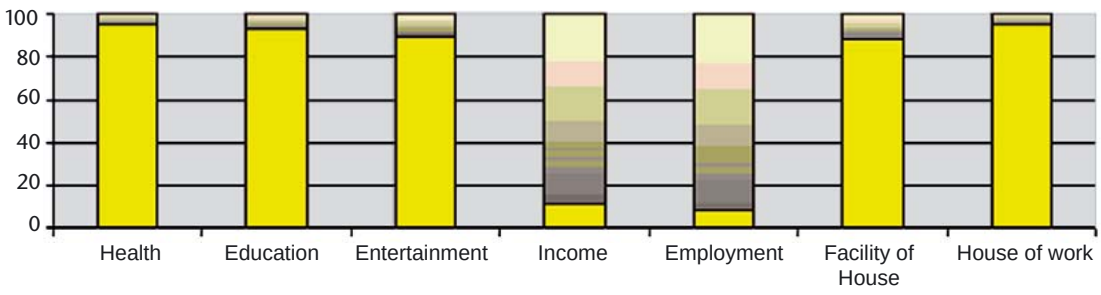
So the technical part of project was redesigned with new micro hydro station plus installation of a diesel generator, reconstruction of the electricity distribution system, and establishment of a battery charging system *(Fig. 2)*. The total budget for the project was 85,600 USD.

Running the system after re-opening for another 3 years the villagers were asked again whether positive changes had come from the project (in the graph dark colour means "no positive changes"):

The graph *(Fig. 3)* shows that improvement in income and employment as the main requirements and expectations were not fulfilled and so again the project came under financial crisis: about 50 % of the customers did not pay or could not pay because the income and employment situation had not increased.

Figure 3
Fulfillmet of requirements and expectations

= degree of fulfillment



Conclusion: latest renewable energy technology was provided but the planners had no idea of the non-technical aspects and the target group (villagers) did not participate in decisions, human resources were not trained or developed, economic situation did not improve: this kind of renewable energy project is not sustainable. In more than 100 similar case studies of SESAM in Africa, Asia and Latin America this kind of experience is (unfortunately) quite typical.

Human Resources for Renewable Energies:

To analyse, understand and solve the complexity of problems it is no longer suitable to just have a "tunnel" view which means just narrowing the view on aspects you like to see and not being capable to understand interdependancies with related aspects. Typical for tunnel views are technical solutions for development problems and under this category also falls "renewable energy for development".

Project evaluations and research studies clearly prove that the failures in implementation of energy technologies are mainly found in non-technical reasons and very often related to lack of awareness and lack of capable human resources: "In general, economic and information/awareness barriers were the most important obstacles across the countries and RETs (renewable energy technologies, author). This points to the low level of awareness and information on RETs among the potential users. Therefore, better ways to raise awareness are required… Small size of market, unfavourable policies, and subsidy to competing conventional fuels were other reasons that affected the economics of RETs further." (Painuly J.P./ Fenhann, J.V., 2002, p.37)

"A further factor that constrains the effectiveness of decentralised planning is the lack of sufficiently skilled people to carry it out. While collecting data … it is necessary, in addition, to introduce higher level training of planners." … "A further important lack of information is the one felt by rural people themselves. Although they know a great deal about traditional energy supplies and end-use options, very few of know about the potential of new technologies and modern fuels, making it difficult for them to contribute meaningfully to much of the planning process." (World Energy Council 1999, p.101)

Therefore the international MSc-course "SESAM-Sustainable Energy Systems and Management" aims to prepare participants to work in leading positions in national and international organisations as well as in businesses in order to promote sustainable development strategies and to implement energy concepts in the context of sustainable development. Of great importance in this context are key qualifications:

- ability to view problems/solutions in their entirety, i.e. a holistic approach
- creativity and openness to innovation
- inter-disciplinarily approach
- problem-solving ability
- social competencies and the ability to operate in teams.

Besides interdisciplinary study phases on technology and management with emphasis on renewable energy, project management and development strategies, environment and economy and socio-cultural aspects (10 months in Germany) participants will take part in a five months international study programme: two months with all participants as a group in an "International Classroom" and three months as individuals in field research. The international phase is in collaboration with partners like United Nations Development Programme (UNDP) in Nepal with its "Rural Energy Development Programme REDP". The partnership is to provide opportunity to apply the theoretical knowledge and skills in practical projects.

Experiences of the International Classroom with UNDP Nepal:

Every year the SESAM group went to Nepal to evaluate rural energy projects and to learn the phases of project implementation. Vice versa staff members of REDP/UNDP participated in project orientated seminars in Nepal during the Interational Classroom and staff members were

SESAM– Building Bridges between North and South

also taken for full SESAM MSc study course and within their own field research also evaluated technical, economical and socio-cultural changes, benefits and failures.

The Rural Energy Development Programme (REDP) is a joint programme of UNDP / World Bank and His Majesty's Government of Nepal which adopts a holistic approach for sustainable rural development, to enhance rural livelihoods and to preserve environment through the promotion of renewable energy systems (micro hydro, solar home systems, biogas, improved cooking stoves etc.) where possibilities of commercial energy supply do not exist. Specifically, the programme aims to have impact in the areas of

- promotion of efficient end-use technologies, including non-farm actitivies
- improved quality of life, especially for women and children
- rural capacity building and
- restoration of the natural environment.

Capacity building is a focus for REDP and SESAM: staff of both the institutions are in a continous learning process with different professional, technical and socio-economic experiences on one hand based on academic background, and on the other hand based on practical programme experience. Linking these two elements offers the chance for synergy-effects: academic training and education with application to programme identification, implementation and evaluation gives benefit to the international SESAM participants and the REDP staff likewise.

Especially the implementation of projects through community mobilization, bottom-up participatory planning and decentralized decision-making in energy development as well as producing human resources in renewable energy on national level down to grass-root level for nearly 1500 village technicians, about 4350 income generating and micro-enterprises, awareness and orientation on rural energy technologies for about 6000 people in the districts in Nepal and has successfully established more than 125 community owned micro-hydro schemes, about 3500 biogas plants and 1700 solar home systems (REDP 2003).

Main experience of the common learning process of SESAM and REDP / UNDP is:

- Renewable energy as a tool for social changes, for creating awareness and changing the role of gender is an encouraging perspective for rural development.
- Human Resource Development is an indispensable component of a country's development process: this is a must for national project and development planning and it is essential for the capacity of local groups (community members, locally elected bodies, NGOs, private sectors) to manage and operate rural energy projects in a sustainable manner.

Figure 6
Energy Wheel
Source: REDP 2002

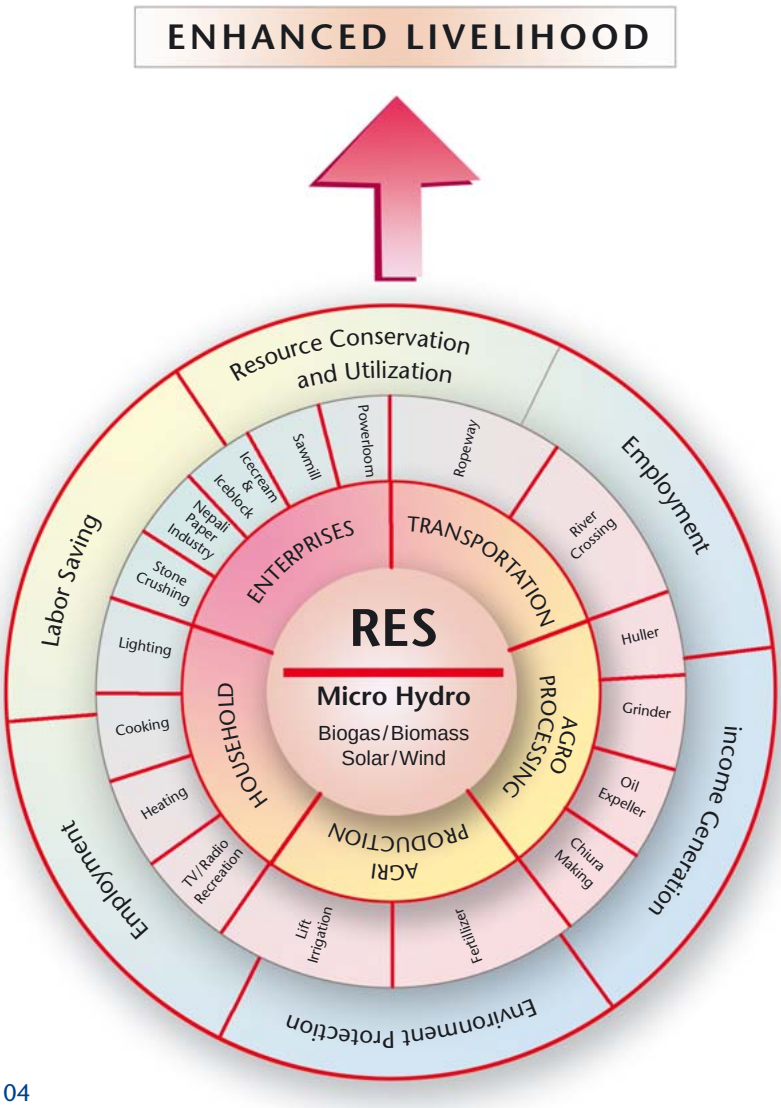


Figure 7 (left)
Practical Training for Rural Technicians (REDP 2000)

Figure 8 (right)
Awareness on rural energy in villages (REDP 2000)

- Basic energy services alone do not bring positive changes in the society: for sustainability people's participation is a must. Bringing people or mobilizing them (both men and women) into the mainstream of development process is essential before any kind of technology intervention
- Never promote energy projects in isolation: in rural and generally poor communities, the design must be essentially aiming at integrated development.
- Renewable energy projects are not auto matically sustainable: economic aspects with generating additional income is the most challenging task. Income generating activities through locally produced goods and services also depend on access to markets, number of potential customers (difficult in remote areas), diversification of products, and purchasing power in the villages.

And last not least:

- Combining university's academic education of SESAM with project implementation of UNDP/REDP as International Classroom has contributed in a significant way to the competency of the participants in both the institutions preparing them for leading positions in international projects.
- Since a number of years SESAM also uses internetbased course facilities to give more people the opportunity to participate in this global learning in the coming years.

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