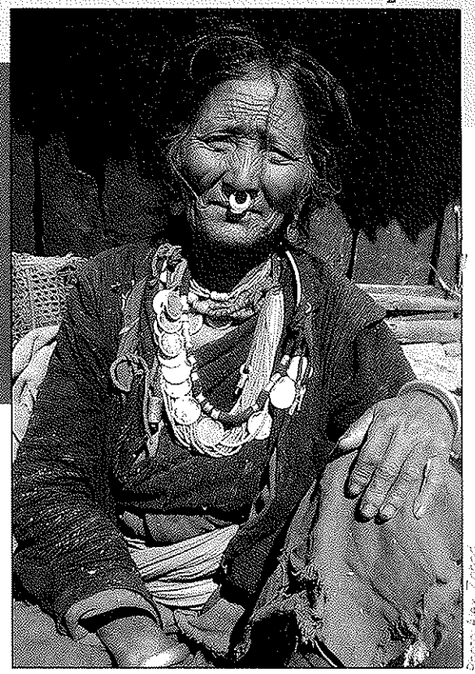
A Holistic Approach to Community Development

by Alex Zahnd

Bringing Water, Sanitation, Heat and Light to Rural Villages in Nepal



This Nepali woman has lived her whole life withot indoor lighting – until now.

Photo: Alex Zahnd

More than 99% of the world's 2 billion people now without access to electricity live in developing countries, and four out of five live in rural areas. Today, 100 years after Edison's seemingly forward-looking statement –"We will make electricity so cheap that only the rich will burn candles" – the promise of cheap, abundant electricity seems to hold true only for industrialized countries. Who anticipated that today, more people have no light in their homes than the entire world's population in Edison's time?

There is a clear relationship between poverty and access to electricity. The more remote the community, the greater its poverty level, and the higher the costs for electrification and other development projects. Approximately 85% of Nepal's 26.5 million people live in the rural areas, and about half of these live in such remote areas that neither a road nor the national electricity grid will reach them for decades to come.

Families in the remote areas use precious trees for firewood for cooking, room heating and light. These activities, especially the indoor cooking on open fireplaces, have a direct chronic impact on people's health and are a major factor in the extremely low life expectancy for women and the high death rate of children under five. In some places, families do not even name children under five, since child mortality is so high. Deforestation is alarming in these regions. The once picturesque, biodiverse forests and valleys are being stripped of their resources in unsustainable ways. Drinking water is taken from dirty streams, as there are no latrines. Nepal has no fossil fuel resources, but plenty of renewable energy resources such as water, sun and wind.

Over the past eight years of working with remote villages in Nepal's high country, four issues have again and again been identified by the local people as their most urgent needs for their holistic and sustainable development: light, smokeless stoves, clean drinking water, and latrines. Our research has found that this "family of four" increases each other's benefits when developed together.

In remote and poverty-stricken mountain villages in Humla in northwestern Nepal, a program designed and led by Kathmandu University, and sponsored by the ISIS Foundation, is trying out new ways to utilize local renewable energy resources in more affordable, sustainable and appropriate ways. In project villages, three 1-watt white LED lights are installed in each household, powered by a commonly owned, centrally located, self-tracking solar PV system with underground wiring. The LED lights and the self-tracking frame for the four solar modules have been developed and manufactured in Nepal, as part of the University's research program. Further, an efficient smokeless metal cooking and heating stove has been designed and developed with these villagers' needs in mind. The stoves consume half the firewood of an open fire, and offer a smoke free, safe way to cook and heat the home. In keeping with the desire to address the community's needs in a holistic way, a pit latrine for each family and a commonly owned village drinking water system are also implemented in close partnership with the community. Project planning, installation, and local training for operation and maintenance are all part of the excitement.

It is crucial to understand that the local community is at the center of any holistic development project and that the technologies applied are to serve and support their struggle for a better life. Therefore, any project has to be based on a thorough understanding of the local context and culture, and must include an understanding of the "invisible" causes of poverty, and the impact on the community of decades of deprivation. This approach demands time, compassion and dedication. These more "human" aspects of a development project are crucial factors that need to go alongside the technical aspects. In this way the people are recognized from the beginning as equal partners and not as receivers of imposed ideas. This time-intensive, often frustrating process is central to a holistic development project.

The Situation in Nepal

Every home in the remote, high-altitude villages in Humla uses wood in indoor open fireplaces for cooking, heating and light. Women and children are most likely to suffer from the enormous health effects of this indoor air pollution. The deforestation results in a scarcity of local firewood, and forces villagers (mainly the women and children) to spend up to seven hours every other day gathering fuel wood. Thus it is understandable that women place a high value on improved energy services, because they are not only the primary users of the household energy, but are also exposed to the greatest health risks and work loads.

Lack of electricity and heavy reliance on traditional biomass are hallmarks of poverty in developing countries. This is generally true for Nepal, and in particular for the mountain communities in Humla. No light and no stove in the home also lead to generally poor hygienic conditions for families. It is also common to have no latrine and no access to clean drinking water. But through ongoing awareness-training with educational tools such as simple brochures, colorful posters designed according to the peoples' context, and songs in the local language, people understand quickly that light in their homes, a smokeless metal stove, pit latrines and clean drinking water are not just desirable, but necessary for the healthy development of their families and community.

Nepal has plenty of renewable energy resources, in particular water and sun energy. As of 2003, only 533 MW have been developed nationwide (nearly all hydropower), which represents less than 2% of the technically and economically feasible potential. The sun's plentiful and free energy provides an excellent local renewable energy resource, with an average solar insolation of 5.5 - 6 kWh/m2 per day.

Lighting is often the first use of electricity in a developing country, and people are often willing to invest in home or village electrification once they understand the potential health improvements, the possibility for improved educational opportunities for their children, and the possible financial savings for their families. Solar PV technology is increasingly viewed as an important option, especially by governments in developing countries with a limited and poor national grid network. The technology has proven to be robust in developed countries under field conditions and is considered mature. Installation and maintenance are simple for solar home systems, if installations are done professionally, the systems used according to their design, and maintenance is done faithfully.

In order to design a solar village PV system that will provide the expected energy service in reliable ways, over a typical life span of 20 years, one needs not only technical information about the solar insolation and irradiation for the location, but also detailed information on where and how the system will be installed and maintained. The participation of all stakeholders in all project steps is crucial for ownership. Culturally appropriate training, hand-over and operation periods have to be incorporated into the process as well.

In order to design projects with these considerations in mind, Kathmandu University and the ISIS Foundation – in partnership with the local communities in the high-altitude mountain areas of Humla – have built a high altitude research station. Here, all the technologies that will be used in the villages are thoroughly tested as part of research projects for students and faculty. The smokeless metal stove, solar cookers, a University-designed solar water heater for high altitudes, a pit latrine, and solar PV modules with self-tracking frames have been tested over an extended period of time at the research station.

Taking it to the Villages

In June 2003, Kathmandu University launched a program to help bring holistic development to poor villages in Nepal. The two poorest villages in the area near the university's high-altitude research station were chosen to become pilot projects for holistic village development. In each home a smokeless metal stove, a pit latrine and lights are installed. Each home will have access to pure drinking water through a village water system that taps into a natural spring. One of the two villages, Chauganphaya, now has a centrally located 300-watt solar PV system for its lighting system for 63 homes, and clean water and a pit latrine (previously there was none for the 365 residents, which contributed to a variety of diseases). In the second village, Kholsi, a 1-kilowatt pico hydropower plant powers lighting for its 60 homes. Water and sanitation will be installed once political tensions ease off (the village is in the area of the Maoist revolt). As Kholsi's 180 LED lights are only consuming a maximum of 250 watts, it also has a warm water heating system. Both villages have efficient metal stoves in all homes.

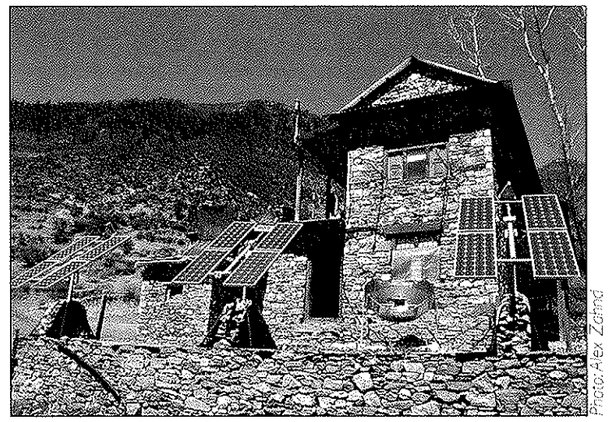


Photo: Alex Zahnd

The High Altitude Research Station enables local testing of technologies.

Since the mid-1990s the Nepal government – financially supported by various international nongovernmental organisations and donor agencies – has run subsidized solar programs. This caused a mushrooming of new solar PV companies in Kathmandu. Today, the appropriateness and effectiveness of solar PV electrification is questioned in many rural places, as solar home systems in Nepal have often not performed as expected or delivered what was promised. The price for a system is so high that subsidy programs will have to run for decades to come if the poor communities are intended recipients. Further, there has not been enough consideration to sustainability, maintenance and availability of spare parts.

With the Chauganphaya solar PV system, we are trying new ways to address these issues. Centrally located solar PV systems use four 75-watt solar modules, mounted on a self-tracking frame to increase the daily energy output by up to 40%. Underground cables connect each home from the centrally located powerhouse. This armored cable is able to cope with a 300% power transmission growth in the years to come, and wires are not exposed to the high UV radiation. Each home has 3 white LED lights (consuming 1 watt each), just enough to read and socialize, and deeming obsolete the smoky resin-soaked pine-stick lighting.

The lights used in this system have an expected life of 100,000 hours (or 45 years if used for six hours a day), making it close to unnecessary to ever need a spare bulb. The PV system's battery bank means that even after five days of no sunshine there is still plenty of power, and the life expectancy is 8-10 years. The program trains three local people per village, who participated after their initial training in the actual installation work (and thus earned credibility from fellow villagers). They are also responsible for the solar PV system's maintenance and monthly fee collection in order to maintain the whole system.

continued on page 15

SPECIAL FOCUS ON ASIA

Nepal continued from page 9

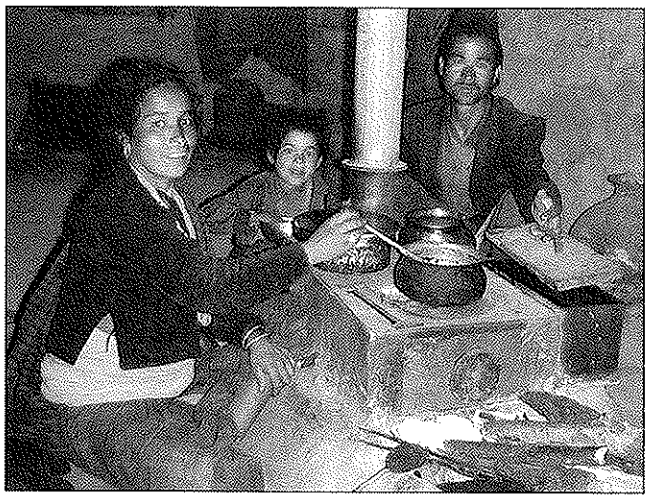


Photo: Alex Zahnd

A family enjoys a smokeless stove.

Expected Impact

To have light inside the home means that inevitable changes are occurring, such as:

- Decrease in health problems: fewer respiratory diseases, asthma, eye infections;
- General increase in hygienic conditions;
- Less wood consumption for lighting; and therefore a decrease in longterm deforestation;
- Increase in the literacy rate and children's education level;
- Increase in social gatherings after dark, leading to improved relationships;
- Increased willingness and demand for non-formal education during the evening hours, and
- Increased awareness of community development possibilities.

The program is looking at changes in the villages through a series of surveys. The first was carried out before any community development work had taken place, and a second survey will take place about 12-18 months after initial installation.

The initial success and strong participation of the local communities, along with the continued support from ISIS, has enabled Kathmandu University to extend the programs in Humla. While the "family of four" – light, stove, latrine, drinking water – remains fundamental, this year we will also include a non-formal education program for mothers and out-of school children (especially girls), a greenhouse for growing vegetables out of season, separate bathing centers for women and men using high altitude solar water heaters, and a water filter project. All these projects will be implemented in 2005-06 in one neighboring village. Additionally, we will be following up with previous project villages by revisiting families to discuss the ongoing changes and impacts of the projects. The goal is to determine whether or not the villagers' needs have been met, and if overall living conditions have improved as hoped, or if changes in the project approach is needed. ■

The author works in applied renewable energy technology research projects at Kathmandu University in Nepal. His design for a smokeless metal cookstove has been installed in more than 2,600 homes in remote Nepali villages. He can be reached at azahnd@wlink.com.np, or at Kathmandu University RDC Unit, P.O. Box 6250, Kathmandu, Nepal.