# Financing micro-hydro to provide communities with power and lighting

## Micro-hydro for community benefit

Decentralized, small-scale water power, or micro-hydro, is a particularly attractive option for electrification in many rural areas. Micro-hydro (defined as plant with capacity less than 100kW) can play an important role in developing the socio-economic status of communities in isolated hilly and mountainous areas.

ITDG has developed micro-hydro schemes with communities in Nepal, Peru, Sri Lanka and Kenya. The schemes are usually run-of-the-river that is, they do not require any dams or storage, but divert water from the stream or river, channel it along a valley and drop it into a turbine via a penstock.

The beneficiaries of the schemes may contribute in cash and/or labour up to 30% of the project cost. They may use the power to produce electricity; or directly for mechanical grain milling. Besides meeting domestic lighting needs, village hydro schemes enable people to engage in income generating activities.

The Barpak scheme in Gorkha, Nepal, is a typical micro-hydro scheme with the following specification:

| | |
|---|---|
| Area of distribution | 1.8 km$^2$ |
| Turbine | Pelton |
| Total installed capacity | 50kW |
| Gross head | 96.5m |
| Design .ow | 100 litres/sec |
| Water channel | 300m |
| Number of connections | 564 |
| Applications | Domestic: lighting;cooking, radio, TV<br>Industrial: paper pulp |

Micro-hydro is well established as a technology in several regions of the developing world. It has the potential to benefit, in various ways, hundreds of thousands of people who lack grid access.

But this potential can only be achieved if the non-technical conditions surrounding its application are tackled from the project design phase onwards. In this it is highly illustrative of the issues surrounding the brokering of access to renewable energy options in developing countries.

## Creating the right conditions for the success of small scale energy schemes

Micro-hydro depends on certain types of infrastructure and financing to provide an enabling environment. For instance:

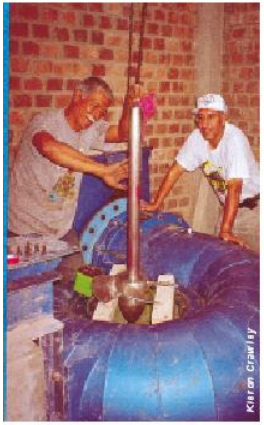
- In Peru, subsidized pilot projects for micro-hydro convinced a key institution, the Inter-American Development Bank, to support the commercial development of community micro-hydro through a *revolving fund* where pay-back of an original loan is used to provide funding for further micro-hydro plant. So far 15 new micro-hydro plants have been installed, benefiting approximately 10 000 people.
- In Nepal ITDG, along with other organizations, has helped facilitate the development of 1200 micro-hydro schemes, for about one million people. Most produce mechanical power for mills to process agricultural produce, but around 300 schemes also produce electricity for domestic and industrial use.
- In Sri Lanka, ITDG has assisted in setting up a village hydro model where the technology, cost and management of the scheme has been simplified so as to be handled by the community. This has resulted in over 70 schemes being installed in eight provinces in the last 8 years.

**Micro-hydro can provide electricity for community services, such as this school in Chalan, Peru.**

digester;
sawmill;
grinder; de-huller;
bakery

Three major factors have ensured the success of these initiatives:

. The participation of the beneficiaries in project planning and implementation




**Installing the runner, 25 kW low head turbine, Las Juntas, Peru.**

- The development of a local manufacturing base to produce low-cost equipment
- Capacity building at community level to enable the replication of the technology

## The market for micro-hydro

Supplying improved energy services profitably to very poor people who live isolated from roads and the grid is particularly challenging. Micro-hydro compares well with other energy supply technologies in these difficult markets.

Despite this, energy planners frequently do not consider it as an alternative to grid expansion.

Currently, micro-hydro schemes are seen primarily in terms of securing livelihoods and the development of small, profit-making businesses. The sustainability of grant-based programmes is limited, and ways must be found to attract private capital if these programmes are to have anything but a marginal impact.

Another view of micro-hydro is that it should be part of the social infrastructure, a public good like health services, roads and schools. Some schemes are justified by their promoters solely in terms of their contribution to improving the quality of life through electric lighting.

These two approaches are quite distinct in aims and outcomes, implying the need to make hard choices early in project design. A socially desirable end use, for instance, is lighting; but financial sustainability depends upon discovering a profitable end use.

If costs for either approach appear too high for marginalised people to sustain, however, they can be significantly reduced by involving the community in project development.

## Community involvement and participative approaches


**Using micro-hydro to power this grain mill in Nepal provides opportunities for generating additional income.**

Community participation enables costs to be reduced in three ways:

- Employing local labour, or utilizing other community-owned assets such as land
- Community cost-sharing enables the more wealthy households and entrepreneurs to carry the bulk of the costs, and thereby to make a service available to their poorer neighbours
- Increasing the number of people involved in a scheme can reduce the cost to every one when micro-hydro schemes exhibit economies of scale.

As in the Sri Lanka example, community involvement implies capacity building and training so that the community can continue to manage and maintain the resource, making it financially and institutionally sustainable.

People from the community pull together to transport the step-up transformer to the powerhouse, Peru.