The pico hydro system of 750W implemented in Makumira village (north Tanzania) is a demonstration site which gives an example of 100% locally made renewable energy technology suitable for isolated areas. The local realization of the device was possible through the contribution of 3 institutions: Dar es Salaam University for the design, Arusha Technical College for the workshops and the construction of the device and Oikos East Africa for the coordination, logistic and community aspects. This collaboration brought to the local technical college the skills to replicate such a system and to spread this knowledge to future students. These skills were completely absent in this area, where there are many isolated places that could be exploited to replicated the plant. This system provides electricity to 20 households, which is now managed as a community owned service. The site was already a demonstration site for biogas, wind, stoves, agriculture technologies and mechanical workshop that was started by a local skilled technician.

**PROJECT DATA SHEET**

**Year the installation started operating**
2011

**Type of system**
Hydro

**Type of energy produced**
Electricity

**Location**
Tanzania, Arusha region, Arumeru district, Usa River, Makumira Village

**Geographical position**
3°21'36.26"S 36°48'44.78'E

**Size of installation**
13 m³ (Power house, penstock & channel)

**Power of installation**
0.75kW

**Use of energy produced**
Lighting, battery charging

**Quantity of energy produced per day**
18 kWh per day

**Type of financing**
Grant

**Source of financing**
European Union, 9th European Development Fund

**system investment cost**
6000 USD

**System cost per watt**
8 USD per W

**Income generated from installation**
15 USD/day (savings on diesel for generator)

**Maintenance cost per year**
200 USD

**Fossil fuel savings per year**
Approx. 3500L (diesel)

**CO2 reduction per year**
Approx. 9.4t of CO2 per year

**Number of beneficiaries**
20 families

**Presence of renewable energy country programme**
No
The hydro system is part of the BEST RAY (Bringing Energy Services to Tanzanian Rural Areas) project which aims to provide energy services through renewable/efficient technologies (solar, biogas, improved stoves, etc.) in an isolated rural area of north Tanzania. Best Ray objectives are: to implement renewable energy systems in local institutions (schools, hospitals, dispensaries, community centres) rural household, but mostly to create local capacity (technicians), awareness and access to the community to the use of these alternative technologies. In this framework, the implementation of a locally made hydro system as a demonstration site, gave access to energy to an isolated area, created capacity through the strengthening of the local technical college and the training of community technicians during the construction; finally it improved the awareness as it is set in a demonstration site.

ENERGY FOR LIFE - BEST PRACTICE AWARD 2011

System / Location
Pico hydro system local made / Tanzania

LEGAL FRAMEWORK
The hydro system is part of the BEST RAY (Bringing Energy Services to Tanzanian Rural Areas) project which aims to provide energy services through renewable/efficient technologies (solar, biogas, improved stoves, etc.) in an isolated rural area of north Tanzania. Best Ray objectives are: to implement renewable energy systems in local institutions (schools, hospitals, dispensaries, community centres) rural household, but mostly to create local capacity (technicians), awareness and access to the community to the use of these alternative technologies. In this framework, the implementation of a locally made hydro system as a demonstration site, gave access to energy to an isolated area, created capacity through the strengthening of the local technical college and the training of community technicians during the construction; finally it improved the awareness as it is set in a demonstration site.

FEASIBILITY, SUSTAINABILITY AND REPLICABILITY
Tangible project impacts are: 20 isolated households now have electricity for lighting and charging batteries; the community has a demonstration site where they can go, see and learn practically about hydro technology. The project is likely to be replicated in nearby areas since now the local technical college has the capacity to build hydro turbines and because there are many potential sites for their implementation (isolated areas with low water flow). To be replicated somewhere else, it just needs to find the appropriate technical expertise and workshop for the turbine construction, then it is a suitable technology to be implemented in any isolated area with water flows nearby. The financial support can be found through private individuals, organizations, projects or by the same benefiting community. The beneficiaries of this system are managing the plant in as a community owned facility both for its use (the electricity is equally shared) and for the financial aspects (they organize a fund for maintenance needs). One of the beneficiaries has been trained on maintenance and technical issue. These aspects contribute to the sustainability of the project.

SOCIAL IMPACTS
The isolated beneficiary community is now electrically served. The families can use clean light even in the evening thus increasing the number of hours used for different activities (e.g. working, studying, and housework) per day. This service can also be exploited to create small business activities (e.g. battery charging service, etc.). There will also be other communities touched by the project as the location is very popular as a demonstration site, so it will give high visibility to the project. The ability of sizing, designing, constructing and implementing a hydro turbine developed at the technical college can be used again as a business activity to produce other turbines at suitable locations. Technicians from the rural community have also been trained for feasibility studies, sizing and maintenance of hydro plants; thus they can use these skills for future work opportunities.

FINANCING AND FINANCIAL IMPACT
The financial support for the realization of the project was a collaboration between: Oikos East Africa (Best Ray project), that financed the material for the construction of the plant and the logistic aspects; the Arusha Technical College gives the technical expertise and the workshop where the turbine was constructed; and the Dar es Salaam University that gave the design and the engineering expertise. The benefiting community is in charge of the financial management of the plant (they organize a fund for maintenance needs).

ADDED VALUE
The project has been implemented on a site owned by a skilled local technician (part of the beneficiary community). He is very manually skilled with a solid educational background, and already experimenting and promoting renewable energy and environmental systems by himself for biogas, organic agriculture, forestation, wind energy, etc.), at his home. Choosing this location for the implementation of the project has also supported his activities and visibility. Moreover he is now collaborating with the technical college combining his technical skills with proper knowledge to improve his products while realizing new project ideas.