



# 10

PREP

PROMOTION OF RESOURCE  
EFFICIENCY PROJECTS

## SUSTAINABLE ENERGY FOR POVERTY REDUCTION

II. ISSUE 2007



# WISIONS

## SUSTAINABLE DEVELOPMENT IS POSSIBLE

**WISIONS** is an initiative of the Wuppertal Institute for Climate, Environment and Energy, carried out with the support of the Swiss-based foundation Pro-Evolution, to foster practical and sustainable energy projects.

Sustainable development is possible. Numerous innovative and valuable contributions from different countries, fields and institutions have shown that an appropriate reconciliation of economic, ecological and social factors is not unrealistic utopia. We have made a promising start, but the greatest challenge still facing us in the 21st century is to learn how to use the world's resources more efficiently and in an ecologically sound and socially balanced way.

Progress is being made; however, fifteen years after the UN Conference on Environment and Development in Rio de Janeiro, many people, especially in developing countries, still lack access to resources, clean technologies, and education. At the same time, people's level of resource consumption and means of production remains unsustainable.

To meet global challenges like climate change, water scarcity and poverty, it is necessary to foster projects of potential strategic global importance by supporting them so that they can be implemented locally. Examples of good practice need to be actively promoted to a wider audience.

**WISIONS** promotes good practice in resource efficiency through its publication of relevant successful projects in its Promotion of Resource Efficiency Projects: **PREP**

**WISIONS** also provides consulting and support to ensure the potential seen in visions of renewable energy and energy efficiency can become mature projects through its Sustainable Energy Project Support: **SEPS**



Photo: aboutpixel.de

# SUSTAINABLE ENERGY FOR POVERTY REDUCTION

Progress in reducing poverty has been made; however, there is still a long road ahead. More than one billion people (one in five in the world) still earn less than one dollar a day; another 1.5 billion live on one to two dollars a day. These facts taken together mean that about 40 percent of the world's population constitutes a global poverty class, faced with extreme standards of living.

## INTERNATIONAL ACTION IN ORDER TO ALLEVIATE POVERTY

The Millennium Development Goals (MDGs), adopted at an international level in 2000, set a list of human development objectives to be achieved by 2015. Although energy is not addressed directly in the eight MDGs, it is widely accepted that access to clean and affordable energy is a prerequisite to achieving sustainable development and reducing poverty. Energy is only one determinant of poverty and development, but it is a vital one. Energy supports the provision of basic needs (cooking, heating, lighting, etc.) and creates productive activities (manufacturing, industry, commerce, etc.).

The poor pay more money, or spend more time for energy services, than those who are better off. Because efficient devices tend to have higher initial costs, the poor end up with less efficient devices, which consume more energy for a given level of service. Therefore, a direct improvement in energy services would allow the poor to enjoy both short-term and long-term advances in living standards.

## GENDER INEQUALITY

Women are referred as the best energy managers. This points towards the drudgery of collection of fuel, carrying the head-loads of fuelwood to cover long distances and burning it inefficiently under unhygienic conditions. Maintaining the consistent supply of fuel for meeting daily energy needs is a time-consuming activity, which also restricts the time to utilise for education and productive activities. Therefore, dissemination of efficient and affordable fuel, particularly in rural areas, shows up the possibility of reducing the burden associated with performing the daily household, tasks and time spent on these activities. It helps in enhancing the income opportunities, the possibility of better health and education facilities for women and children, thereby, supports to fulfil the tasks of the MDGs.

## CONTENTS OF THE BROCHURE

In this brochure, **WISIONS** focuses on how sustainable energy use can support poverty reduction. **WISIONS** presents projects from Namibia, Brazil, the Philippines and India that have been successfully implemented, with the intention of further promoting the particular approaches used by these projects. Using a key number of internationally accepted criteria, the main consideration for the selection of the projects was energy and resource efficiency with social aspects being of high additional relevance. The assessment of the projects also included the consideration of regional factors acknowledging different needs and potentials. All projects that fulfilled **WISIONS** application criteria were independently reviewed, and five of them, with the potential to make a significant

impact on global energy and resource efficiency, are published in the following pages. **WISIONS** is pleased to present good practice examples from ambitious projects which have been successfully



Photo: photocase.de: luxxmail@gmx.de

implemented on different continents. All of these projects are appropriate within their local context and have been developed to a level which meets **WISIONS** selection criteria. Although uniquely designed for a particular setting and problem, the projects presented can be adapted to different situations or can provide valuable information from their implementation phase. Links to the illustrated good practice examples shown in the brochure, as well as a couple of other issue-related good practice projects, are available at [www.wisions.net](http://www.wisions.net).

The selected projects are not intended to represent the only possible courses of action to take in the area of sustainable energy for poverty reduction but they do demonstrate promising approaches.

## SOLAR MOBILE PHONE CHARGING – IMPROVED COMMUNICATION FOR OFF-GRID COMMUNITIES

### Location:

Namibia

### Project's Aim:

Enhancing off-grid communities' communication opportunities by providing a local charging system for mobile phones and, therefore, avoiding long travel distances

### Technical Answer:

A photovoltaic energy system which enables mobile phones to be charged and provides energy for lighting, radio and other services

### Project's Duration:

From September 2006, still ongoing

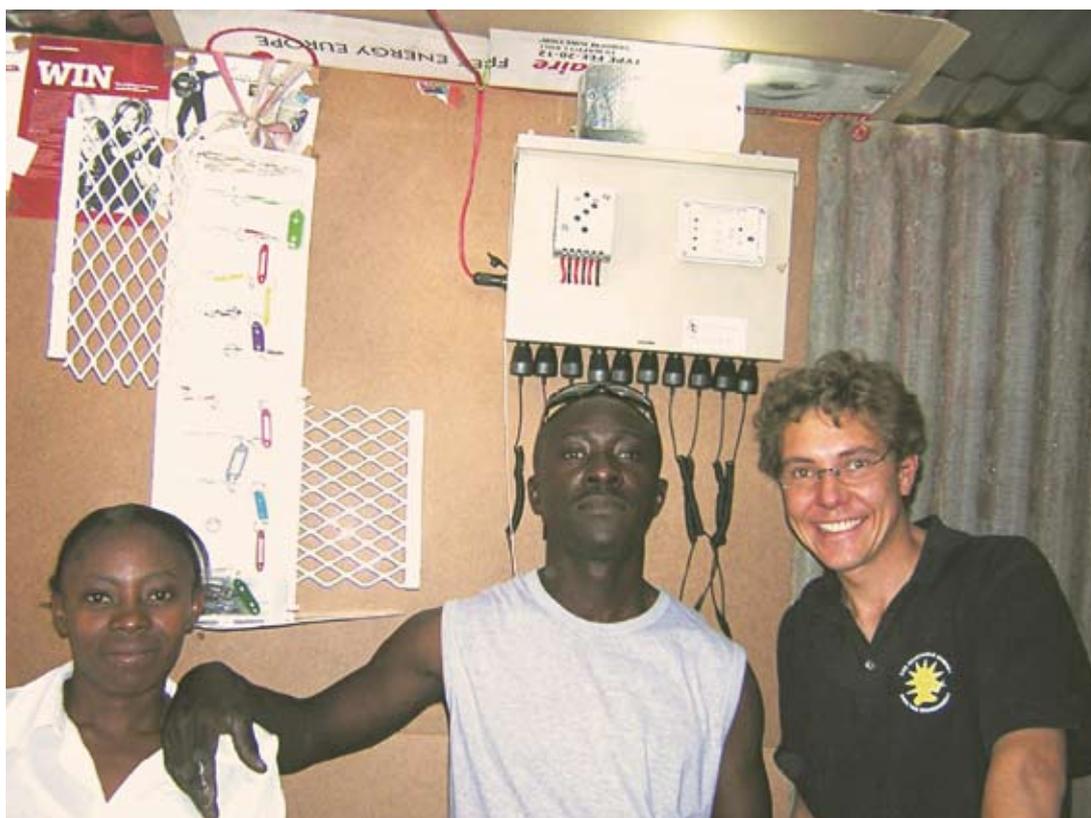


Photo: DRFN – Shopkeepers and DRFN representative with the installed solar cell phone charging system.

Namibia has over 600,000 mobile phone users (which is every third citizen); however, only 40 percent of Namibians and 12 percent of the rural population have access to electricity. Therefore, the demand for charging of mobile phones is very high. As a result, small businesses have evolved to provide this service for a small fee (EUR 0.5). However, these businesses are confined to locations with grid access, which forces off-grid community members to travel long distances in order to charge their mobile phones. As grid extension is costly and prone to theft, solar energy technologies provide an affordable and sustainable alternative energy supply.

The first solar home system was established in a shop in an informal settlement in Windhoek. A pre-feasibility study assessed the demand for such a service and commissioned the local construction of a prototype. The shop owner now offers 10 terminals

for charging mobile phones, at a rate that is currently set below the market price (EUR 0.4). In addition, the solar energy system provides enough energy to operate lights and a radio.

This project won the "Sam Nujoma Innovative Entrepreneurs Award Competition 2006" in the 'Bright Idea' category.

### BENEFITS

The project offers improved access to communications and electricity through the establishment of a sustainable business in an informal off-grid settlement that has a secure client base with a demand for mobile phone charging. This service has improved the living conditions of between 20 and 100 people by providing them with the opportunity of regular communication. In general, the project can facilitate off-grid



Photo: DRFN

businesses through modular expansion by providing additional services such as entertainment, refrigeration and charging facilities for other power tools. This type of expansion can be financed solely by the income generated.

The PV system was locally manufactured, thereby providing local employment opportunities. Other job opportunities will emerge from the higher rate of mobile phone usage as people profit from improved communication and flow of information. Moreover, entrepreneurship and employment from the collection of old batteries and the resale of these to the manufacturer will arise.

## SUSTAINABILITY

The sustainability of the project is guaranteed as the electricity is 100 percent renewable and, after the initial investment, no further energy or financial input is needed. In addition, the system has run without any faults since its implementation in October 2006 and the lifespan of the solar panel exceeds 7 years, which keeps the maintenance costs low and reduces the risk of loss of income.

The demand for electricity will increase over time due to the fact that access to electricity is a precondition for development and, also, because it is acknowledged that there is a high demand for such services.

Furthermore, the project encourages energy efficiency because the possibility of generating income from the PV system acts as an incentive to avoid wastage of energy by e.g. unnecessary lighting, radio usage, etc.

## TECHNOLOGY

The project is based on PV technology. The system operates on a 20Wp PV module

and includes two lights, a socket for a 9V radio and 10 mobile phone charging terminals. The system can charge about 20 mobile phones per day and also provide energy for lighting and a radio.

## FINANCIAL ISSUES

The purchase of a solar home system requires a capital investment of EUR 500, with a pay back period of 5.3 months if only 50 percent of the capacity is used. This rate of return makes the system highly lucrative and allows for investment without the need for external funding or subsidy. However, existing community based saving or micro credit schemes can help to minimise any concerns regarding potential inability to repay the loan.

## OBSTACLES

The project did not face any major challenges. However, it is important to assess the market demand before implementing a solar home system, because the project's success clearly depends on the need for the services offered.

In contrast to the potential security risks associated with grid-lines, which are not under the direct control of the owner, the PV panel's security is higher. The implementation of the system within owner-operated shops ensures that control mechanisms are in place; however, theft is still a potential obstacle.

## REPLICABILITY

The solar home system is a stand-alone technology which can be installed anywhere with a few modifications. The low initial investment, together with the short pay back time and guaranteed income generation, are good indicators for replication. This has been proven by

the fact that the shop owner has invested in an additional PV system and has also been able to lease the technique to other shops.



Photo: DRFN – Unelectrified informal settlement.

Although investment is feasible without any external support, the project is trying to involve Namibia's three mobile telecommunication providers to accelerate dissemination. The aim is to persuade the companies to roll out basic solar systems that are entirely funded by private companies. The combination of advertising opportunities and social responsibility constitute the companies' motivation to buy into this scheme.

## CONTACT

**Desert Research Foundation of Namibia**

Mr Robert W Schultz

e-mail: [robert.schultz@drfn.org.na](mailto:robert.schultz@drfn.org.na)

URL: [www.drfn.org.na](http://www.drfn.org.na)



## BRAZILIAN FAMILY AWARENESS PROGRAMME PROMOTING THE POSITIVE USE OF SOLAR THERMAL ENERGY

### Location:

Brazil

### Project's Aim:

To develop and disseminate a low cost solar thermal water heating system especially designed for poorer Brazilian families

### Technical Answer:

Solar thermal heating system, build in the do-it-yourself mode and adapted to Brazilian needs and made from locally available and affordable products

### Project's Duration:

From 1992, will be ongoing until 2014



Photo: Sociedade do Sol – Typical houses in the outskirts of São Paulo.

At the exhibition linked to the 1992 Earth Summit in Rio, Sociedade do Sol took the opportunity of presenting their belief that every Brazilian family has the right to own and use a solar water heater. This concept emerged firstly from the fact that Brazil is one of the countries with the highest rate of solar radiation and, secondly, because there have been problems concerning grid electricity in Brazil. In the evening hours more than 20 percent of the power demand is used to heat water for personal hygiene, increasing the power demand to more than 35 percent of the daily mean. Thirdly, by complementing the energy used in electrical showers with solar thermal energy showers, the families' energy expenses could be reduced by between about 25 percent and 40 percent. This represents a significant increase in income, especially as about 85 percent of the Brazilian population is extremely poor.

As the consequence, the project has developed a low cost option for solar thermal heating for a household of 4 to 6 people based solely on local home building

materials and adapted to the needs of Brazilian families. Since 2006 the technology has been disseminated as a freeware technology that can be easily built by the families themselves and costs only about 10 percent of a regular system. Since the construction of the prototype the project has been focusing on capacity building and awareness raising.

Recently, Sociedade do Sol received the Brazilian Philips Simplicity Award.

### BENEFITS

The energy saved by using the solar heater system has many positive impacts. On the one hand, families are able to increase their income through decreasing energy costs, which enables them to invest in other activities e.g. education. On the other hand, less pressure is put on grid electricity and, therefore, maintenance costs will decrease. The associated decrease in the use of grid electricity will also make expressive savings in CO<sub>2</sub> emissions and avoid part of invest-



Photo: Sociedade do Sol

ment needs in hydro or thermal electrical plants with their negative impact on environment and society.

The assembly of one solar system encourages others in the neighbourhood to set up their own installations. Due to the simplicity of setting up the system, there are opportunities for anyone – but particularly for plumbers – to generate additional income through entrepreneurship. To date, more than five small factories assembling the solar installations have been established.

Sociedade do Sol has developed a demonstration site giving information about the solar system and its installation. Furthermore, the organisation works together with schools raising awareness amongst children about the GHG problem and demonstrating possible solutions, e.g. the solar thermal system, solar cookers, and water re-use systems. By reaching and informing the children in this way, Sociedade do Sol aims to disseminate information about solar energy as widely as possible.

## SUSTAINABILITY

The project is sustainable as it is finely adapted to the needs of Brazilian families, as well as to the financial constraints that a family might face in obtaining a regular solar water heater. Because of the simple construction, the local availability of the components and the low initial investment, the technology is affordable for even the poorest families in Brazilian society and offers a constant return over many years.

## TECHNOLOGY

The solar thermal system consists of technology comparable to conventional solar thermal systems; however, the compo-

nents used here are simplified, combining 3 thermoplastic panels and widely used water storage tanks of approximately 250 litres. The physical disposition of this heater is similar to the regular one, where the insulated water storage stands above the panels, inducing a natural process of water circulation as long as the sun is shining.

## FINANCIAL ISSUES

The costs are kept to a minimum (around EUR 100 per system); however, as the materials used are very common many households already have them in storage. In general the costs of the solar heater do not exceed 10 percent of a conventional one.

## OBSTACLES

In the beginning, the construction of a simple and low priced solar heater was a challenge and development took about 10 years. The second obstacle that the project faced was how to promote itself widely to families across Brazil, in particular to the poorest sector. These groups (about 26,000,000 families) usually lack access to media, books, magazines and TV.

However, as a result of good media relations, the involvement of teachers, pupils and students through intensive courses and presentations, combined with the establishment of a comprehensive demonstration site where interested parties can learn about the construction of a heating system and have their questions answered by volunteers, about 7,000 families have already installed the solar heating system.

Opposition from formal solar heater manufacturers remains an obstacle.

## REPLICABILITY

The project was designed in such a way that it could be replicated either on an individual or entrepreneurial level. The low initial investment costs and the abundant local availability of the components make the technology easy to reproduce. Technical support is available from Sociedade do Sol – either via the demonstration site, online or personally – enabling challenges to be overcome.

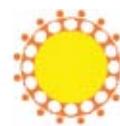


Photo: Sociedade do Sol – Presenting the black painted PVC collector.

## CONTACT

### Sociedade do Sol (SoSol)

Mr Augustin T. Woelz  
e-mail: [info@sociedadedosol.org.br](mailto:info@sociedadedosol.org.br)  
URL: [www.sociedadedosol.org.br](http://www.sociedadedosol.org.br)



SOCIEDADE DO SOL

## AMBULANT FOOD VENDORS: ENERGY EFFICIENT STOVES AND HYGIENIC, HEALTHY FOOD

### Location:

Manila,  
Cebu and Davao,  
the Philippines

### Project's Aim:

To reduce expenditure  
on energy for cooking

### Technical Answer:

Provide fuel saving and  
energy efficient  
improved cooking  
stoves

### Project's Duration:

February 2006 –  
June 2006



Photo: Approtech Asia – AFVs using the MABAGA stove.

A study conducted by Approtech Asia on "Enabling Urban Poor Livelihood Policy-making: Understanding the Role of Energy Services" under the DfID KaR showed that energy for cooking in food micro-business accounts for 30 percent of the expenses of female ambulant and street food vendors. Most of the ambulant food vendors (AFVs) do not have any training and are dependent on loan sharks for their day-to-day capital, with interest rates of 20 percent paid in equal daily instalments for a period of between 1 and 60 days.

In 2006, Approtech Asia, with assistance from UNDP REP-PoR, introduced a fuel saving, energy efficient MABAGA charcoal stove and provided microfinance assistance to over a hundred food vendors in the cities of Manila, Cebu and Davao to free them, either instantly or gradually, from their dependence on loan sharks. Capability-building training activities were conducted in the areas of food micro-business management, record keeping and basic accounting, food hygiene and sanitation, meal planning and

food processing, solar water disinfection and more. Only those who completed all training courses were eligible for the improved cooking stove, microfinance facilities, food cart, health card or certification from the City Health Office. By the end of the pilot stage, 124 ambulant food vendors from the initial 178 who joined the orientation meeting had completed the 5 training courses.

### BENEFITS

During the pilot stage, the AFVs who used the improved cooking stoves reported savings in cooking energy of between 30 percent and 70 percent for cooking the same quantity of food, compared to their previous use of traditional charcoal stove, kerosene and LPG.

The improved cooking stoves can bring tremendous social benefits as the AFVs gain self-confidence and self-respect. Additionally, the relationship in the family and among AFVs has improved; now there is a



Photo: Approtech Asia – Original MABAGA stove.

greater focus on cooperation rather than on competition.

During the baseline survey, those who complained of eye irritation and other health problems after cooking using traditional charcoal stove, kerosene and LPG for 6 to 24 hours were very positive about their experiences of the improved cooking stoves. They no longer suffer from these health problems because they are no longer exposed to the direct heat from the stoves.

The customers also benefit as the street food is now prepared hygienically, with AFVs using aprons, hand gloves and hairnets and now being aware and more cautious on food safety. Healthy drinks from fruit and vegetables are supplied and solar energy is used to disinfect water for drinking and juice, instead of boiling it using charcoal or fuelwood and buying bottled water.

## SUSTAINABILITY

After the completion of the pilot stage, there were still more AFVs requesting training and assistance. The vendors promoted the MABAGA charcoal stove and sold over 500 units in six months to their neighbours, customers and government employees who came to buy the stoves after learning about the savings to be made in cooking energy and the associated health benefits.

The micro credit facility is almost self-financing and, with the increase in number of AFVs and their contributions to sustain their activities as an organisation, it will eventually become self-supporting.

The partnerships with the City Health Office, Education, Philippine Commission for the Urban Poor, ESLA Cooperative, non-government organisations, the women in science and technology, inven-

tors' organisations, and micro-finance institutions ensure the sustainability of the project.

## TECHNOLOGY

In this project improved MABAGA cooking stoves based on modified Thai bucket stoves and New Lao bucket stoves promoted by the Asian Regional Cookstove Program (ARECOP) are used to benefit the AFVs. The fire is steady and is not blown by the wind or air, with the result that the heat is contained and concentrated at the bottom of the pot. The heat efficiency is high and, therefore, effective in cooking fried food and in reducing the cooking time. Further improvements have been made to the MABAGA stove based on feedback from users such as the AFVs. A sliding door in the air inlet was included to control and regulate fire and save fuel or avoid the burning of cooked food.

The amount of charcoal used decreases due to the use of high quality charcoal produced from improved charcoal kilns and the production of high quality charcoal is integrated with sustainable tree lot farming or an ecologically sound forestry programme with community and government support.

## FINANCIAL ISSUES

The total cost of the project was US\$ 42,000 (UNDP REP-PoR) + US\$ 18,000 (Approtech Asia), which included the capability-building training activities, improved cooking stoves, kiosks with solar water heaters for disinfecting the eating utensils, acquisition of health cards etc.

The revolving capital of the micro credit facility was initially US\$ 7,000 in March 2006 and has now accumulated to over US\$ 15,000.

## OBSTACLES

Most of the impoverished female food vendors in urban areas have no legal status and no business permit. This may have contributed to significant obstacles such as weak or non-existent legislative support, and to corruption.



Photo: Approtech Asia

## REPLICABILITY

Local Government Units such as the City Health Offices and other implementing partners recommend the replication of the project in other cities, especially those in emerging areas. Currently, the number of participating AFVs is expanding and the replication of the project in two additional cities in Manila is under development.

## CONTACT

**Approtech Asia**  
Ms Lumampao Feri  
e-mail: [fglumampao@yahoo.com](mailto:fglumampao@yahoo.com),  
[fglumampao@approtech.org](mailto:fglumampao@approtech.org)  
URL: [www.approtech.org](http://www.approtech.org)



## SAVING WOMEN'S TIME AND ENERGY: AN INITIATIVE TO REDUCE DRUDGERY AND EMPOWER IMPOVERISHED MOUNTAIN WOMEN

### Location:

Himachal Pradesh,  
India

### Project's Aim:

To reduce the daily  
drudgery of  
impooverished  
mountain women

### Technical Answer:

Replace the use of  
firewood by introducing  
LPG cookers,  
pressure cookers  
and hamams

### Project's Duration:

From November 2002,  
still ongoing



Photo: Jagriti – Using a hamam.



Photo: Jagriti

Ongoing drudgery reducing initiatives of the Community based organisation Jagriti are built on the following growing realisation: if women in mountain societies are to begin on the long road to empowerment, they need to be gradually (and quickly) freed from the routine drudgery that takes up a good part of their day. In the mountains, the dependence of most households on firewood for cooking and heating is generally acknowledged. For women, the burden of gathering firewood is relentless. The deforestation that has taken place in recent decades has exacerbated the situation. This burden, added to women's reproductive role, confines women to their homes, effectively barring them from any active participation in community social life.

The main objective of this project is to reduce the daily drudgery of impoverished mountain women. As a result of the changes that have been implemented, women and girls now spend less time and energy in

gathering firewood, in cooking and washing blackened utensils and in heating water in inefficient ways. On another level, the accumulated time saved by the women can now be productively used to learn skills that help generate additional income, to group together to save money and to establish small individual or group enterprises. Even more importantly, the time may be employed to discuss, and participate in, community social development work, or simply used for leisure.

In December 2003 the project started to distribute an LPG package (comprising a gas stove, a regulator with a pipe, one igniter and one LPG cylinder) to those women who were members of Women's Savings & Credit Groups. This intervention was supplemented by the allocation of pressure cookers in July 2004 and was further consolidated by the distribution of hamams (local water heating devices) in November 2005.

## BENEFITS

The preferred firewood in the valley is green oak, a slow growing tree that is difficult to regenerate. Reducing its use as firewood has greatly benefited this species. In the hamam, dry, fallen pine needles and cones can be used and where these are collected, the risk of forest fires is reduced, especially around areas of housing. Additionally, the use of LPG leads to an almost smoke-free environment in kitchens with the associated obvious health benefits, which especially affect women and girls.

## SUSTAINABILITY

The main indicator for sustainability is the fact that the project has survived for three years beyond its initial funding phase, which was from 2001 to 2004. Not a single woman member has, so far, discontinued the use of LPG. The hamam initiative was introduced after this initial funding period.

These cooking devices free up to 5 or 6 hours per day for the women. The daily trips to the forest are reduced to between 1 and 4 trips per week. Heating 25 litres water in the hamam needs 2 kg of agricultural waste/twigs compared to between 10 kg and 12 kg of fuelwood. The time saved helps women generate income to pay for LPG, the use of which frees up more time as well as greatly reducing the effort of gathering firewood.

## TECHNOLOGY

Until now (June 2007) 383 LPG connections, 207 pressure cookers and 362 hamams have been distributed. The enthusiastic response from the women and their willingness to share the costs has helped Jagriti to expand and

strengthen the drudgery reduction initiative over the years.

## FINANCIAL ISSUES

While there is an initial inducement of subsidy, its proportion is gradually reduced with a lower subsidy for the hamam (20 percent of the costs) than for the LPG (40 percent). As women members save and earn more, their willingness to pay increases, as observed in the case of the hamams, where members bear 80 percent of the cost. In total, the LPG package, the pressure cookers and the hamams cost the women Rs 2200 (EUR 43) (with the level of subsidy being Rs 1200 (EUR 23)).

In addition, women members are gradually, but consistently, accumulating savings. Intra-loaning within groups and the income from small enterprises set up to produce and market products such as milk and cheese, vermi-compost or honey have further added to the groups' bank balances. Even small improvements in their economic status make women more enthusiastic about group activities and learning new skills.

## OBSTACLES

The high initial costs of LPG were a big barrier to its adoption by the poorer households that were targeted by the project. Negotiating with stove manufacturers to offer lower price on bulk buying, with LPG dealers to lower security deposit for the LPG cylinder, to waive charges on items such as tubes and to provide free igniters reduced the costs.

Concerns that were raised by the women about the possibility of gas cylinders or pressure cookers exploding had to be overcome by demonstration. It was also difficult to convince women that using LPG was actually cheaper than

other fuels including firewood once the cost of collection was taken into account. Eventually, persuading a few women to use LPG and share their experiences proved more convincing than presenting calculations. Once a few women in a group began to use LPG and share positive feedback, the demand surged.



Photo: Jagriti

## REPLICABILITY

Across the mountain region of Himachal Pradesh, the geo-physical and socio-cultural format is similar. Women form the backbone of its rain-fed, agro-pastoral economy. Mountain women everywhere are overburdened with daily chores and, therefore, the possibility of less strenuous work and greater social mobility is instantly appealing. In that sense the drudgery reduction initiatives of Jagriti are suitable for replicability.

## CONTACT

**Jagriti**  
Ms Mamta Chandar  
e-mail: [mamta@jagritikullu.org](mailto:mamta@jagritikullu.org)  
URL: [www.jagritikullu.org](http://www.jagritikullu.org)



## IRRIGATION DRIVEN BY RENEWABLE ENERGY– EFFICIENT TECHNOLOGIES FOR PROMOTING RURAL DEVELOPMENT AND ENTREPRENEURSHIP

### Location:

Brazil

### Project's Aim:

To support rural development and entrepreneurship by increasing agricultural production through an efficient irrigation system driven by renewable energy

### Technical Answer:

Use of photovoltaic and bio diesel water pumps to improve local irrigation systems

### Project's Duration:

June 2003 – December 2008



Photo: D. Cesano – Agents of Water Citizenship in Valente, being disseminators of PV pumps and good practice in water management.

The semi arid north-eastern region of Brazil is severely under-served by water irrigation systems. In addition, it is affected by periodic droughts. Therefore, local farmers are confronted with serious problems relating to water availability and effective irrigation. Until now, traditional irrigation techniques such as trenches and inundation have proved inefficient, leaving farmers to survive at subsistence level. Although artificial ponds are present, this water is rarely used due to a lack of high yield pumping systems. By improving irrigation, agricultural production will increase significantly enabling the farmers to sell surplus at local markets.

REDEH, SouthSouthNorth and Ambiente Italia together with CO2nnect in collaboration with La Guardia Foundation and Econengenho Institute aimed to develop a fully replicable model that addressed issues of technical, social, economical and ecological sustainability and replicability. The project consisted of two phases. While strategies concentrating on awareness raising and capacity building were the main focus of the first phase, the second phase was dominated by the implementation of 5 pilot projects.

In total 3 pumps were installed, one PV pump serving 1 family farmer and 1 bio diesel pump serving 4 family farmers. These pumps have been connected directly to small-scale drip irrigation systems of 500 m<sup>2</sup> to 1000 m<sup>2</sup> aiming at increasing local agricultural production. The progress was monitored in relation to social, technical, economical and environmental factors that could influence the project's success and opportunities for replication in the region.

### BENEFITS

The project, which is based on the sharing of experiences and mutual learning among farmers, has increased cohesion within the community thereby enhancing agricultural output, raising employment levels and improving technical skills. It is expected to increase job efficiency as working hours under the new system have been halved. As a consequence, these increased benefits of agriculture offer new opportunities to the local youth with the result that they are less likely to move away to urban areas in search of employment.



## SUSTAINABILITY

By using the best technological option in terms of price and quality, the technological sustainability of the project has been assured through the establishment of a commercial partnership with national technology providers. This will also be relevant for the replication phase. The technical partners of the project have provided a user's manual for implementation and maintenance, which will include also lessons learnt, and that enables the farmers to manage the irrigation system themselves. This ensures that the project will continue after the pilot phase. It is predicted that the project will be a success, as the level of interest among the farmers is already high and still on the increase.

## TECHNOLOGY

Either a PV or a bio diesel water pump supplies a drip irrigation system. The advantage of the bio diesel water pump is that it can be shared among users and the investment costs are lower compared to a PV water pump, which is difficult to move and, therefore, remains in a fixed place. For these reasons the PV system is used preferably in situations where a single farmer has limited access to agricultural fields (an area of less than 2,000 m<sup>2</sup>) and no access to electricity.



Photo: D. Cesano – Increase in agricultural productivity after the use of irrigation in Pintadas.

## FINANCIAL ISSUES

The cost of the project and the payback time depends on several factors such as size, type of culture, capacity of the farmer to master the technology and maintenance. For a 500 m<sup>2</sup> drip irrigation system driven by a bio diesel water pump the costs are around EUR 500, while the same system driven by a PV water pump costs between EUR 1,100 to EUR 1,850, leading to payback times of 3 to 7 years. With an estimated income of about EUR 200 to EUR 500 from the sale of beans, and considering that part of the income needs to be used for the farmers themselves, the development of a micro credit scheme over a period of 3 to 7 years seems possible. The use of high value cultures such as spices could decrease the payback time to 2–3 years, always depending on the local social, technical and environmental conditions.

## OBSTACLES

During the implementation process several obstacles were evident. The most important challenge was to find a technical solution at a cost of less than EUR 3,000 per integrated system to include the drip irrigation and the water pump driven by renewable energy. This upper limit was necessary in order to take advantage of a micro credit scheme. Furthermore, the identification of appropriate technology partners presented a challenge. Access to a local market and the option to sell products with a certain threshold to limit the pay back time is also mandatory for the project's success if subsidies are not available.

## REPLICABILITY

The project can be fully implemented in areas where agriculture is still under development and no irrigation technique is applied. The willingness of the farmers and the community to collaborate concerning micro credits, as well as access to a local market where the surplus can be sold, are also important factors. On a technical level, the farmers should have



Photo: D. Cesano – Tonho, one of the beneficiaries of drip irrigation systems and bio diesel water pumps in Pintadas.

access to at least 1000 m<sup>3</sup> of water per year for irrigation. This amount includes precipitation. Additionally, it is important that the quality of the water is good enough to avoid clogging in order to keep maintenance costs low.

## CONTACT

### CO2nnect / REDEH

Mr Daniele Cesano; Mrs Thais Corral  
e-mail: [daniele@co2nnect.com](mailto:daniele@co2nnect.com);  
[thaisc@redeh.org.br](mailto:thaisc@redeh.org.br)  
URL: [www.co2nnect.com](http://www.co2nnect.com);  
[www.redeh.org.br](http://www.redeh.org.br); [www.southsouth-north.org](http://www.southsouth-north.org); [www.ambienteitalia.it](http://www.ambienteitalia.it)



## NEXT PREP TOPIC: SOLAR COOLING – USING THE SUN FOR CLIMATISATION

The forthcoming **PREP** brochure will mirror the stated objectives of previous issues, namely to collect, evaluate and promote good practice examples, and will highlight the issue of 'Solar Cooling'.

### BACKGROUND

In recent years, the number of record-breaking hot summer days, especially in those regions with a usually moderate climate, has been increasing. This has led to a growing demand for climatisation in, for example, the workplace, and more and more office buildings are already being fitted with air-conditioning systems. In many countries air conditioning is, however, one of the highest energy consuming services in buildings.

Conventional cooling technologies are generally based on electrically driven refrigerating machines. These have several disadvantages: they lead to high levels of primary energy consumption, cause high and expensive electricity peak loads and usually employ refrigerants with negative environmental impacts. This is where solar cooling comes into play. The sun, while heating up buildings, also delivers the energy to cool them. The major attraction of this system is that the hottest days have the greatest need for cooling and, simultaneously, offer the maximum possible solar energy gain.

Solar cooling systems have the advantage of using harmless working fluids such as water or solutions of certain salts; they are environmentally safe. Additionally, they can lead to huge energy savings in primary energy of between 40 percent and 60 percent in chilled water systems. This, in turn, also reduces the pressure on electricity grids, which can sometimes reach their capacity limit on hot days.

In principle, two different alternative cooling technologies are available: closed cooling systems (absorption and adsorption) and open systems for dehumidification and/or cooling (desiccant cooling). In addition to using solar energy, both systems can also use waste heat from, for example, combined heat and power plants to power or regenerate the system. Closed cooling systems are based on the thermo-chemical process of sorption. A liquid or gaseous substance is either attached to a solid, porous material (adsorption) or is taken in by a liquid or solid material (absorption).



Photo: photocase.de: pluss

### FIELDS OF INTEREST INCLUDE:

Implemented projects that use solar cooling systems applying

- adsorption, absorption or desiccant systems in
- office buildings, public buildings, hotels, factories, hospitals etc.

Photo Background: photocase.de: Matrikz

Desiccant systems, on the other hand, reduce the humidity, which means that the air only seems to be cooler, yet comfort levels are significantly increased. Therefore, desiccant systems are often used in combination with evaporative cooling.

Although a large potential market for solar cooling exists, the current high investment costs present a significant barrier to broad implementation. Compared to conventional cooling systems, the upfront costs are around 2 to 2.5 times higher and, additionally, the overall annual costs of solar cooling systems are still between 1.2 and 1.5 times more than conventional systems. So far, larger cooling systems have been successfully put into operation; however, smaller systems for household use are still under development. Currently, there are about 120 of the larger installations in Europe.

However, despite the cost factors, it is accepted that there is great potential for solar cooling due to the basic benefits that it offers. Additionally, greater standardisation will, in time, result in cost reduction. In this context, **WISIONS** is looking for projects in which solar assisted cooling systems have already been implemented and invites the submission of examples of good practice.

## SEPS – SUSTAINABLE ENERGY PROJECT SUPPORT

Realistic concepts and visions of effective sustainable energy projects do exist, but the much needed implementation sometimes fails. **SEPS** – the related field of action that **WISIONS** undertakes in addition to **PREP** – aims to bridge this gap.

The key objective of **SEPS** is to identify projects with the real potential to be of strategic importance in the renewable and efficient use of energy. By providing technical and other forms of support, **SEPS** seeks to overcome existing barriers and will help clean and efficient energy become commonplace.

The most promising renewable and energy efficiency concepts are selected using transparent analysis based on internationally recognised criteria. The selection process is carried out via an annual call for applications. Once a project is selected, **SEPS** can provide additional guidance and support, for example:

- potential financial support to assist with project implementation
- practical expert advice and knowledge transfer for effective implementation
- promotion to relevant institutions, decision makers and scientists
- publication on [www.wisions.net](http://www.wisions.net)

### EXAMPLES OF SUPPORTED SEPS PROJECTS

#### Rural microenterprise model for biofuel extraction in India

The Integrated Research and Action for Development, India (IRADE), will demonstrate a business model for production and commercialisation of biofuels at village level. The project takes place in three neighbouring villages of the Haryana state and comprises the extraction of straight vegetable oil from Jathropa seeds and its commercialisation in the



Photo: IRADE

region, mainly for stationary applications. Capacity building activities will be performed in order that the villagers conform and manage their own biofuel micro-enterprise. If successful, the project will trigger the development of decentralized biofuel extraction business as in rural areas of India and improve welfare of villagers. The project started in February 2006.

#### Cameroon Sustainable Sun Bakeries Program

The Cameroon Sustainable Sun Bakeries Program will establish, equip, train, and implement self-sustaining bakery enterprises. Each bakery will employ 7–10 women to prepare, bake, sell, and deliver goods. This project by UNEP Centre on Sustainable Consumption and Production addresses the need for locally produced, fresh bread for reduced consumer price, provides employment and protects local forests. By installing a revolving fund with a proportion of revenues being reinvested into new bakeries, financial sustainability is ensured. The project started in March 2007.

### CRITERIA FOR OBTAINING SEPS SUPPORT

**SEPS** has a set of criteria used in selecting appropriate sustainable projects and relevant forms of support. The following

5 criteria are obligatory:

- technical viability of the project
- economic feasibility
- local and global environmental benefits
- marketability and replication possibilities
- implementation strategy

As the goal of sustainable development requires an integrated approach, additional criteria are also applicable, like:

- social aspects
- inclusion of local population/structures
- employment potential
- cooperation with other stakeholders

### SO FAR...

In the first three years **SEPS** has launched three rounds to find innovative and promising projects to support. We received more than 200 applications from all around the world showing high quality, good concepts and motivation, but also the need for additional promotion.

The project proposals demonstrate a wide range of ideas: from the use of solar energy for food conservation in developing countries to energy efficient lighting in Europe. So far, twenty-five projects have been selected for financial support covering a broad array of innovative sustainable energy solutions in more than 16 countries. In order to contribute to the implementation of more intelligent energy projects, **WISIONS** makes an annual call each spring for **SEPS** applications.

Further information about **SEPS** can be found on [www.wisions.net/pages/SEPS.htm](http://www.wisions.net/pages/SEPS.htm)

## CONTACT US:

More information about **WISIONS**, application criteria for **PREP** and **SEPS**, as well as prior **PREP**-issues are available at

[www.wisions.net](http://www.wisions.net)

Wuppertal Institute  
for Climate, Environment and Energy  
Doeppersberg 19  
42103 Wuppertal  
Germany

e-mail: [info@wisions.net](mailto:info@wisions.net)  
Phone: + 49 (0) 202 . 24 92 252



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## PRIOR ISSUES

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- 2 II. Issue 2004 Water and Energy – Precious Resources
- 3 I. Issue 2005 Sustainable Transport – Solutions for Growing Demand
- 4 II. Issue 2005 Sustainable Tourism – Combining Holidays with Local Needs
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