

COMMUNITY BASED RURAL ENERGY DEVELOPMENT IN NEPAL: EXPERIENCES AND LESSONS FROM INNOVATIVE APPROACHES

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ABSTRACT

This paper presents the two innovative approaches to effectively addressing the rural energy needs in remote mountain areas. The first part of the paper deals with the approaches, impacts and lessons from REDP experiences while the second part deals with the lesson from ICIMOD project experience with women energy and water in the Himalayas. The paper concludes that energy becomes an instrument for the eradication of poverty only when it is properly designed in a holistic way and directed deliberately toward the actual energy service needs of the poor while at the same time enhancing their capacity and empowerment to have voice in shaping their energy choice over which decisions are made.

BACKGROUND

Nepal is among the poorest countries in the world with nearly one-third of its population living below the poverty line. Agriculture is the mainstay of the economy, providing a livelihood for over 80% of the population and accounting for 41% of the GDP. The average annual per capita income of Nepalese is around US\$ 241 (*Asian Development Bank, 2004*). The average per capita energy consumption is one of the lowest at around 15 GJ per year. The source of energy is primarily biomass (~ 86% of the total energy consumption), of which almost 77% is met by firewood alone. More than 90% of the total consumed energy is used in residential sector alone and 86% of the total consumed energy is used in the rural areas. Almost 85% of the total Nepalese population resides in the rural areas (*10th Five Year Plan-National Planning Commission/ Government of Nepal, 2002*).

Despite the huge economically feasible hydro-power generation potential of 44,000 MW in the country, only around 600 MW has been harnessed so far. This has been able to supply electricity to around 33% of the total population in the country. Further, only 5% of the rural populace has access to electricity from grid (*10th Five Year Plan - National Planning Commission/Government of Nepal, 2002*). In this context, it is evident that for a foreseeable future extensive rural electrification from grid cannot be realized. Likewise, the significant change in rural household energy consumption pattern cannot be taken for granted. Evidence shows clearly that energy has a determinant influence on the Human Development Index (HDI), particularly in the early stages of development such that little increase in energy intake increases the HDI significantly in the least developed countries such as Nepal and vice versa.

Most conventional energy strategies fail to help meet basic human needs for the poor majorities in developing countries. Worldwide, 2.4 billion people still rely on traditional biomass for cooking and heating with over 1.6 million deaths (predominantly women and

children) annually attributable to biomass indoor air pollution (WHO, 2002). Clearly, a lack of access to energy services affects women and girls more profoundly than men given the traditional gender role of gathering and managing water and fuel for the family. This situation entrenches poverty, constrains the delivery of social services, limits opportunities for women, and erodes environmental sustainability at the local, national and global levels.

Conventional approaches to electrification, through a centralized power plant and power line distribution, cannot reach the poor residing in the dispersed rural mountain communities, where levels of demand are low and limited and the cost of providing energy is high. Although electricity has many benefits, it does not help address the cooking and heating energy need of most poor women in rural areas. This, together with the scale-sensitivity of hill and mountains due to their fragile nature, makes decentralized and integrated renewable energy options more viable.

If one is concerned about the well-being of women in the Himalayas and about reducing poverty and environmental degradation there, it seems natural to focus on interventions that empower women themselves to meet their energy and water needs in a way that frees them from excessive time and drudgery and allows them to increase their income and improve their status in society. However the numerous smaller scale technologies which women can take control of and manage themselves to meet their needs continue to largely remain overlooked in government planning and donor investments (Sharma and Banskota 2005). The nexus between women, energy, water, environment and poverty is still poorly understood and rarely treated in an integrated way. Finally, policy makers and planners continue to treat energy projects as gender neutral based on the assumption that energy bottlenecks and solutions impact men and women in similar ways¹. In most countries this does not reflect reality as men and women have different needs and they use and benefit from energy services differently.

RURAL ENERGY DEVELOPMENT PROGRAMME, REDP

The REDP was initiated on 16 August 1996 as a joint programme of Government of Nepal (GoN) and the United Nations Development Programme (UNDP) in five remote hill districts of Nepal. Alternate Energy Promotion Center (AEPC) of the Ministry of Environment, Science and Technology (MoEST) is the executing agency of the Programme. Based upon the successes, the programme was expanded to 10 districts in 1998 and 15 districts in 2000. At present the REDP is operational as the joint programme of GoN, UNDP and the World Bank in 25 districts which are remote, difficult and economically backward. Presently, works are underway at different stages to commission additional 100 MHPs with the total power out of 2,500 kW that would benefit around 200,000 more people from 30,000 households of far way settlements. The REDP activities are carried out in hill districts. The primary beneficiaries are the rural communities, with special considerations to vulnerable communities (VCs) like women, Dalits (the untouchables) and Indigenous People (IP). Main stakeholders include local bodies (District Development Committee - DDCs and Village Development Committees - VDCs), private sector organizations, government organizations, local NGOs, education institutes, international donors and other organizations working in the renewable energy sector.

¹ Gender-neutral policies are not specifically aimed at either men or women and are assumed to affect both sexes equally. However, they may actually be gender-blind.

REDP APPROACHES AND GUIDING PRINCIPLES

The approach adopted by the programme focuses on three pillars of sustainability - social, economical and environmental - through decentralized planning and implementation, holistic development, integrated promotion of rural energy technologies, multiple uses of natural resources and energy, coordination and synergetic collaboration. The foundation for all these is the *Community Mobilization* works.

COMMUNITY MOBILIZATION PROCESS

As the programme is designed putting the community at the centre, the community people, both men and women are the main stakeholder for their development. The community mobilization process with six basic principals commonly known as *Mul Mantras* is exercised at the grassroots level (Community Mobilization Guidelines-REDP, 1998) as highlighted in Box 1 (Vulnerable Community Development Plan Frameworks-REDP, 2004).

Box 1 Six basic principles of community mobilization under REDP

Organization Development: Creation and strengthening of broad based and self-governing organizations provide an institutional platform for the rural people to come together, nurture social capital, build awareness and initiate productive and community development activities enthusiastically. Upon maturity, community organisations(CO) join together to form functional group (FGs) to undertake specific activity such as the installation and operation of micro hydro schemes and management of community forestry.

Skill Enhancement: Each household is motivated and encouraged to engage in at least one income generating activity for making them able not only to pay for electricity but also to meet other household needs. For this required skills are imparted to the participating members for enhancing their capacities to maximize the benefits.

Capital Formation: REDP has recognized capital formation at the local level as one of its basic thrust for breaking the vicious circle of poverty. Capital is developed through the mobilization of internal and external resources. Saving and credit among the community members have proved to be appropriate mechanism to mobilize the local fund for productive uses. Each CO member deposits a fixed amount in weekly CO meeting which is then loaned to the members for funding their consumptive as well as economic needs.

Technology Promotion: Emphasis is given to the technologies that are deemed necessary to increase productivity, reduce drudgery of women and help in conservation of the natural environment in the rural areas. Besides the installation of micro hydro schemes, efforts are being made to promote various other rural energy technologies (solar photovoltaic, biogas and improved cook stoves) including the promotion of technology oriented enterprises such as agro processing mill, rice huller, cereal grinder, oil expeller, battery charging system, water pumping, sawmill, furniture making, paper making, milk chilling etc.

Environment Management: Since the sustainable operation and management of a micro-hydro system depend on the watershed condition and proper management of natural resources, a range of activities are undertaken for the environment management of the programme VDCs. These include community forestry, tree plantation, land terracing, agro-forestry and other bio-engineering environment education to environmental health and sanitation, toilet construction, garbage pit making and drinking water schemes renovations.

Empowerment of vulnerable group: REDP has supported women by creating conducive environment to involve them at each stage of project cycles through the mandatory requirement of one female from each household in all initiatives implemented at community level. Women form separate COs that have enabled them to develop leadership and confidence among themselves without being relegated to passive “beneficiaries by handing over control to men. Furthermore, the community mobilization process requires equal representation of both male and female COs to form functional groups (FGs) thereby providing both men and women equal opportunity to participate in the development initiatives.

The four pillars or bases of the community mobilization are participation, transparency, consensus decision and inclusion. These bases call for people's involvement (community participation) in every stage of the development process, so that community would be more productive and capable in decision making, implementation, benefit sharing and self-evaluation. This ensures efficiency and efficient use of resources, equity, sustainability and empowerment – the four essential pillars of human development.

REDP community mobilization, thus, is a multi-dimensional phenomenon and it:

- encourages local people, both males and females, to form community organizations,
- makes people aware about the importance of social capital to initiate development work through self-help approach,
- raises awareness among community members about the adverse consequences of the unsustainable use of energy systems,
- mobilizes community resources and skills to undertake micro-hydro schemes and other community development initiatives,
- enhances skill and capability of community organizations and functional groups to manage and utilise energy resources for various socio-economic activities, and
- promotes self-governance by empowering the local community through resource mobilization and human resource development.

Experiences have shown that these principles are highly effective in developing strong social capital among community members to undertake different development initiatives both individually and collectively.

The REDP community mobilization requires the participation of 99 percent of beneficiary households in the community. From each household, participation of one male and one female in the grass root institution (CO) formation and decision making process is mandatory. The size of the CO ranges from 15-25 members depending up on the size of the settlement. The CO will be formed on the basis of gender, settlement, ethnicity, economic condition, common interest, and others that would help to be CO sustainable. Bases such as settlement, ethnicity, and common interest will ensure the inclusion of IPs and Dalits in community mobilization. There is also a mandatory clause that each settlement must have at least two COs, one for male and one for female COs, which ensures the gender equality in community mobilization. Each CO will have a Chairperson and Manager nominated by the members on consensus decision. After maturity of the COs (such as conducting weekly meeting, decision making on community development initiatives, keeping records of the decisions, implementation of the minute decisions, saving, investment to the needy people etc), functional group is formed according to common needs, priorities and willingness to fulfil those needs through collective group actions. Functional Group (FG) is executed through the Working Committee (WC) which is represented by all beneficiaries COs. (REDP's Community Mobilization Manual, December 1997 rev. 2005)

The REDP supports for the capacity building in order to make the community people aware and capable to implement various activities related to the organisation development, income generation and natural resources management. The supports include orientation, training, exposure visits and workshops and seminars. The villagers are trained to develop as MH

operator, MH manager and repair maintenance technicians. The REDP takes necessary actions in establishing the Rural Energy Service Centres in all its programme districts keeping in view the feasibility for such establishments. The REDP also supports these RESCs financially by providing soft loans through the District Energy Funds (DEF) to improve/upgrade their physical infrastructure and well equip the workshop. The established RESCs have been well functioning and quite instrumental in providing the much needed repair and maintenance services to the already established RETs and energy based end-use appliances.

MAJOR ACHIEVEMENTS AND IMPACTS

The REDP has a well-grounded and strong institutional mechanism from the central level to the grass-root community level. The participatory approach has been adopted as a basic principle of the programme implementation. The community mobilization is the backbone of the programme implementation that requires the participation and involvement of 99 per cent households in the target community. This principle automatically ensures the inclusion of all households including that of the Dalits, IPs and ethnic groups residing in the community. Field based data indicates nearly a 100% participation of households in the programme in the communities.

The REDP has had a successful history in mobilization of equal number of males and females at the community level particularly since gender balance is ensured through the mandatory mobilization of one man and one woman from each household in the targeted community. This gender-balanced participation is achieved not only in the COs, but also in leadership positions in the FGs. This gender mainstreaming approach can be considered as one of the key factors for the REDP's impressive successes.

The community based micro hydro system is a demand-driven project of people living within the community. The community is selected based on the requests from the community people following the decentralized and bottom up planning process followed through VDC and DDC. The request has to be supported by the technical feasibility with commitment and willingness of the people to fund, implement and manage the proposed MH scheme. This ensures the ownership and timely execution of the project.

As of September 2006, a total of 165 MHSs have been installed, which generate 2083.2 kW of electricity. This figure represents about 25 per cent of the total installation in Nepal. Approximately a population of 200,000 from remote locations have benefited for accessing electricity from these MHSs. It is a great achievement in the national context, where only about 5% of the rural people have access to the electricity from the national grid. ***REDP is the single such organization***, which has installed so many micro hydro projects generating 2083.2 kW in Nepal.

Other achievements are listed below:

- 3,980 toilet attached biogas plants have been constructed
- 1,945 solar home PV systems have been installed

- ❑ 9,586 smokeless improved cooking stoves including 270 institutional improved cooking stoves (in schools with the support of World Food Programme for school feeding programme) have been constructed
- ❑ Community people have undertaken plantation of 2,752,948 trees, carried out construction/renovation of 431 ponds/taps and completed construction/expansion of 728 km of rural roads/trails.

RECOGNITIONS/AWARDS

- ❑ REDP has been successful to bag many national and international awards. Some of these include Energy Globe Award 2000 - Austria, Global 100 Eco-Tech Awards - Japan in 2005 and Pearl of Knowledge Award, 2005 – UNDP Regional Bureau in Thailand.
- ❑ The experience is highlighted by UNDP, New York on its publication: EXPANDING access to modern energy services in May 2006.
- ❑ The MHPs promoted by REDP (along with those promoted by AEPC) are being currently developed as Clean Development Mechanism (CDM) projects to obtain carbon revenue.

RURAL ENERGY POLICY MAINSTREAMING

- ❑ The programme has supported GoN for the formulation of National Rural Energy Policy (which is in the offing) based on lessons learned at all levels – community, district and centre. The Rural Energy Policy is recently passed (September 2006) by the GoN.
- ❑ GoN has incorporated the lessons learned while formulating rural energy plan in the Tenth Five Year Plan (2002-2007).

LINKING REDP IMPACTS TO MDGS

Although REDP (1996) came before the MDGs (2000), a study **was** carried out by Winrock International to undertake comparative analysis of changes before and after REDP intervention and assess its contribution to Millennium Development Goals (MDGs). The study has shown how the holistic approach of REDP rooted in six basic principles have clear linkages to a number of MDGs. Some of its notable contributions to MDGs are highlighted below:

MDG: 1. Poverty Reduction

- Average HH's annual income increased from Rs 48,000 to Rs 73,000.
- Percentage of HHs below Rs 50,000 annual income decreased from 59% to 54%.
- People below Rs 10,000 annual income reduced from 15% to 12%

MDG: 2 Primary Educations

- People of age group between 6 to 14 years without primary level education dropped from 25% to 7%.
- Average Boys/Girls ratio of school enrolment changed from 1.20 to 1.13.
- Drop out rate seems little higher for boys than girls. But, the drop outs only because of domestic problem are very small and in the decreasing trend.
- FGDs view was that boys and girls are equally sent to School

- About 90% of the respondents agree that the educational status of the villages has improved because of REDP activities.

MDG: 3 Gender Equity and Women Empowerment

- The average distance to be traveled decreased from nearly 400 M to 175 M.
- In overall, men and women are almost equally involved in HH work.
- In indoor work, women's are more involved than men.
- In agricultural work, men are found slightly more engaged.
- There is reduction in working hours for the works such as 'Firewood collection' and agro processing' for both men and women.
- Men's participation has significantly improved in works: 'Cleaning' and 'Agro-processing', and even in 'Cooking'.
- Social involvement of both men and women significantly increased (almost doubled).
- Active participation of women covers 48% of total participants

MDG: 4 Reduce Child Mortality

- Mortality rates of Child and Mother are considerably decreased.
- More diseases are found after REDP programme
- Toilet users increased from 40% to 70%.
- Access of tap water supply increased from 58% to 82%.

MDG: 7 Ensure Environmental Sustainability

- MHP activities have very significantly reduced the use of kerosene.
- Firewood consumption has also reduced.
- FGD responds that REDP activities have helped to increase biogas and ICS installation. REDP has contributed for installation of 932 biogas plants and about 1300 ICS in these 20 project sites.
- 64% of villagers said that REDP role played significant role in reducing firewood demand.
- Trend of firewood collection from Private forest (7% to 11%) has increased.
- Community peoples both men and women have experienced more greenery in their localities (based on FGD).

LESSONS LEARNED

The best option to improve access to modern and sustainable energy service in rural areas is the promotion of decentralized and integrated rural energy systems that are relatively cheaper, environmentally friendly, and easy to operate and manage by local people. The best approach to harness people's potential to develop rural energy systems is the provision of self governing institutional mechanism for inclusive participation and empowerment based on the transparent and consensus decision making process. The community mobilization is the key to build their capacity, motivate and encourage community members, both men and women, for equal participation in the development process. Local people are capable to implement and manage rural energy systems with guidance and capacity building. Decentralized institutional frameworks and operational modalities are required for wide scale promotion of Rural Energy Systems

The sustainability of rural energy systems, specifically the micro hydro depends very much on how well it is integrated with rural economy in the spirit of holistic development approach. The holistic development is however a gradual process and depends fully on the participation and capacity building of community members to plan, implement, manage and maintain the rural energy systems for sustainable operation and management of rural energy systems. Such an approach is instrumental to develop capability of the villagers to pay -for the electricity by undertaking various economic activities and increasing the productivity of the energy generated.

While the promotion of various rural energy technologies is a must to fulfil actual energy service needs of the villagers, energy provision is not technology provision which should remain open and driven by the development needs. Put differently the pertinent question is not merely which technologies best serve the needs of end users but rather more importantly how to enable /empower people through community mobilization process to choose which options meet their needs in order to escape them from various manifestation of poverty and hence improve their livelihood.

Rural energy is an effective entry point for reducing poverty and promoting sustainable development. Experience from REDP and elsewhere in the region shows that provision of energy service can make a significant difference in meeting the development challenge including the MDGs at the local level. Rural Energy Systems bring positive benefits such as better light, reduced labour and drudgery, increased income, improved environment, better education, better health, value addition, social harmony.

Liberating rural women from the vicious cycle of time and drudgery poverty through the provision drudgery reducing and income enhancing technology can be a powerful entry point for enlisting their participation in any forms of development so vital for improving their livelihood. This is Women throughout rural mountain areas are so heavily burdened by virtue of their traditional gender role of gathering fuel and water from diminishing resource base that they simple have no time to participate in development activities. The participation of women is high in the development of rural energy systems as these technologies benefit rural women more by relieving them from drudgery, tedious working hours-and indoor air pollution and allowing them to harness the productive use of saved time for improving their livelihood.

WOMEN, ENERGY AND WATER IN THE HIMALAYAS: ICIMOD EXPERIENCES

Women's lives are intimately connected to and affected by water and energy resources because of their central role as primary collectors, users and managers of these resources for households use. Across the Himalayan region, rural women continue to face the daily struggle to collect fuel wood and water from diminishing forest and drying water springs to meet the energy and water needs of their family, leaving very little time to spend on income generating activities and other more productive work. With the spread of new interventions women seem to lose control over it, in many instances and burden on women and often their children is further increasing in the hills and mountain areas due to male out-migration. Without reducing women's time spent in water and energy collection and management, involving them in new livelihood opportunities is almost impossible. Most of the past interventions on energy and

water have however failed to consider women as active partners in development and decision making process and as a result they continue to be marginalized and left out from mainstream decision-making processes. Experience shows that exclusion of women from decision making have led to failure of many poverty alleviation programme in the region.

Realizing this gap, the ICIMOD executed a two year project titled “Capacity Building of Women for Energy and Water Management in the Rural Areas of the Himalayas” on a pilot basis in three Himalayan countries of India, Nepal and Bhutan with support from UNEP and SIDA. Implementation took a "learning by doing approach" based around participatory action research. Women were placed at the forefront for the dissemination of technological options that catered to their needs. Gender analysis was conducted to identify and prioritize most significant technological interventions to address women's needs. Technology manuals were prepared in national languages to train selected women as trainers during the training of trainer (TOT) workshop. Environmentally friendly, pro-poor and drudgery reducing technologies (such as improved cook stove, solar drier, solar lantern, pressure cooker, LPG, rainwater harvesting tank, infiltration well technology, recharging traditional spring, sprinkler and drip irrigation etc) were tested and promoted along with range of activities centred on integrating women in decision making and building their individual and organizational ability to manage and prioritize household energy and water initiatives. Enabling support mechanism was created by providing seed money to carry out demonstrations for the purchase of promoted technologies and to create a revolving fund for supporting credit needs of women for income generating activities..

In less than two years, the project has made differences in the lives of women, their families and their communities by reducing poverty. It has demonstrated how empowerment led and women centric water and energy initiatives can make a significant difference in meeting MDGs (Table1).

A few simple, proven and cost effective technologies have shown substantial multiple impacts (saving in time & fuel, drudgery reduction, improved health, education of children, productive use of saved time, empowerment) in the lives of women. Time savings and reduction of drudgery (practical need) among participating women are indeed valuable impacts in their own right making it possible for women to participate in new livelihood opportunities (productive need). Additionally strategic needs are addressed by local organizational capacity building processes and technologies that empower women to choose their own technologies and to improve their standing in society. Women have emerged as energy entrepreneurs and leaders for example in running LPG depot (Bhutan), technology demonstration village (Nepal) and production and selling of solar dryer (Bhutan) and ICS (Nepal). A technology demonstration village (TDV) operated by women group in Nepal has been a fairly effective model for speeding up the technology transfer in non project areas.

The project in Nepal has been selected internationally as one of the good practice example by the Wuppertal Institute for Climate, Environment and Energy (www.wisions.net) using a number of internationally accepted criteria of good practice such as promising approach and modalities, simple, proven and cost effective technologies, multiple benefits generated and sustainability and replicability. Another notable achievement of this project is that the

mainstreaming a good practice at the district or national level is already happening. District Development Committee- Dhankuta has replicated the project in Vedetar VDC. Many more VDCs have approached the DDC to also implement the program in their VDCs.

The project concludes that the pertinent question is not merely, which technologies best serve the needs of women, but more importantly how to enable/empower women to choose which options meet their needs in order to improve their livelihood. The experiences and lessons learned from this project has been encapsulated in three publications (policy guidelines, training manual and project learning) and a DVD film.

CONCLUSIONS

The REDP has successfully demonstrated the ways and means of using rural energy systems that are economically, socially and environmentally sustainable thereby providing energy service as a vehicle for meeting the development challenges (poverty alleviation) including the MDGs. It has emerged as one of the widely cited innovative programmes for the development of rural energy system to address the development challenge in the rural areas. The programme has made a remarkable contribution in enhancing the livelihoods of the rural people.

The formation of self governing broad based Community Organisations and Functional Groups have brought about the positive changes in the social behavior and attitudes of the community. The changed behavior and attitudes have further helped in developing social cohesiveness among the villagers to act in an organized way for individual development as well as the development of the community as a whole. Formation of separate COs for male and female has provided equal opportunity to participate in the decision making process. Since there is inclusion of all households regardless of cast, creed, income, religion, political belief etc., it is not just electrification but the entire community mobilization process that has ensured the equal benefit sharing and equal right of access to resources in the communities for an inclusive rural electrification. The approach and modality adopted by the programme has empowered the rural people living in the remote areas to have a voice in sharing their choices over which decision are made.

The programme activities and outputs have been highly successful towards mainstreaming policy and institutions needed to promote rural energy systems for sustainable development and poverty alleviation, and implementing downstream activities concentrating on integrated and holistic energy led solutions addressing social, economic and environmental objectives for enhancement of rural livelihoods and human development.

ICIMOD experience shows that targeted initiatives focusing specifically on women and offering them bundle of services and multiple technologies using an integrated rural energy planning approach are critically important for enhancing the capacity of women upto a threshold beyond which mainstreaming strategy for achieving the goal of gender equality can be effective.

The demonstrated success of these two good practice examples can go a long way in reducing poverty and meeting the development challenge in remote rural areas. Policy makers and rural development practitioners active in the Himalaya region can immediately take these experiences, adapt them to their needs and replicate them and scale them up.

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Annex: 1

Table 1: Linking Women, Water and Energy Project Impacts at the micro level to the Millennium Development Goals (MDGs)

Goal	Targets	Linking Project Impacts to MDGs
Goal 1: Eradicate extreme poverty and hunger	<p>Target 1: Reduce by half the proportion of people living on less than a dollar a day</p> <p>Target 2: Reduce by half the proportion of people who suffer from hunger</p>	<ul style="list-style-type: none"> • After adoption of water and energy related technologies women are able to save several hours they spend on collecting water and fuel wood. The time saved is utilized for income generating activities to increase income and improve family well-being • Use of new technologies improves farm productivity, diversifies rural income and improve household income and nutrition of family members
Goal 2: Achieve universal primary education	Target 3: Ensure that all boys and girls complete a full course of	<ul style="list-style-type: none"> • Access to efficient fuels and technologies frees up children's time specially girls who are unable to attend school to help with fetching wood, collecting water and other domestic chores. • Income generated through use of improved water and

	primary schooling	<p>energy technologies is used for children education and well being</p> <ul style="list-style-type: none"> • Solar lanterns permits children to study at night in less smoky environment (due to ICS)
Goal 3: Promote gender equality and empower women	Target 4: Eliminate gender disparity in education	<ul style="list-style-type: none"> • Decentralized water and energy system reduces time and burden of fetching water and fuel wood thereby enabling women and girls to use the time saved on education (adult literacy and schooling) and other income earning activities (economic empowerment) • Solar lanterns permits women to use time productively even at night • Women's individualised (e.g adult literacy and training) and collective organizational capacity enhances their self esteem and self confidence to address their strategic needs –(social empowerment), which in turn has strengthened women's decision making role at the household and community levels • Mobilization of financial resources has allowed women to participate in community development activities
Goal 4: Reduce child mortality	Target 5: Reduce by two thirds the mortality rate among children under five	<ul style="list-style-type: none"> • Reduction of indoor air pollution and water borne diseases though the use of smokeless ICS and clean water reduces exposure to diseases and improves child health • Women have more time for child care as they spend less time on water and energy activities • Education helps to increase awareness on health, hygiene and sanitation issues
Goal 5: Improve maternal health	Target 6: Reduce by three quarters the maternal mortality ratio	<ul style="list-style-type: none"> • Reduction of excessive workload and drudgery associated with carrying heavy loads of fuel wood and water have positive implications on women's health • Arduous and repetitive food processing tasks and cooking in smoky environment improve women's health and well-being • Empowerment and increased incomes enhances awareness and access to health facilities
Goal 7: Ensure environmental sustainability	<p>Target 9: Reverse loss of environmental resources</p> <p>Target 10: Reduce by half the proportion of people without sustainable access to safe drinking water</p>	<ul style="list-style-type: none"> • Rainwater harvesting through micro reservoirs recharges traditional water springs • Plantation ensures slope stability and retards soil erosion • Adoption of social fencing by women to control livestock grazing promotes healthy growth of trees and ground cover and promotes carbon sequestration and other environmental services • Availability of cleaner fuels and energy-efficient technologies reduces demand for fuel wood, increases availability of dung and agricultural wastes for fertilizer, and reduces air pollution and greenhouse gas emissions

