

Institute for Financial Management and Research

Centre for Development Finance

Working Paper Series

December, 2008

Bringing Clean Energy to Rural India:

A Case Study of the Bagepalli CDM Biogas Project.

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The author extends a special thanks to Mr. Ram Esteves, founder of the Agricultural Development and Training Society (ADATS) for sharing his field experiences. His invaluable knowledge about the local communities' helped immensely in providing valuable inputs for the paper

The views expressed in this note are entirely those of the author and should not be attributed to the Institutions with which he is associated.

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Keywords

Clean development mechanism; biogas digesters; project monitoring; NGO; small scale projects; community; bottom-up approach.

Abstract

In many of the contemporary CDM projects, we see that community development is simply an afterthought, if it is indeed considered at all. By contrast, the Bagepalli biogas CDM project is an example of a grassroots level project resulting in tangible benefits for the rural community. The project has benefited 5500 poor households in the Kolar district of Karnataka. The key to the success of this project has been the active involvement of the local community.

In the following case study, we focus on the sustainable development and community involvement aspects of the Bagepalli Biogas CDM project. The paper also studies and analyzes various NGO models of involvement in CDM projects and it tries to identify the keys to scaling up a NGO promoted CDM project by briefly comparing the Bagepalli project with the Nepal Biogas support program.

The Bagepalli project started in the year 2005, initiated by Anandi Sharan from Women for Sustainable Development, a Bangalore-based NGO. Ms. Sharan and Ram Esteves from the Agricultural Development and Training Society (ADATS), an NGO based in Bagepalli, saw an opportunity to promote sustainable development in the drought-prone region of Kolar district by pioneering a biogas digester project. Their vision lay in a bottom up approach. As the local households were the primary stakeholders, all major decisions regarding the project came from them. A total of 5,500 families were selected to participate in the project, which was funded exclusively by the revenues generated by selling the emissions reductions.

ADATS has played an important role through building village level organizations known as the Coolie Sangha. These Coolie Sangha Units were instrumental in motivating villagers to participate in the project. The monitoring of the biogas units is done on a real-time basis. Specific trained personnel from the villages have been designated to ensure the proper functioning of the units. This was also one of the keys for the success of this project.

Introduction: Initiating a grassroots level movement in rural India

As one moves along the plush Bangalore-Hyderabad National Highway, after approximately three hours' ride from the new Bangalore airport at Devanahalli, comes the small panchayat town of Bagepalli in the Kolar district of Karnataka. Kolar is the easternmost district of Karnataka and is bounded by the states of Tamil Nadu and Andhra Pradesh. As this is a border region, the population is a mix from all the three states and one hears Telugu, Tamil, and Urdu being spoken, as well as Kannada. There is an abundance of livestock, which becomes evident as vehicles usually get stranded in herds of oxen and cows crossing the roads. The region is identified as the land of "silk, milk and gold," as the inhabitants' main sources of livelihood are agriculture, dairy, sericulture and floriculture. However, Kolar region is drought-prone, the major reason being that Kolar borders the Rayalseema desert belt where vegetation is very sparse. A visit to Bagepalli and surrounding villages demonstrates the difficulties of achieving sustainable development in an arid, drought-prone area.

It is in this district that a group of young people headed by Ram Esteves started the NGO Agricultural Development and Training Society (ADATS) in December 1977. ADATS adopted a participatory model of sustainable development, in which the NGO did not go to the people with any solutions; instead, the local communities sat down with the members of ADATS to determine the most suitable solutions to address their needs. It was through such an initiative that the Coolie Sangha was first formed. The Coolie Sangha is a membership-based people's organization created with ADATS' intervention, which consists mostly of poor and landless farmer families. In the early stages of its formation, the main issue faced by the Coolie Sangha was controlling the exploiters like landlords and middle peasants. After addressing this problem, the Coolie Sangha then shifted its focus to village development activities.

The Bagepalli biogas CDM project is a joint initiative of the local communities headed by the Coolie Sangha and ADATS, and conceived by Anandi Sharan from Women for Sustainable Development. The stakeholders saw this as a chance to promote development in the drought-prone region of Kolar district through pioneering a biogas plant¹ model.

¹<http://www.energyfarms.net/biogasdigesters>

One of the main reasons why Ram Esteves of ADATS believed in promoting the use of bio-digesters is that women in poor households are often neglected by traditional development projects. Development activities in rural belts often focus on electrification of villages, construction of roads, and other infrastructure projects, but Esteves wanted a project to directly benefit the poor women of the rural households. That was the driving force behind installing 5,500 bio digesters across needy households in the Kolar region. This benefited the women by reducing or eliminating the time spent collecting firewood, which they could then devote to other productive activities like agriculture. Furthermore, apart from ensuring cooking gas throughout the year, the project also helped in generating revenues which would directly go to the woman in the household.

The Bagepalli CDM biogas project

Background of the project

According to an UNDP report on Biomass Energy for Rural India (BERI)², India's rural population, in the order of around 700 million people or about 70% of the population use only 40% of total energy and 33% of generated power; however a major portion of that energy comes from kerosene for lighting and firewood and timber for cooking. These sources of energy have significant negative impacts, including adverse effects on health from pollution, GHG emissions and environmental degradation; thus alternative sources of energy are being sought to meet rural households' needs. Biogas production is one of the healthiest ways of disposing of waste, and the gas generated from the biogas digester is a means of addressing the energy scarcity present across poor segments in the society.

The Bagepalli CDM biogas project has installed biogas digesters of 2 m³ capacity for the households. Household cow or goat dung is used as raw material to feed the digester to produce biogas for cooking purposes. The overall aim of the project is to replace the commonly used inefficient wood-fired mud stoves with clean, sustainable and efficient biogas.

The biogas digester creates the ideal conditions for the bacteria to ferment the organic material in oxygen-free conditions digestion process create the ideal conditions for the bacteria to convert organic matter into biogas. This biogas is then used for cooking and other purposes.

² www.undp.org/gef/05/documents/writeups_doc/cc/India_BERI_biomass.doc

The project was registered on 10th December 2005 and was intended to start on 18th December 2005. However the biogas plants were functional only from 1st September 2006. The CDM Executive Board secretariat approved a change of date as applied in the original draft of the PDD and the crediting period was revised to 1st September 2006 – 31 August 2013.

Project Participants

The Bagepalli CDM biogas project enshrines the spirit of CDM—to promote sustainable development through financial flows generated by tradable emissions reductions. Credit for the implementation of the project is shared by several people, notably Anandi Sharan, who conceived the project and promoted it during its initial stages; Ram Esteves, who worked on the community development aspect of the project; Velcan Energy, a French company that funded the project by pre-purchasing the CERs; and Dr. Ravindranath and Dr. Sudha Padmanabha who helped in the initial phase of the PDD preparation by doing an on-site analysis.

ADATS³

ADATS is a non-government organization (NGO) based in Bagepalli that works with 38,615 small and poor peasant families in 915 villages of the 5 taluks of Chickballapur district, Karnataka. It is a comprehensive rural development organization working in the fields of community organization, adult literacy, children's education and community & referral health. ADATS is funded by a global network of NGOs in Europe and New Zealand to carry out Coolie Sangha activities.

Coolie Sangha⁴

The Coolie Sangha is a 25-year old membership-based organization formed by small and poor peasant families in the Kolar district of Karnataka. It was born through the efforts of ADATS' community organization; however it is not just an implementing agency for the NGO. The main function of the Coolie Sangha lies in implementing various village level developmental activities

³ <http://www.adats.com>

⁴ <http://www.adats.com/cs/>

such as children's education, small loans for local village women, activities to support young widows and deserted women and agricultural development.

Women for Sustainable Development⁵

Women for Sustainable Development (WSD) is a group working from Bangalore that focuses on projects promoting climate change mitigation and rural development. WSD was founded in 1994 and since then has been working with women to help them achieve self-sufficiency and empowerment in their daily lives. The projects undertaken include agro-forestry and renewable energy plants, such as a biogas plant fuelled by cow dung. These projects provide work, income and sustainable energy for poor families in rural communities. Existing sponsors include Innocent Drinks, The Carbon Neutral Company and Plan Vivo.

Velcan Energy⁶

Velcan Energy financed the Bagepalli CDM project by purchasing the first seven-year cycle of CERs generated by the project. The company, headquartered in Paris, is an independent clean power producer that specializes in renewable electricity generation in emerging markets from hydroelectric power and biomass combustion.

Inspiring the village community: Role of the Coolie Sangha

The role of the Coolie Sangha has been crucial throughout the lifecycle of the project. The Coolie Sangha was pivotal in motivating the local people to get involved in this project. Throughout various stages in the project, the Coolie Sangha has been actively involved in aspects like selecting the households for bio-digester installation, providing manpower to construct the biogas digesters and conducting regular meetings to maintain the digesters.

Ram Esteves in the year 1975 along with a few of his friends traveled to the village of Bagepalli to work with the local villagers and improve their standard of living. It was the villagers of this place who inspired him to set up his NGO ADATS in Bagepalli in the year 1977. Ram worked with the motivated villagers to set up a community based organization named as the Coolie

⁵ http://www.treehugger.com/files/2006/01/sisters_are_doi.php

⁶ <http://www.velcan.fr/eng/>

Sangha. Over the years, Coolie Sangha gave an identity and protection to its members representatives elected through the community.

This organization gained self sufficiency through a system of Sangha Fund contributions, which were made by the member families and the annual declaration of incomes and paying of Sangha Tax. The reach of the Coolie Sangha is extensive and its membership stands at 38,615 families across 915 villages as on 1 October 2008. The Sangha identifies itself as an independent functional unit and not as a beneficiary of ADATS.

In this particular project, the Coolie Sangha along with ADATS decided to work towards addressing the household fuel needs of the women. ADATS and WSD designed the project which was implemented by the Coolie Sangha at the ground level. The key to the success of Coolie Sangha is that it is entirely participatory in nature. Being participatory meant that the end users at the village level are open to questioning the allotted amount of money being spent on various project activities. The actions taken by the Sangha are open to questions by the local community and most of the important decisions are made by the community as a large. This helps in preventing any unnecessary delay in the timeline of the project. The entire process brings about more transparency to the way the Coolie Sangha functions. Coolie Sangha has always been able to show results in whatever initiatives it has undertaken, this helps in keeping the motivation level of the people high. Also as the Sangha is an elected democratic body so any non functioning member in the body is voted out by the community. All these factors play a crucial role in the success of the Bagepalli Biogas CDM project. The community was interested in learning and knowing more about every aspect of the project. The Coolie Sangha has set an example for any interested organization who wants to take up a similar project. For a community development project, gaining the confidence of the local community and making the project participatory in nature is of utmost importance.

In this specific case, gender mobilization also played a key role. As the project was targeted towards the poor women folk in the households, their needs were given priority. Mahila meetings with women members from the concerned households were conducted regularly. Mahila meetings involve the women from the benefitting households in the village. These meetings discuss the problems faced by the women in the households and how various

initiatives can address their problems and needs. If there is a common consensus amongst the women, then their decisions taken are carried forward by ADATS and the other stakeholders. The women participants in the meeting were made at ease by using the female health workers and school teachers in the initial meetings. The health workers and teachers acted as moderators for these meetings, this helped in making the women voice their opinion about their needs. Gender mobilization, though a key in this project is not necessary for every grassroots CDM project which is initiated, but however for projects which directly concern the women in the household, it is always a good initiative on behalf of the stakeholders to actively involve the women in the project.

Project partnerships: Equitable distribution of responsibilities

The Bagepalli Biogas CDM Project has been implemented primarily by ADATS through the involvement of the Coolie Sangha Units (CSU). ADATS is in charge of construction, service and maintenance of the biogas unit, and data collection. It provides support in the villages through the CSUs and co-ordinates training for users. ADATS has been active in this region for the past 25 years. It has 17 area teams composed of three members each. These teams have an intimate knowledge of every member coolie family. They maintain good relations with the households, which is vital for the implementation of the project.

The Coolie Sangha is a highly organized and self-financed membership driven organization that was created by ADATS. Each CSU consists of a group of 30-35 small and poor peasant families. The CSUs and ADATS come together to take up many development initiatives. These are efforts to empower the coolie caste-class in village society, and build a people's organization at the village, cluster and taluk level.

The current biogas CDM project has been implemented, executed and monitored by ADATS and CSUs in a transparent manner. Every process is monitored in detail; all monetary transactions are well documented; and the reports are made accessible to all. ADATS only undertakes projects that have been initiated from the bottom-up through extensive grassroots discussions. At every stage of the project, the communities are fully involved.

Project technology: Promoting grassroots level innovation

The technology used for the bio-digester is known as the Deenbandhu Model⁷; it consists of a digester with a fixed, non-movable gas space. Families feed raw cow dung through the inlet into the digester dome made of bricks and cement. Gas is produced through anaerobic digestion of the dung and stored in the upper part of the digester before being piped to the biogas stove in the kitchen. The digested slurry is then displaced into the compensating tank which can be used as excellent manure. Some of the benefits of using this technology as mentioned in the project design document of the Bagepalli CDM Biogas programme are:

- Low construction cost, locally available material and technology;
- Non-rusting steel parts, hence long life (25 years or more);
- Safe and secure underground construction;
- Low indoor air pollution from biogas combustion; families benefit from smoke-free kitchens; quick, easy and clean operation; and relief from drudgery;
- Construction creates local employment.

The Deenbandhu model was developed by Action for Food Production (AFPRO), an organization based in Delhi. There has been a substantial amount of knowledge innovation in the design of the Deenbandhu biogas digester under the Bagepalli CDM biogas project. The innovations made include increasing the depth of the saucer-shaped base, the diameter of the dome, and the inlet and outflow tanks. The biogas stove and burners are made of high quality stainless steel. The burner has been specially designed to suit the biogas flow. To prevent any accident, a steel mesh has been designed to fit the outlet tank. Maintenance of the biogas units has been given high priority in the project to sustainably achieve emission reductions. The innovations combined the scientific knowledge of experts at the Indian Institute of science and ADATS along with the grassroots level knowledge of the people benefitting out of this project. This helped the solutions in being more practical and efficient⁸.

⁷ www.solutionexchange-un.net.in/environment/cr-public/cr-se-wes-18070601-public.pdf

⁸ Local innovation is an important aspect of ensuring a good project "fit," this helps in bringing out the best from any technology. Developing an effective process for local innovation is an important topic for further research.

Bottom-up Community Based Development: An integral part of a successful grassroots level CDM project.

The decision making in any community development project usually is a “top down” or “bottom up” process or a combination of both.

In the “top down” approach, the top level management takes a decision and passes it on to the bottom level management for it to be carried out. It is usually known as the expert decision. In the following case study, if all the major decisions pertaining to the project had been taken by ADATS and the villagers and field staff were made to carry out the decisions, then the approach would have been a top-down management.

A “bottom up” approach is one that works from the grassroots — the community concerned is involved in the process of decision making right since the project inception. As the decisions are usually taken by the joint consensus of a large number of people, it is beneficial to the concerned community as a large. This approach of development is known as the “bottom up” approach.

The Bagepalli example is a “bottom up” approach because all the major decisions come from the villagers which are passed on through the members of the Coolie Sangha. Members of the Coolie Sangha are elected by the villagers themselves. The decisions are taken and carried forward in the Coolie Sangha unit and Mahila meetings. In the Mahila meetings, the women folk of the concerned households discuss major issues pertaining to the project. The decisions taken in these meetings are passed on to implementing bodies like ADATS. ADATS then prioritizes the need of the people and then employs workforce from within the village community to carry forward the decisions taken.

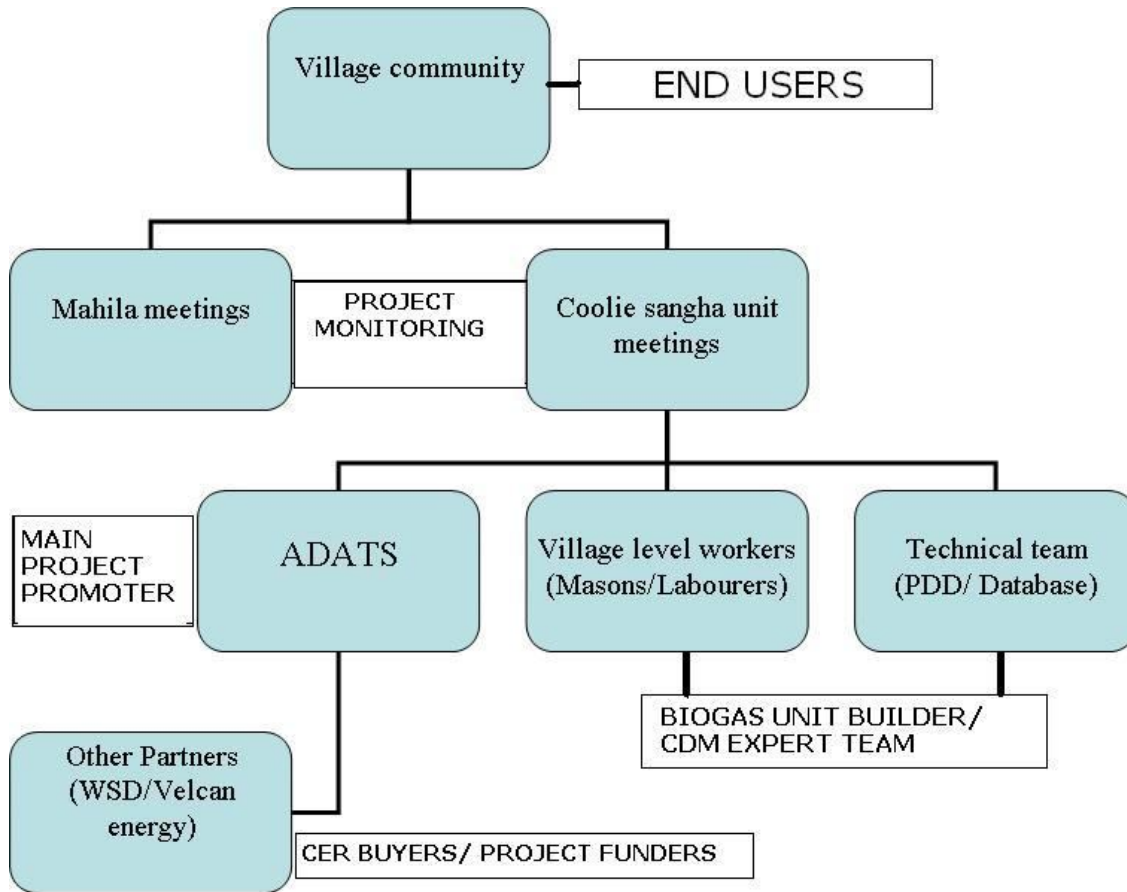


Figure 1: The Bagepalli Biogas CDM project approach with roles of the participants.

In recent times, the top-down approaches to CDM projects have come in for criticism because of their inherent propensity to prioritize and exclusively value professional and scientific knowledge over community preferences. This might augur well for the project in a few cases but in most examples, this does not help in making the projects sustainable in nature. The “Top down” approach lends the approach a potentially exclusive and conservative disposition, which can lead to the estrangement of local people and their internal resource management schemes from the project. Hence universally, there has been a growing recognition of bottom-up approaches that by nature take into consideration the needs of the local people and their local knowledge, skills, and experiences

Project monitoring: Key to a successful grassroots level CDM project

An effective monitoring methodology is one of the most essential parts of a CDM project. The implementation of an effective and convincing monitoring system is a key factor in deciding whether a project receives approval and credits from the CDM Executive Board. The monitoring system also provides information to evaluate the performance of a CDM project in relation to the reductions estimated at the time of registration and the real reductions which occur from the project activities. The number of CERs issued to a project is calculated based on the data collected from the monitoring of the project, subtracting actual emissions and adjusting for leakage.⁹

While the CDM EB has provided standardized methodologies for estimating project baseline emissions, there is no standardized procedure for monitoring a CDM project, even across projects within the same sector using the same baseline methodology. Different renewable energy projects, such as biogas digesters, wind and small-hydro will have different monitoring mechanisms based on project type, size, scale and other localized factors.

Velcan Energy India Pvt. Ltd. (VEI), a subsidiary of Velcan Energy, is in charge of the overall monitoring programme of the Bagepalli project, along with ADATS. The components of the monitoring process are described below.

1. Monitoring of the Biogas Units Installed

All the units installed and the financial transactions are monitored digitally by ADATS. Monthly and weekly reports of the monitored data are made available for future reference. This data is generated and monitored at the taluk, village and household level. The database is updated on a

⁹<http://cdmrulebook.org>: Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the project boundary, and which is measurable and attributable to the CDM project activity (4/CMP.1, Annex II, paragraph 30)

daily basis, as and when field staffs return from their respective villages. Efficiency of the biogas units is constantly checked.

II. Monitoring the Operating Biogas Systems and the Average Annual Operational Time

The number of operational biogas units and the average operating hours are monitored twice a year. A survey sheet for each of the biogas users is maintained at the village level by the village health worker. The health workers are employees of ADATS and members of the local community, thus gaining the confidence of villagers and getting accurate data is easier for the health workers. Furthermore, the health workers have traditionally worked with the villagers over the years; addressing their health needs thus they have the easy access to the village households to monitor the data. The first monitoring of operating biogas systems was conducted in February 2007, 6 months after the start of the crediting period. This survey was conducted for one month (28 days). For efficient monitoring, it was decided to continue daily monitoring. Hence since February 2007 the operational units are monitored on a continuous basis.

III. Sample Survey for Non-renewable Wood and Kerosene Usage

The project promoters determined via survey that 75.6% of biomass used for cooking and heating water is non-renewable in the Kolar district of Karnataka. This survey was based on available secondary data and data collected from GIS sources. Non-renewable firewood consumption contributes to deforestation or forest degradation, as consumption is greater than the increase in sustainable biomass growth.

IV. Sample survey to establish that baseline is still applicable

A sample survey was undertaken before establishing the project additionality to determine the usage of fuel wood among households without biogas digesters. The survey findings show that the current fuel wood consumption for households not equipped with biogas units is about 3.82 tons/household/year and the kerosene consumption of the same household is 34.75

liters/household/year. This is in concurrence with the baseline survey done during the PDD preparation. The major fuels for cooking are wood and kerosene.



Impact of the project: Revolutionizing lifestyles of the poor

Employment Generation: The Biogas CDM Project at Bagepalli has created job opportunities for the local communities. The households provide labor support to the masons, and, in case of shortage of labor, local youth are employed to assist the masons in building the biogas digester tanks. ADATS has trained masons who are responsible for each of the biogas units built. This has resulted in a high sense of ownership among the masons and the households as well. Biogas masons are proud to be identified with the physical as well as socio-economic results of their work. Furthermore, based on the quality of their work, ADATS refers these masons to other similar biogas projects (including a larger, 18,000 biogas unit, CDM project that ADATS is undertaking), thus sustaining the expertise that local masons have acquired during this project. The process of learning and working on their own biogas digesters has helped members of the local community in creating a market for them. The skills of these laborers are used in building digesters in the neighboring villages and other similar activities round the year. Thus the employment generated is sustainable in nature and continues even after the projects are complete. The project has roughly generated employment to the scale of:

- 16,500-22,000 person-days of masonry work.
- 44,000 person-days of daily wage labor to excavate the pits and assist the masons.

Mason Krishnappa who worked in a few villages around the Chintamani taluk talks about the respect that the poor households have for his work and how they turn to him in case of any difficulty with the biogas digesters. Despite having to work harder and for longer hours, he is happy. He believes that such respect would not have been possible without this project and ADATS.

Monetary savings: The total cost for a single digester unit is around 11,000 INR which includes the cost for excavation of land, the construction of tank, setting up of biogas connection and providing the biogas stove. This cost does not include the cost of a tractor load of cow dung which is the raw material required by the digester in order to commence anaerobic digestion and

produce gas. The average time required to construct one biogas plant is about 257 days. The entire activity cycle of biogas plant construction is broken up into many phases. There are numerous small lull periods after every activity like identification of the household for setting up the plant, excavation onsite, construction of the digester tank, checking the tank for leaks, filling in cow dung in the digester tank and setting up a gas connection. All these steps contribute to the pace of the biogas plant construction. Another major factor which decides the pace at which a tank is constructed is the availability of mason and manpower.

As a result of the usage of the biogas unit, the collection and purchase of fuel wood by the local community has reduced considerably. This has resulted in direct savings for the households. This biogas unit installation has also resulted in the replacement of kerosene from the households. Kerosene based gas stoves and lanterns are commonly used in these areas as it is easily available and at subsidized rates. Kerosene even after subsidy is expensive at around Rs 10.00 per litre in the fair price shop and around 20.00 Rs / litre in the open market if available. Around 1 litre would be needed per day to cook food twice daily, which is the equivalent of a day laborer's daily salary. Thus it is highly unlikely for the target consumers in this project activity to use kerosene.

Another important form of cash savings is the usage of biogas slurry in place of chemical fertilizers. The slurry is an environmentally friendly and cost effective replacement of chemical fertilizers.

Quality of life: The use of biogas as a cooking fuel has improved the quality of life for the local households. The benefits are time saved in fuel procurement, improved kitchens and ease in cooking. In the households, women are able to save more time for agricultural activities which will eventually result in the earning of more wages. The households have become smoke free, reducing health-related problems and thus gradually improving quality of life.

Sujatha is a housewife with two children in the Gudibanda taluk of Kolar district. She talks about the time she had no firewood to boil milk for her first-born baby because of incessant rains. She thanks the project producers for installing a biogas unit at her home which has helped her in boiling milk for her second newborn child and made her life much simpler.

Carbon revenue: The revenue generated from the selling of the initial CERs will cover the cost of installing the biogas units. After this cost has been recovered, the revenues will be given to the women in the 5,500 participating households. The second and third crediting periods will benefit the women who have used biogas over the entire period of the project, as the revenue generated will go directly to them.

Education: ADATS staff took up the initiative of educating the communities about the project by conducting meetings at the village and taluk level. Project updates are usually discussed in the CSU and Mahila meetings (the latter comprise only the women of the households). The Coolie Sangha Unit meetings take place weekly and are provide an opportunity to discuss various issues that are of immediate concern to the villagers. In the Mahila meetings, the women have been trained to effectively use biogas for cooking. The households are also taught and trained how to monitor their equipment in order to increase the efficiency.

The main beneficiaries of the Bagepalli biogas CDM Project have been the women in the households. They have been involved from the inception and implementation of the project to the monitoring of the biogas units. The women were the primary stakeholders in this project, and they have benefited from the clean and smokeless energy for cooking, which has had a positive impact on the health and environment of the house.

“More than having access to a doctor, the critical factor for us was being able to afford the medicine” says Parvathi Amma. Some of the most common problems for the women earlier used to be burning sensation in the eyes, breathing problems etc. “Now that we can afford a doctor because we save more and earn more, we don’t need him because there are no major health related issues anymore” she concludes.

Gaining Ground and Scaling up

The Bagepalli project can be replicated by an NGO with the same institutional capacity as ADATS in terms of educated staff and manpower to reach out to village households. In fact, the

project is being replicated in other parts of the district. ADATS has initiated another CDM project which includes 18,000 biogas digesters to be installed across 600 small villages in Kolar district. In what may be the first of its kind, ADATS has received approval from the UNFCCC to use two methodologies in the project design document of its new project. The new project is also seeking a CER buyer to pre-finance, so that work may begin across villages. ADATS has no share in the profits made out of these CDM projects. The maintenance cost of the biogas unit is funded by the local people themselves.

The lessons learnt in the first project provided ADATS the impetus to go for a second similar but larger project. The key again is the involvement of the Coolie Sangha Units. NGOs across the subcontinent can use the example of ADATS and initiate similar projects, recognizing that they will need to adapt their projects to their surroundings and intelligently reinterpret the Bagepalli example.

Analysis of the project

The annual average reductions (tCO₂e) over the crediting period were estimated at 19,553 in the PDD for a total installed capacity of 5,500 biogas plant units. However, the total emission reductions for the period 1st September 2006 to 31st August 2007 for the installed and operational 4,399 biogas units is 12,034 tCO₂e. The non-achievement of emissions reductions due to repairs of biogas units intermittently is 273 tCO₂e, bringing the total emission reductions for the period 1st September 2006 to 31st August 2007 for the installed 4,399 biogas units to 11,761 tCO₂e.

According to the calculations in the PDD, the per unit emission reductions are $19554 \text{ tCO}_2\text{e} / 5500 \text{ units} = 3.55 \text{ tCO}_2\text{e/unit}$. Based on the actual amount of emission units recorded and the number of biogas digesters installed, the actual per unit emission reductions are $11,761 \text{ tCO}_2\text{e} / 4399 \text{ units} = 2.67 \text{ tCO}_2\text{e/unit}$.

A per unit analysis is a good indicator of how successful the technology actually is; in this project, the actual emissions reduction is 0.88 tCO₂e/unit less than the projected reduction. This suggests that the technology is underperforming. The main reason for underperformance during the 1st phase of the project are the delayed setting up of the plants, however another important reason may be the over-monitoring of the project which may involve the practice of the same

data being entered twice by two different village level workers, which can lead to data duplication and data omission and contribute towards underperformance.

Role of NGOs in the Development of Small-Scale CDM Projects

The participation of NGOs was crucial to the development and implementation of the Bagepalli biogas CDM project; the development and the subsequent monitoring and maintenance were undertaken by two independent NGOs—Women for Sustainable Development (WSD) and ADATS. While WSD played an important role in the initial drafting stages of the project, ADATS came into the picture after the project was drafted and registered and took up the role of capacity-building and maintenance.

The role of an NGO in a small-scale biogas CDM project can start from the project note development stage with the NGO identifying beneficiary households. This stage can be known as the community identification stage.

Replacing biogas with firewood benefits the community in numerous ways. The participating NGO usually has to develop its own set of criteria and indicators to identify the households to include in the project. In the Bagepalli biogas project, households with minimum space of 15 square feet around their houses and with livestock were given the first preference. The first criterion was necessary because 15 feet is the minimum amount of space required to construct the biogas domes and tanks.

The community and household identification can be done in two tiers with the first tier identifying appropriate villages and the second tier identifying qualified households. Villages can be identified according to the basis of firewood requirement per household and income per household, and the second level of streamlining households for the project can be done on the basis of availability of livestock. A sample survey identifying firewood usage by the local communities and the consequent depletion in the natural resources is one of the key aspects to establishing additionality in the project.

Capacity-building is the most crucial aspect in any community-driven CDM project, and a biogas CDM project requires community involvement throughout. Some of the most important phases in the entire chain of the biogas CDM process require the active involvement of the community. In the Bagepalli biogas project, ADATS had more than 30 years of experience in the Kolar district, and were thus able to motivate the local communities to switch to biogas from firewood without much difficulty. ADATS functions through the Coolie Sangha Units described above.

Similarly, for the Nepal Biogas programme, although it is a government supported initiative, the primary role of promoting the project is done by the NGO BSP-Nepal. It includes many active project partners such as:

- Regional Biogas Coordination Committees.
- Local NGOs and international NGO network.
- Government forestry department.
- Third party researchers.

The role of the local NGOs in this project is to increase the outreach of the project and to train the local communities about the benefits and the usage of biogas. These NGOs are also actively involved in the construction of the biogas pits and distribution of the biogas stoves. The regional biogas coordination committees oversee the development of these projects.

The flowchart given below is a sequential representation of the various stages in a small-scale CDM project where an NGO can intervene. The most important stages are community identification, capacity-building and monitoring. Capacity-building facilitates the monitoring of the project through the involvement of people, but is not limited to that. The NGO has to play an important role in the development of a good database in order to regulate information and data flow.

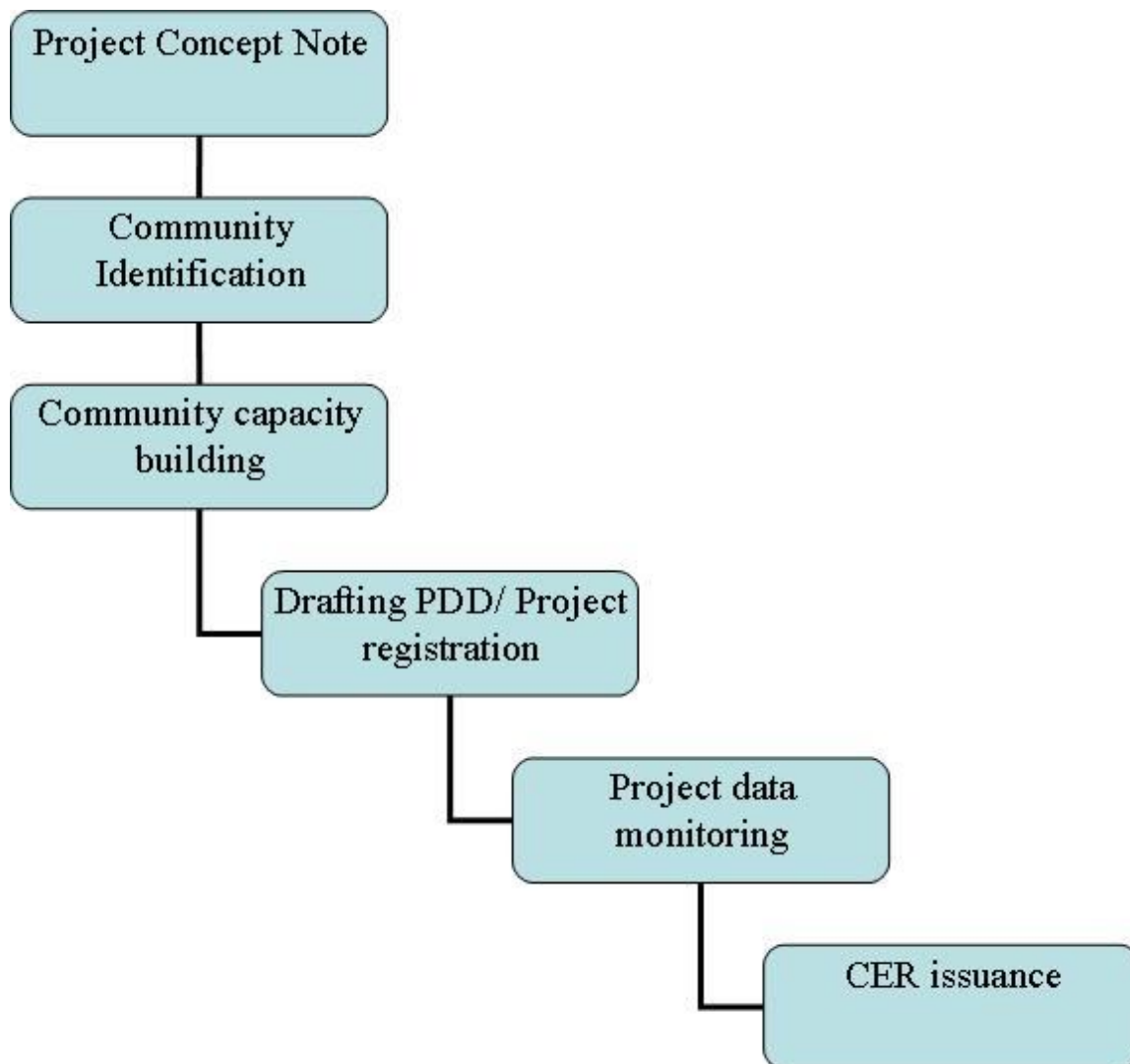


Figure 2: Stages of NGO involvement in small-scale CDM project

In the Bagepalli example, the NGOs that play an important role are long-established. However in case of new NGOs, the capacity-building exercise has to be carried out well in advance in order to gain the confidence of the local communities. Pilot project work should be undertaken in the identified area before embarking on a full-scale basis.

Based on the information above, we can divide the community development aspect into four different phases. Each phase has a clearly defined objective, which would help towards developing a successful grassroots level project. The phases can be:

Phase 1: NGO development programme

This would include the local NGO interested in taking up a small-scale CDM project to plan a course to educate the members within the NGO of the nuances of the project.

- The role of each NGO member has to be clearly defined. The role of members involved in training the local communities should be given maximum importance, as participation of the local community would be the key aspect to developing a successful community based programme.
- There should be smaller divisions within the project that address specific needs of the project. For example if there is a division involved in writing the PDD, then its role should be exclusively that, as it would help the members within the NGO in gaining expertise.

Phase 2: Local community communication programme

The focus of communication activities to be undertaken during Year 1 of programme implementation will be local stakeholders. The objective of this local communication programme will be:

- To build local understanding and support for implementing the ideas and concept as expressed in this plan.
- To engage the primary stakeholders by addressing their training needs in building the biogas units.
- To coordinate relevant stakeholders like the government, local communities and private operators and resources to deliver on the project development vision.
- To educate major stakeholders about the details of the project and provide the tools and understanding necessary for them to become project promoters for other similar projects in the future.

Phase 3: Local community development programme

This would focus on forming small independent community groups (sangha) that would interface between the NGO and the villagers. The groups' activities would include:

- Regular data collection. Each household should collect data for itself. A member of the community group or Sangha can do rounds in the evenings verifying the collected data.
- Maintenance of annual data records for the purpose of CER revenue calculation.
- The final distribution of the CER revenue to individual households. This should be done as per an agreement formed during the initial stages of the project. The distribution of the revenue should be uniform, so as to maintain a healthy relationship among the villagers.
- Any excessive revenue should be deposited in a village development committee (VDC) or in case of absence of a VDC, the funds can be deposited in a village development fund.

Phase 4: Village development programme

This would be a joint initiative of the NGO and the community groups, wherein they would focus on other similar development projects covering a wider audience in terms of reach and scale. The revenues generated from one project can be used as the basic fund for another project. A major share of the overall revenues can then be directed towards village development committees.

Role of NGOs in the monitoring of a small-scale CDM project

Monitoring of the project is another crucial aspect which requires the involvement of local communities. Monitoring at different levels involves the NGO, the village NGO worker and members of the participating households. Households need to be trained to maintain data on the biogas stove usage. This data generated should be monitored at the taluk, the village and household level by an electronic database. The database should ideally be updated on a daily basis, although this may vary depending upon the size of the project.

The NGO ADATS has played a crucial role in the monitoring of the Bagepalli CDM project. Stove usage data is monitored on a daily basis, and this data is fed into a unique database which has been specifically designed for this purpose. In comparison, the Nepal biogas project follows a multi-tiered sampling method of monitoring. The most basic reason for doing so is that the scale of operations in case of the Nepal biogas project is much larger than the scale of operations of the Bagepalli CDM project. Thus the cost involved increases multifold if each single unit of data is monitored. This factor also plays a crucial role during the verification of any project. The scale of operations rationalizes the monitoring techniques in place and in this case, the monitoring is apt in both the scenarios. Another important aspect is that in case of the Nepal biogas project, monitoring and cross-checking have been entrusted to a third party, which is a more effective way of increasing the credibility of the project.

The cost involved in monitoring the project can be covered by pre-financing the project through an advance sale of the CERs anticipated for the first period of 7 years. The advantage of pre-financing is that it provides revenue to implement and maintain the project. However, CERs purchased on an upfront basis usually command a substantially lower price than CERs purchased after issuance. The revenue generated over the subsequent CER issuance cycles can be shared as profit by the local households and the NGOs involved. Pre-financing can also be done by state and national governments that promote the development of such projects. One of the most important reasons for the failure of community-driven projects in general has been that NGOs and communities lose focus after the inception of the project and forgo maintenance or monitoring.

The different roles of an NGO in monitoring the project can also be clearly defined for a small-scale CDM project.

Stage 1: Formation of a monitoring cell

- This is a small body of skilled personnel who know about the various aspects of monitoring a small-scale CDM project.
- The experts should be proportional in number to the households being covered
- The expert to household ratio could be in the range of 1:15, so that one expert has to focus on 15 households, which can help in better monitoring.

- This cell in the NGO should also focus on including members from within the community as they would be easily accessible.

Stage 2: Educating participants about simple monitoring methods

- Individuals within the household should be taught the basics of monitoring the equipment installed.
- Data should be monitored at a specific time daily.

Stage 3: Cross-verification of the data collected

- Randomized cross-verification of the data being collected should be carried out at frequent intervals.
- The equipment should also be cross-checked regularly for leakages of any sort.
- This verification should be done by a third party as it increases the credibility of the project.

Stage 4: Data log maintenance

- Systematic data should be monitored and logged in a simple database daily.

The steps outlined above should be flexible according to the need of the project. There is often greater emphasis on monitoring in a bilateral CDM projects because in this type of project a buyer agrees upfront to purchase the CERs generated by the project. Thus there is added pressure from the buyer to monitor the project well. This is not the case with a unilateral project. Bagepalli CDM project was pre-funded by Velcan Energy, which was in charge of the project monitoring.

Pitfalls of a complete NGO led CDM project.

Revenue Generation

The seed capital required for NGO led projects are hard to come by. The best possibility of generating revenue for a community based CDM project is through forwards contract. The project needs to be bilateral in nature, i.e. the buyer and the seller need to be on the platform right since the initial stages of the project.

Scalability

In case of community based CDM projects, support from the government is very crucial. The role of the government may not be active, but however it needs to support the NGOs involved through measures like subsidies in setting up the project, training personnel to handle technical issues, forging partnerships with international agencies etc. These attributes help the project in scaling up much more rapidly than a CDM project promoted by any single NGO or a group of organizations.

Partnerships

Forging good bilateral and multilateral partnerships is crucial for any NGO led CDM project. The partnership can be multi-tiered and help in various aspects of the project. Technology sharing and seed funds for initiating CDM projects are generated through partner organizations. Consultancies have a better outreach when it comes to forging partnerships rather than NGOs. This is one of the major pit falls of a NGO driven CDM project.

Technical Expertise

The lack of technical expertise leads to irregular maintenance and monitoring of the projects which lead to a reduction in the amount of calculated CERs. Training individuals within the NGO to handle technical issues with the setting up and maintenance of the CDM project holds the key to implementing a successful NGO driven CDM project. The Bagepalli CDM project owes its success to the trained personnel who played a major role in maintaining the biogas digesters.

An Alternative view: Comparison between the Bagepalli Biogas CDM project with the Nepal Biogas support programme

Along the lines of the Bagepalli Biogas CDM project, there was another CDM project based in Nepal which helped the community as a whole. The project was the Biogas support program in Nepal. The outreach of this project was vast as it covered most of the districts in Nepal. This was a project which had the support of the Nepalese government through subsidies and was easier to scale up. Though the government had no direct involvement in the project activities, but however it helped the project participants through its support at various stages of the project.

Biogas Support Programme-Nepal

The Biogas Support Programme – Nepal (BSP-Nepal), is the only other biogas digester project apart from the Bagepalli Biogas CDM project which is registered at the UNFCCC. The first phase of BSP-Nepal is intended to promote the usage of biogas in Nepal by installing 200,000 quality-controlled, small-sized biogas digesters in the country's Terai, Hill, and Mountain regions. The project is to be implemented over the 5-year period 2004-2009 by the support of Government of Nepal through Alternative Energy Promotion Centre (AEPC) by implementing agency Biogas Sector Partnership Nepal (BSP-Nepal).

In the PDD of “Biogas Support Programme - Nepal (BSP-Nepal) Activity-1”, the project promoters estimate the annual number of CERs to be 46,990 tCO₂e.¹⁰ For the two-year period August 1, 2004 to July 31, 2006, 93,901.6 CERs (tCO₂e) were issued, which is equivalent to 46,950.8 per year.

The Alternative Energy Promotion Center (AEPC) aims to sell biogas digesters to individual households located primarily in the rural areas of Nepal. The project activity will reduce greenhouse gas (GHG) emissions by displacing conventionally used fuel sources for cooking, primarily wood and kerosene. In its first phase the project has installed a total of 9,708 small biogas digesters from November 1, 2003 to June 15, 2004 in 57 districts of Nepal.

¹⁰ <http://cdm.unfccc.int/UserManagement/FileStorage/A4NYD8EXQY928HD61LHWHEIM82MBIN>

Technology of the Project Activity

The biogas digester plants sold under this project provide biogas for the thermal energy needs of households. The minimum requirement is households having at least 2 heads of cattle. The households feed cow dung mixed with water into the biogas plant, which through anaerobic digestion produces biogas.

The project developers estimated that the project would result in approximately 329,000 tons of net emission reductions over a crediting life of 7 years (2004-2011).

Table 1: Cost and Size of Biogas digesters in the Terai and Hill region (in US \$)

<u>Size(m³)</u>	<u>Location</u>	<u>Average Cost</u>	<u>Subsidy</u>	<u>Net Cost</u>
4	Terai	251	73	178
4	Hill	261	113	148
6	Terai	284	73	211
6	Hill	295	113	182
8	Terai	335	67	268
8	Hill	350	107	243
10	Terai	376	67	309
10	Hill	393	107	286

Source: CDM-SSC-PDD (version 02) "Biogas Support Programme - Nepal (BSP-Nepal) Activity 1"

The total programme will cost around \$58.4 million after the government subsidy at a cost range of \$178 to \$286/each plant depending upon the region and the size of the biogas digester.

Monitoring method of the Nepal BSP CDM project.

The project employs the following monitoring methods:

I. Random Sampling for Annual Biogas Users' Survey

A Biogas Users' Survey is annually undertaken through an independent third party consultant for evaluating the impacts of biogas digesters installed. The survey is part of monitoring and evaluation activities of AEPC in coordination with BSP-Nepal and has included additional monitoring parameters necessary for the purpose of monitoring emission reductions.

BSP-Nepal uses software to identify randomized clusters. A four-tiered system is followed in which 15 clusters are defined on the basis of 5 development regions. In each cluster, districts are randomly sampled and in each sampled district Village Development Committees (VDCs) are again randomly sampled. Samples of households are finally taken from households in sampled VDCs. This survey usually includes checking of the installed systems for leakages and hours of biogas stove usage. Random sampling is the most appropriate technique to shortlist households for this survey as the overall number of households under the BSP-Nepal programme is around 200,000, making a user survey for the entire population cost-prohibitive. Random sampling helps in generating an unbiased overview of the present situation prevailing in the project.

II. Sampling for Regular Quality Control & Monitoring in BSP

This monitoring exercise is undertaken to check the quality of the biogas digesters and the after-sales service provided. Newly constructed digesters are inspected by BSP-Nepal for construction and operation qualities which include checks for leakages in the bio-digester tanks and proper flow of biogas produced in the tank to the biogas stove in the house. Every year 5% of the households participating in the project are inspected. Households selected for inspection are randomly generated through software. At least 5% of plants are checked with a minimum of two plants per branch per manufacturer.

The overall performance evaluation of biogas manufacturers is termed the Biogas Performance Index (BPI). The data collected from the Biogas User Survey and from the regular quality control and monitoring of the plants are entered in the BSP database system. The data collected are used for generating the emission reduction calculations to determine the final number of ER units.

Project Analysis

The monitoring mechanism in place seems to be effective as the difference between the number of CERs estimated in the PDD and those actually issued is less than 0.1 %.

A per unit analysis based on the information given in the first monitoring report shows that for all sizes and locations, emissions reductions per installed digester range between 4.83 tCO₂e/unit to 5.1 tCO₂e/unit.¹¹ Thus the technology in use appears to be successful and appropriate to the environmental conditions. The 99 percent success rate in CER issuance also shows a good monitoring system in place.

The Biogas Support Programme - Nepal (BSP-Nepal) is a much larger undertaking than the Bagepalli CDM project. Thus the in-depth monitoring approach adopted by the project participants for the Bagepalli CDM project will not be cost- and time-effective for the BSP-Nepal project. The present method of monitoring using random samples generated through software for each tier in the project is a simpler and more cost-effective way to monitor the progress of the project. Also the evaluation of biogas digester manufacturers through the data collected is a good way of eliminating faulty biogas digester manufacturers.

Both the Biogas projects, Bagepalli Biogas project and Nepal BSP CDM project have their own virtues in being a rare breed of CDM projects which directly benefit the community. However when it comes to scalability and outreach, the Nepal project scores over Bagepalli in sheer terms

¹¹ According to the monitoring report, 1284 units of 4 m³ bio digesters produce 6267.84 tCO₂e in the hill regions for the first annual crediting period from 1st August 2004 to 31st July 2005. The per unit emission calculations annually amount to: Hill: 6267.84 tCO₂e/1284 units = 4.88 tCO₂e/unit; Terai: 962.42 tCO₂e/199 units = 4.83 tCO₂e/unit. Similar calculations can be conducted for the 6m³, 8m³, and 10m³ units.

of its access to most of the districts in Nepal. The support from the government and also the simpler means of monitoring the project has contributed into the present scale of the project. The Bagepalli project on the other hand can be taken as an example of a project which has been more locally empowering, and community knowledge is a benefit that's hard to quantify but certainly significant. This can be seen in the active participation that the community has in promoting similar projects in the villages neighboring them.

Lessons from the Bagepalli and Nepal biogas CDM project

Both the projects are unique and independent of each other. They are very strong community based programmes, which is the crucial factor behind the success of both the projects.

In the Nepal example, the Nepalese government has played an active role in scaling up the project through the support of NGO, which has helped in promoting the project on a larger scale. The NGO BSP-Nepal took charge of the project in 2003 with support from the Netherlands Development Organization (SNV), which is partnering with the Nepalese government and Alternative Energy Promotion Centre (AEPC) to install 200,000 biogas digesters across 67 districts in Nepal. Some of the salient features of the Nepal Biogas Support Program were:

- The government of Nepal was involved through AEPC from phase 3 of the project.
- The government initiative was mainly through the implementing NGO which helped the project in raising funds and the government helped by providing subsidies which assisted in setting up the digesters across the country.
- The government support also encouraged many district level NGOs to take up specific roles in the project like maintenance and monitoring.
- The credibility of the project got an immense boost because of the government support, which could later translate into better market prices for the CERs.

In the case of the Bagepalli biogas project, there was no government intervention or initiative¹². The project was initiated by a team of motivated individuals and the NGO ADATS. The credibility of the NGO with the local community helped it to undertake the project with complete co-operation from the community. One of the reasons for the underperformance of the project during its first crediting period can be attributed to the lack of government initiatives. With the help of the government, rural development projects can get a subsidy which will speed up the subsequent processes. The Bagepalli project had some unique features like:

- It was a bottom-up project, in which the involvement of the end users was given highest priority. All the major decisions regarding the biogas plants were taken by the communities themselves and ADATS' role was restricted to providing technical support during the initial phase.
- The end users are trained to monitor their devices regularly, which improves the functioning of the device and the number of CERs generated.
- The involvement of the community in this project was direct, which results in increasing the self sufficiency of a village, as the knowledge and lessons learned remain within the community.

The above projects can be viewed as two different models of involving a community and aiding its development. From a macro point of view, the Bagepalli model is a bottom-up model, which entails more participation from the community, including community involvement in all stages of decision making. The Nepal model is a top-down model, in which the decision making is centralized with the governing body at the top. Both these models have their own advantages and disadvantages as described above. The overall model of involving a community in any grassroots CDM project will remain the same as the above two with a few minor changes as per the geographic and demographic patterns. Alternatively, a mix and match model may also be followed which involves the best aspects of both the approaches. An example would be a state government supporting a biogas programme through partner NGOs that take inputs from the concerned communities.

Both the models are extremely efficient community based CDM projects. The Bagepalli model is one that is scaling up into a bigger 18000 biogas digester project. The 5500 digester project

¹² Discussions with Mr. Ram Esteves, ADATS on 6 Aug 2008

served as a pilot project for this current larger project. The scaling up required time because of the lack of government support in case of the Bagepalli example, however in contrast the Nepal project was a large project right since its inception because the mentoring provided by the Nepal government helped in increasing the access of the project to 70% of the districts in Nepal. However the Government of Nepal supported the BSP Nepal project from Phase 3 of the project. If any similar support is provided to the Bagepalli biogas project, then it can scale up at a much faster rate.



Conclusion

Very few grassroots CDM projects ensure tangible benefits to the rural community. In a biogas digester CDM project the benefits accrue directly to the participating households in the form of improved quality of life, reduced fuel expenditure and additional income through CER revenue.

The above example though not the only way to promote NGO based CDM projects, however sets a shining example of projects which are doing very well at the ground level. Ideally a middle path can be used to promote NGO involvement and Government involvement. The right mix can lead to the project being easily implementable and scalable at the same time. The roles for the NGO and the government can be clearly defined, as in the NGOs can work with the communities and help train them in the technicalities of the whole process and the government at the same time should focus more on involving more partners in the process. The Bagepalli example shows how a community based programme with a simple approach can address multiple development challenges. The Nepal project shows how simple government initiatives can help in taking these projects a long way.

It should be noted that the additionality of the Bagepalli biogas CDM project has been brought into question, as biogas digesters have been installed in Kolar and neighboring districts by NGOs (notably SKG Sangha) or through government schemes for a number of years. The following points support the additionality of the project:

1. The Bagepalli biogas project satisfied the additionality criteria of the CDM Executive Board. The project has been registered with the Executive Board and CERs have been issued.
2. The Bagepalli project has enabled a larger number of households to install biogas digesters in a shorter timeframe than would have been possible without CER revenue. Although demand for biogas digesters is high among the rural poor, many households cannot afford the units without external financial assistance.¹³ ADATS has registered a second project with the CDM Executive Board to install biogas digesters in an additional 18,000 households in neighboring villages.

¹³ http://www.ashdenawards.org/files/reports/SKG_Sangha_2007_Technical_report.pdf

3. Similar government-endorsed biogas digester schemes have failed in nearby districts of Kolar due to the lack of maintenance and accountability. The monitoring required to earn CER ensures that the digesters are well maintained by the local communities.

The key learning from the Bagepalli biogas project is its approach towards involving community participation. The bottom-up approach has ensured that the responsibility of the project is equally shared by the project promoters and the local communities. This lesson from Bagepalli can be applied to other grassroots CDM projects; namely, for a project to succeed, community involvement must be prioritized. Another key lesson is that the monitoring of a small scale project is very important in calculating the total number of CERs generated. Accurate monitoring also helps in enhancing the credibility of the project, especially if the project is a small scale unilateral project.

As we see from the above discussion, a project's monitoring can take different forms, even among projects employing the same technology. The monitoring of a project needs to start early to ensure verifiability of the emission reductions. If the process of monitoring in place is not adequate, then the verifying Designated Operational Entity may not be able to track evidence that the emission reductions have actually taken place. This would result in a reduced amount of CERs

Some of the key determinants of success in the Bagepalli CDM project centered on:

1. Organizational capacity of the NGO

The main NGO, ADATS had its base in Bagepalli for over 25 years, this had lead to gaining a lot of support from the local people. Over the years, by handling similar community based projects, the staff of the NGO was also skilled enough to take up a pilot biogas project. The staff for this particular project was divided into smaller teams. These smaller teams had the task of disseminating knowledge about a biogas CDM project across the villages with the help of the Coolie Sangha. The desk job of preparing a project design document was taken up by the top management of the NGO and external partners were involved in hiring expert knowledge to design the PDD. Similarly, the highly efficient Management Information System (MIS) was designed by the highly skilled technical staff with ADATS using simple computer

language. This MIS has later helped the stakeholders in keeping a tab on the finances of the project along with its monitoring and other aspects. Highly skilled and knowledgeable staff has helped the NGO in designing and implementing the project better, both at a ground level and also at the desk level.

2. Community involvement

The community was actively involved in knowing about every aspect of the project. The sense of ownership amongst the project participants helped in the success of the project. The Coolie Sangha helped in convincing the people about the benefits of the project. The involvement of the people has led to good monitoring practices for the project which later translate into a substantial amount of CERs. Community involvement also helped in lowering the cost of setting up the biogas units as the manpower was sourced from the household itself.

3. Technological aspect

Knowledge innovation at a practical level took place, as the digesters were modified to suit the need of the area better. This innovation was carried out by the staff of ADATS. Sustainability aspect was brought in by training the members of the households in small repair techniques, so that they could be self-sufficient. Major repairs to the digesters were done by skilled experts from within the village. High quality low cost products were used to bring down the cost of the project. The products were all sourced locally, so that in case of replacements and repairs they are available locally.

4. Stakeholder involvement

The stakeholders involved played a key role in promoting the project. One of the key aspects was the pre-purchase of CERs done by Velcan Energy which gave rise to an initial capital. This initial capital helped in setting up the plants across the households. Other stakeholders like WSD etc. helped in drafting the project design document with the help of experts from the Indian Institute of Science etc.

The ***Clean Development Mechanism PDD Guidebook: Navigating the Pitfalls*** published by UNEP Risø Centre on Energy, Climate and Sustainable Development, Denmark in November 2005 suggests a few good practices in CDM monitoring which should be followed by

the project participants in order to ensure the maximum CER delivery. The detailed accounts for all of the following should be mentioned in the documents submitted:

1. The authority and responsibility of project management
2. The authority and responsibility for registration, monitoring, measurement and reporting
3. Procedures for training of monitoring personnel
4. Procedures for emergency preparedness for cases where emergencies can cause unintended emissions
5. Procedures for calibration of monitoring equipment
6. Procedures for maintenance of monitoring equipment and installations
7. Procedures for monitoring, measurements and reporting
8. Procedures for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)
9. Procedures for internal review of reported results/data, including a system for corrective actions as needed, in order to provide for more accurate future monitoring and reporting.

The *PDD Guidebook* suggests that the level of detail needed for monitoring and project management is project-specific and depends on the project technology. For example, a wind farm does not need emergency preparedness procedures because there are no factors that could create unintended GHG emissions. However this issue is crucial in case of a bio-digester. Thus the procedures adopted should be based on existing procedures for project management and operation.

Since many projects are in the design stage at the time of validation, it may be difficult to give a detailed account of the above procedures. In such cases, a draft outline of the monitoring and project management plan explaining the roles of each of the stakeholder may be submitted.

However after project registration, the final plan must be adopted before the project starts operation. It is very important that monitoring with defined procedures is carried out from the initial stages of a CDM project.

End notes:

Carbon Finance Framework

The Kyoto Protocol

The Kyoto Protocol is an emissions “cap-and-trade” system established within the United Nations Framework Convention on Climate Change (UNFCCC). Under the Kyoto Protocol, Annex I countries have committed to cap their emissions to an average of 5% below 1990 levels. Annex I countries are the developed countries that have been allotted emission reduction targets under the Kyoto Protocol. Each country with a reduction commitment under the Kyoto regime will be allocated Assigned Amount Units (AAUs) for use during the first Kyoto compliance period of 2008-2012. The allotted number of AAUs for each Annex I country will be less than actual emissions. In order to abide by their Kyoto emissions cap these countries can: cut production from emissions sources; invest in new technology that generates less carbon dioxide equivalent (CO₂e) per unit of output; buy AAUs from a country that has a surplus or purchase credits from companies or countries that have invested in the Kyoto flexible mechanisms: the Clean Development Mechanism (CDM), joint implementation (JI), and emissions trading.

The Clean Development Mechanism

The CDM is designed to promote sustainable development by enabling industrialized countries investing in “clean” projects in developing countries to gain emissions credits. These carbon credit currencies are given in the form of certified emission reductions (CERs), which are expressed in tons of carbon dioxide equivalent (tCO₂e). These units can be used by the financing country to offset its own carbon emissions or it can be sold to other countries as well. The countries can also store these units for use during an ensuing period. Simultaneously, the beneficiary country gains from an increase in investment, which may be from both, private or public sources. This is a bottom-up approach; anyone can propose a CDM project. A proposal will be accepted if it is deemed environmentally sound, satisfies the CDM Executive Board criteria and meets the host country's standards for sustainable development. Another benefit of the CDM is that it can also help the most vulnerable developing countries through the Adaptation Fund to be established under the Protocol. The adaptation funds are to support the most underdeveloped nations across the

globe by contributing 2% of the proceeds of each project to this fund, though the least developed countries are exempt from this requirement.



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- Project Design Documents, Validation Reports, Registration Review Forms and Monitoring Reports of following registered projects:
 - **Name of project:** *Bagepalli CDM Biogas Programmeme*
 - **UNFCCC Project ID:** *Project 0121*
 - **Name of project:** *Biogas Support Programme - Nepal (BSP-Nepal) Activity-1*
 - **UNFCCC Project ID:** *Project: 0136*