

Carbon financing domestic biogas in Lao PDR: barriers and drivers of success

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1. Abstract

Domestic biogas digesters, built under the "Lao Biogas Pilot Programme", are reducing greenhouse gases from four different sources and can be eligible for carbon financing. This case study describes the opportunities and barriers of developing small bio energy programmes like biogas with a carbon component and the roles that various stakeholders could play in the process in Laos. The study identifies four key factors as main drivers for a successful development of a carbon project: a) the availability of resources; b) a thorough feasibility assessment; c) good planning and timing and; d) stakeholder coordination.

2. Context/Challenge

The Lao Biogas Pilot Programme gives Lao farmers the possibility to purchase a biogas digester, subsidised by the Dutch and the Lao governments. 787 digesters have been built since the start of the pilot programme in 2007. The next phase of the programme (under development) aims at building around 14,000 digesters in 11 provinces by the end of 2015.

A biogas digester turns dung from farm animals (mainly cows and pigs) into biogas that can be used by a family for cooking, lighting and heating. By using a biogas digester, a family can save money on their purchases of charcoal and kerosene and time on (not) collecting fuel wood.

Furthermore the biogas digester provides many environmental and health benefits. First of all the **indoor air** will become a lot cleaner, secondly the **hygiene** around the house will improve and thirdly using biogas **reduces greenhouse gas (GHG) emissions** from 4 sources (see also figure 1):

1. **Manure management:** The methane produced by manure would normally be released into the air. In a household with a biogas digester, this gas is being burned and converted into CO₂, which is a significantly weaker greenhouse gas than methane.
2. **Replacement of non-renewable biomass (NRB)**¹: Most rural households use wood or charcoal for cooking, thereby partly making use of non-renewable biomass. Since the use of non-renewable biomass generates net CO₂ emissions, switching to biogas reduces CO₂ emissions.

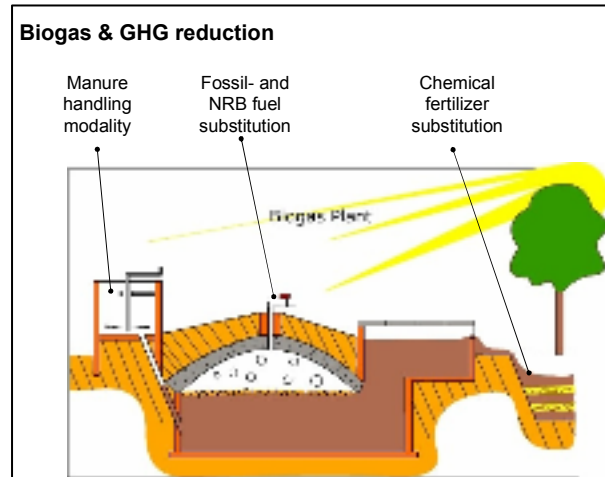


Figure 1: Sources of GHG emission reductions of a domestic biogas digester

¹ Non renewable biomass: biomass, whose harvest results in a reduction of forested area and therefore in a reduction of the carbon sink function of this area.

3. **Replacement of fossil fuels:** Lamps in rural households mostly run on kerosene. Using biogas lamps therefore replaces fossil fuels and reduces CO₂ emissions.
4. **Replacement of chemical fertiliser:** Many farmers use chemical fertiliser on their land, which generates significant emissions of nitrous oxide (N₂O); a very strong greenhouse gas. Biogas digesters produce highly fertile slurry as a secondary product which can be used by farmers to fertilise their lands. The replacement of chemical fertiliser with slurry therefore reduces N₂O emissions.

Apart from reducing emissions of the above mentioned greenhouse gases – acknowledged by the Kyoto Protocol – biogas digesters also reduce the emissions of **black soot particles**, which scientist believe to be important contributors to global warming and the melting of glaciers.

The above described GHG emission reductions make biogas digesters potentially eligible for carbon finance. Carbon finance can stimulate the development of clean and sustainable projects in developing countries that reduce greenhouse gas emissions. The Kyoto Protocol paved the way for this financial market by introducing the Clean Development Mechanism (CDM) that enables industrialised countries to partly achieve their emission reduction commitments in developing countries. The carbon credits produced by CDM projects (CERs) can be bought by entities (like countries, companies or individuals) to offset their own carbon emissions or to sell them to others. Parallel to CDM, other carbon mechanisms have been developed outside of the Kyoto Protocol, commonly known as the voluntary market. The carbon credits produced under CDM and the voluntary market are daily being traded on the rapidly emerged global carbon market.

This case study describes the opportunities and barriers of developing the Lao Biogas Pilot Programme as a carbon project, the roles that various stakeholders could play in the process and the key factors for success.

3. Stakeholders, their roles and relationships

Carbon finance is considered to be complicated; the technical requirements are challenging and subject to continuous adjustments and the project cycle is extensive and costly. This makes it hard for both the public and private sector in least developed countries like Lao PDR to successfully promote and implement carbon projects, especially when it comes to small bio energy projects.

Developing the carbon project

Many players are involved in developing a carbon project. For the Lao domestic biogas programme, the main carbon stakeholders are:

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| a) The owner of the project: | Department of Livestock and Fisheries (DLF) |
| b) The supporter of the programme: | SNV (Netherlands Development Organisation) |
| c) The owners of the biogas digesters: | Rural Households (mostly rice farmers) |
| d) The buyer of the carbon credits: | Yet to be identified from a large market with a lot of players |
| e) The Designated National Authority (DNA): | Lao government (Department of Environment under the Water Resource and Environment Administration) |

Project owner and support

The Department of Livestock and Fisheries (DLF) under the Ministry of Agriculture and Forestry (MAF) are implementing the Biogas Pilot Programme. SNV provides technical and financial support. DLF would be the logical project participant of the carbon project and therewith recipient of the carbon revenues. However, SNV needs to provide substantial assistance and capacity building to DLF to allow them to play that role. A buyer of the carbon credits could be an additional project participant.



Owners of the biogas digesters

The farmers own the biogas digesters and therefore it could be argued that the farmers have the right to receive the carbon revenues. However, there are two reasons why these revenues cannot just be handed to the farmers after they have been received:

1. Additionality is one of the prerequisites of carbon finance, meaning that the project should not be economical viable without carbon revenues. Handing out carbon revenues to the farmers after they have already bought the digesters, would not prove additionality.
2. Carbon financing domestic biogas digesters can only be economically viable when thousands of digesters are bundled into one project. This way, the transaction costs of registration and monitoring only have to be paid once. Part of the total revenues should be used to cover these costs.

It is therefore advisable to let the farmers sign off of their rights to carbon revenues when they purchase the digester. Chapter 4 discusses how farmers will still benefit from carbon finance.

Carbon buyer

The market knows various types of buyers, for example *countries* that have reduction commitments under the Kyoto Protocol (e.g. the Netherlands, Japan), *multilateral organisations* and *banks* buying on behalf of their clients or partners (e.g. the World Bank, ADB, UNDP, KfW), *project developers* (e.g. Tricorona, Ecoscurities), *climate funds* that offset emissions for their clients (e.g. Hivos, Myclimate), *events* that want to be carbon neutral (e.g. climate change conferences), etc.

An important decision for the owner of the project (DLF) to make is when to engage a buyer of the carbon credits in the project. The highest price will be paid for carbon credits when the project already has been registered and verified, so the credits are ready for trade. However, selling the credits in such a late stage would mean that the project owner is responsible to go through the whole registration and monitoring process by himself and also take all the risk. This would require significant financial and technical investments and a thorough understanding of the process. Since most projects in Lao PDR won't be able to fulfil these requirements, it is helpful to engage with a buyer in an early stage and make the buyer (partly) responsible for the development and delivery of the project.

Designated National Authority (DNA)

Several steps need to be taken and validated before a carbon project can be registered under CDM or a voluntary carbon scheme. One important step for CDM-projects is to obtain a Letter of Approval (LoA) from the Designated National Authority (DNA). The main role of the DNA is to check if the project:

1. is a voluntary action of the host party and the project participants involved;
2. will contribute to the “environmental integrity” and “sustainable development goals” of the host country.

The Lao DNA – with support of SNV – has been building its capacities since 2004 to assess proposed CDM projects. The Lao CDM Decree and Guidelines are still to be finalised and approved. Although the Lao DNA is currently able to fulfil its tasks, enhanced capacities are needed to really facilitate the development of carbon projects in Lao PDR.

4. Method / Intervention

The first step to determine the viability of carbon finance for the Lao biogas programme is to do a feasibility assessment. The assessment should focus on

- (i) Technical aspects like estimating the baseline and number of emission reductions;
- (ii) Financial aspects like costs and benefits and the demand of the carbon market; and
- (iii) Institutional aspects like the perspective of the seller and the availability and capacities of the main stakeholders.

The assessment should indicate the chance of getting the carbon project registered and its financial viability and is the main input for a go/no-go decision.

Technical aspects

For the Lao biogas programme, the first part of the feasibility assessment has already been conducted: SNV commissioned Earth Systems Lao (ESL) to do a baseline and emission reduction study, which was finalised in March 2009. The study showed that the emission reductions per biogas digester are likely to be lower than expected (< 1 tCO₂-eq / digester / year), which makes a thorough financial assessment even more important. ESL made several technical recommendations, referring to the need for better data to estimate the emission reductions.

Financial aspects

Before following ESL’s recommendations, the Lao Biogas Pilot Programme and SNV will first determine if any more investments are justified. Table 1 shows that the current price of a Lao biogas digester is US\$ 430, of which 51% is subsidised. The subsidy includes a temporary credit substitute to the buyers. Additionally, the annual support costs of running the Lao biogas programme are around US\$ 580,000.

The estimated net carbon revenues per digester – as shown in table 2 – would be around US\$ 130 for a lifetime. This is based on several assumptions made concerning baseline data and carbon prices. Please note that there are specific rules for bundling thousands of digesters into one carbon project. They could result in reduced carbon revenues.

Table 1: Costs of a 4m³ Lao biogas digester (2009)

Table 2: Estimated carbon revenues in a lifetime of a 4m³ Lao biogas digester

Total costs biogas digester	\$430	Total carbon revenue biogas digester	
Household costs:		- Gross	\$150
- Regular	\$270	- Nett	\$130
- With temporary credit substitute (\$59)	\$211	GHG emission reduction (tCO ₂ /digester/year)	1
BPP subsidy		Lifetime of a digester (conservative)	10 years
- Regular	\$160	Price 1 carbon credit	\$15
- With temporary credit substitute (\$59)	\$219	Registration costs ² / digester	\$20
Subsidy Proportion			
- Regular	37%		
- With temporary credit substitute (\$59)	51 %		

There are several ways how carbon revenues could support the biogas programme in a pro-poor manner, for example by:

- Covering (part of) the support costs of the programme: The revenues could enable the programme to run with fewer subsidies, to upscale to more remote and poorer districts, or to extend to a next phase.
- Reducing the price of a digester (upfront): A lower price will save farmers money and will allow more farmers to purchase a digester.
- Establishing a microfinance scheme or revolving fund: The availability of affordable loans will allow more farmers to purchase a digester.

Institutional aspects

Close involvement of DLF in the feasibility study is essential, because DLF needs to make the key decisions and select the buyer. Since there is no public body in Lao PDR that can assist project developers in making these choices, there is an important role for SNV here. SNV needs to build carbon capacities at DLF and guide them through the steps of the carbon project.

If the financial assessment provides positive results, more data should be collected, after which a Project Idea Note (PIN) can be developed. The PIN can be used to find a carbon buyer who is willing to play a central role in developing the carbon project further. The PDD development and validation as well as the monitoring should (from SNV perspective) preferably be financed and managed by the carbon buyer.



5. Outcome/Impacts

If carbon finance is achievable, it would provide the Lao biogas programme with long-term commercial funding based on performance, therewith providing the programme with a strong external incentive for quality management and control. In its lifetime, each digester could create

² Assuming that all 14,000 digesters fall under one carbon project.

carbon credits worth almost 1/3 of its own purchasing price. Poor farmers would benefit from increased access to clean energy, money and time savings and better health, because carbon finance could support the (up scaled) biogas programme or remove financial obstacles.

While assessing the feasibility of carbon finance, SNV and the Lao Biogas Pilot Programme found several barriers for further development of the project. The barriers can be categorised in:

Technical barriers

- Data and methodologies: Carbon methodologies have very specific requirements for calculating emission reductions. The required national data and statistics are lacking in Lao PDR (e.g. for non renewable biomass fraction, manure management and chemical fertilizer use). Changes in methodologies have been suggested by Thanakvaro de Lopez et al. in 'Clean Development Mechanism in Least Developed Countries: Changing the rules for greater participation'(2009).
- Surveys: Large (and expensive) field surveys are needed to obtain necessary data for pre- and post project emission calculations.
- Monitoring: Monitoring requirements are extensive (and expensive), because the emission reductions are generated by small applications spread out over a large area.

Financial barriers

- Net revenues: Carbon revenues will only be able to partly contribute to the costs of a biogas digester. The estimated emission reductions of a biogas digester are lower than anticipated and the transaction costs for registration and monitoring are high.
- Timing: Carbon credits are issued after emission reductions have been recorded, which means that the revenues normally arrive after implementation of the project. This is far from ideal for small pro-poor bio energy projects since they mostly need the money in the start-up phase. Some carbon buyers do provide upfront payments, but mostly only after registration of the carbon project, which makes that the project owner still needs to disperse significant resources before receiving any carbon revenues.
- Risk: The chance of successfully registering a complex carbon project like domestic biogas depends on many factors. The risk of non-registration (or non-delivery) is relatively high.

Institutional barriers

- Enabling environment: Both the private and public sector (including the development sector) are lacking the capacity to sufficiently facilitate the promotion and development of more carbon projects in Lao PDR. Many projects in Laos are unaware of their carbon finance potentials and if they are, they mostly lack the knowledge or resources to effectively pursue it. Laos currently doesn't have a public organisation that can inform project developers sufficiently about the pros and cons of carbon finance and assists them in starting up a carbon project. To facilitate and attract more carbon projects to Lao PDR, the country needs better *structural and institutional* carbon knowledge. This will help to:
 - Thoroughly and timely assess CDM projects (DNA) and;

- Inform the public about carbon finance and assist projects with the first carbon steps

Both public and private sector should play a role in developing and disseminating this carbon knowledge.

- Project capacities: Most project owners that consider carbon financing, do not sufficiently understand the implications of developing a carbon project. Management should be aware of the investment needs, the requirements and the risks; financial staff should be able to negotiate a contract in the carbon market and technical staff should understand the baseline and monitoring requirements.

6. The lessons learned

Carbon finance is not easy money, but with a professional approach and sufficient resources, it can be done and it can provide small bio energy programmes with many benefits. The analysis made in this case study has resulted in four main drivers of success for developing a small bioenergy carbon project in a least developed country:

1. *Availability of resources*: Financial investments need to be made by the programme in the initial phase. Experts should be involved and the necessary data need to be obtained. In-country knowledge and easily accessible carbon information and assistance in least developed countries would facilitate the development of smaller bio energy activities as a carbon project.
2. *Thorough feasibility assessment*: The economical and technical viability of carbon finance should be thoroughly studied before developing a carbon project, in order to manage expectations and prevent large investments without returns.
3. *Good planning and timing*: An early-engaged carbon buyer can provide the necessary resources like expertise, upfront finance, and liability. Fundamental questions, like how to use the carbon revenues, should be addressed in an early stage to prove additionality and make the necessary arrangements.
4. *Ownership and stakeholder coordination*: Many stakeholders are involved in the development and approval of a carbon project. Unless some players take real ownership for the overall development of the project – including the provision of resources – there is a considerable risk of delay or failure.

The Lao biogas program will make use of these valuable lessons and can hopefully be presented in the near future as a successful carbon case.

References

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