This is a new section of the Public-Private Partnership Resource Center website and is currently in draft form. Your feedback is welcome: If you would like to comment on the content of this section of the website or if you have suggestions for links or materials that could be included please contact us at ppp@worldbank.org.

Photo Credit

Biodigesters Deployment Model for ERP, large green tank with a green lid sits in front of a field

Biodigesters Deployment Model for ERP

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On this page: *Biodigesters Deployment leveraging a New-Build-Finance-User-Fees model - Model 8 in the ERP Project Guidelines. Read more below, or visit Strategic Guidance for Country System Assessments, Guidance for Countries in Assessing ERC Projects, or Mobilizing ERC Finance.*

Project Type: Household device

Sector: Energy - Households

Applicable Project Methodology: Reduced Emissions from Cooking and Heating – Technologies and Practices to Displace Decentralized Thermal Energy Consumption

This model describes a project that aims to install and promote the use of biodigesters across households that have access to livestock bio-waste and would otherwise be using wood taken from nearby forests as the energy source for cooking. Aside from transitioning households to cleaner energy alternatives for cooking, installing biodigesters is expected to enhance agricultural productivity through the bio-slurry produced, and potentially reduce deforestation.

Proposed Structure of this Public Private Partnership (PPP) Model

The project will be leveraging a **New-Build-Finance-User-Fees** model. Given the nascent nature of such biodigesters for this geography and the reliance of the model on carbon financing, the government or state-owned entity may be best placed to support a private company with the appropriate experience to take on the core obligations in this model. The private-sector entity in this model designs, partly finances and installs the biodigesters across the target households. This company will also be tasked with owning the continuous operation of the project, to support households with the new biodigesters for their continued use.

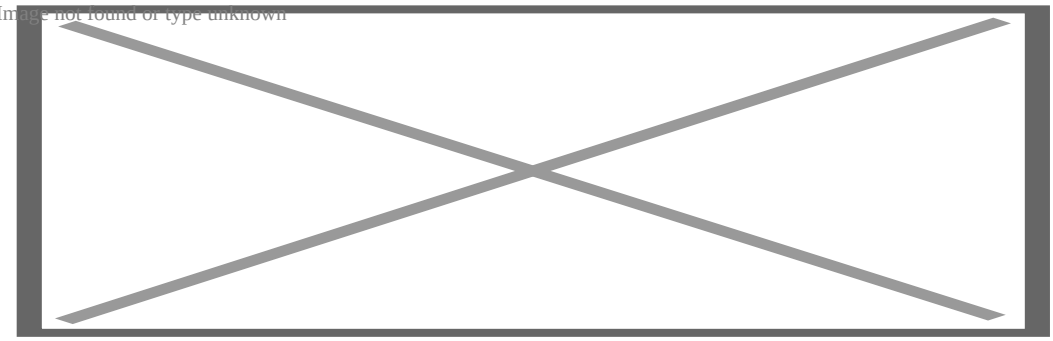
Table 1: Model Attributes

Dimension	Attribute	Description
Business	*New*	The model involves the creation of a new business entity to manage and operate the new transmissions infrastructure
	Existing	
Construction	*Build*	The model involves the creation of a new business entity to orchestrate the deployment and support the continued use of the biodigesters
	Refurbish	

Dimension	Attribute	Description
Private Funding	*Finance*	The model involves installing the biodigesters across the target households
Service	*Bulk*	The resulting project company in the model will be installing the biodigesters across the user households
	User	
Revenues	*Fees*	Majority of revenues in this model will be sourced from the upfront fees paid by the households through supported micro-loans to install the biodigester; the rest will be sourced from carbon financing.

Proposed risk allocation of the Public Private Partnership Model

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Key features of PPP structure

- The government or state-owned entity designs, builds, operates, and maintains biodigester program in collaboration with local communities
- The private sector entity acts as the technical project development implementation partner with the government or state-owned entity responsible for overall project management
- Ministry will work together with private sector entity to develop key elements of project design with private sector entity
- In exchange, private sector entity receives payments for its services that it provides
- The government or state-owned entity benefits as well from portion of proceeds earned from the emission reduction credit (ERC) sales
- Potential to include financiers in this PPP structure in exchange for a portion of the ERC revenues earned in this project

Expected ERC end use

- End use can belong to project developer as part of additional revenue stream

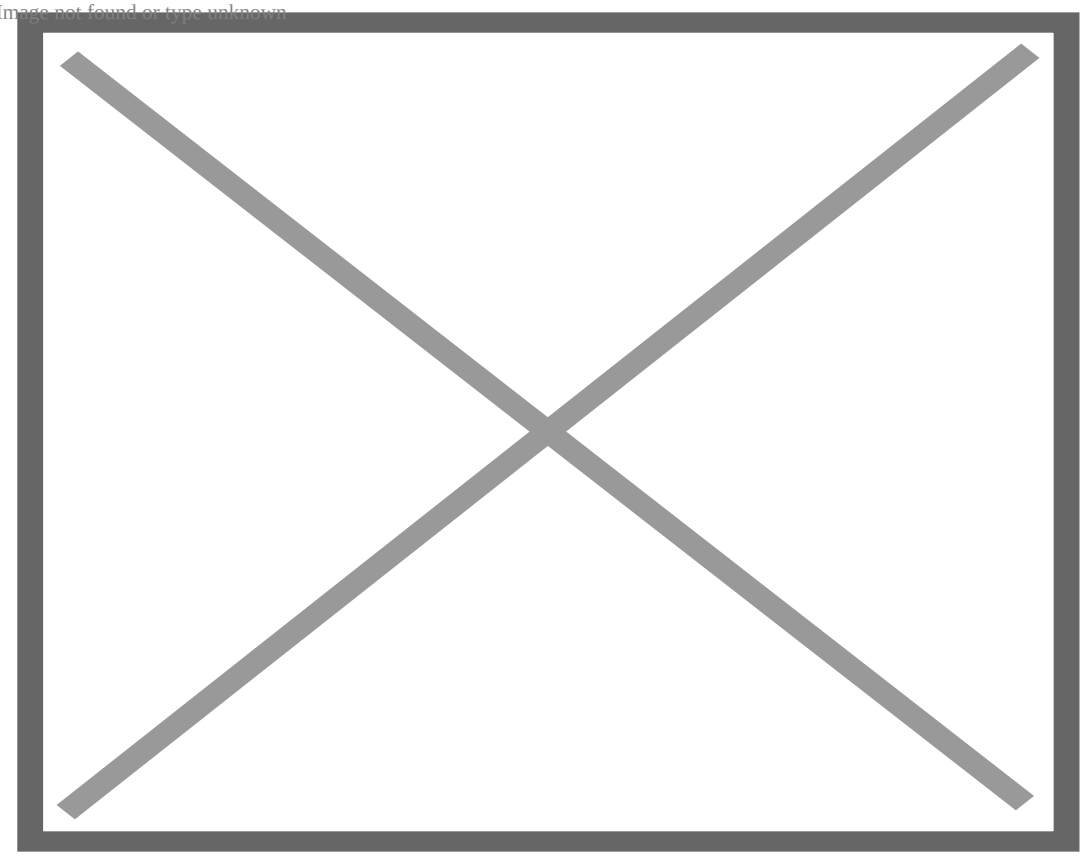
Key considerations/risks for proposed project

- Extensive stakeholder engagement and consultation required to ensure buy-in from local communities to install biodigester in their households
- Need to ensure adequate technical local expertise in day-to-day execution to ensure minimal carbon leakage from use of biodigester
- Regular monitoring need to be carried out to ensure continuous use of biodigester
- Partnering with a service provider for the project’s marketing, sales and pricing is needed to identify potential offset buyers, negotiate contracts, and secure good target price per tonne to enable the financial viability of ERC generation

- Contracting a monitoring, verification and reporting (MRV) service provider with experience in conducting MRV and preparing the necessary documents for generating ERCs in a voluntary carbon market standard will reduce risk of registration and issuance delays or bottlenecks, and strengthen credibility of project's carbon integrity quality

Figure 1: Financing and Activity Flows for the Model

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Case study: National Biodigester Programme, Cambodia

Project description

The Cambodian National Biodigester Programme (NBP), set up in 2006 by the Ministry of Agriculture, Forestry and Fisheries (MAFF) and SNV Netherlands Development Organization, has constructed nearly 29,000 biodigesters through 118 micro-enterprises in 15 provinces. It aims to develop a market-oriented biodigester sector in Cambodia to promote biogas use and reduce deforestation, while improving agricultural yields through bio-slurry, and enabling rural households to switch to clean cooking from wood.

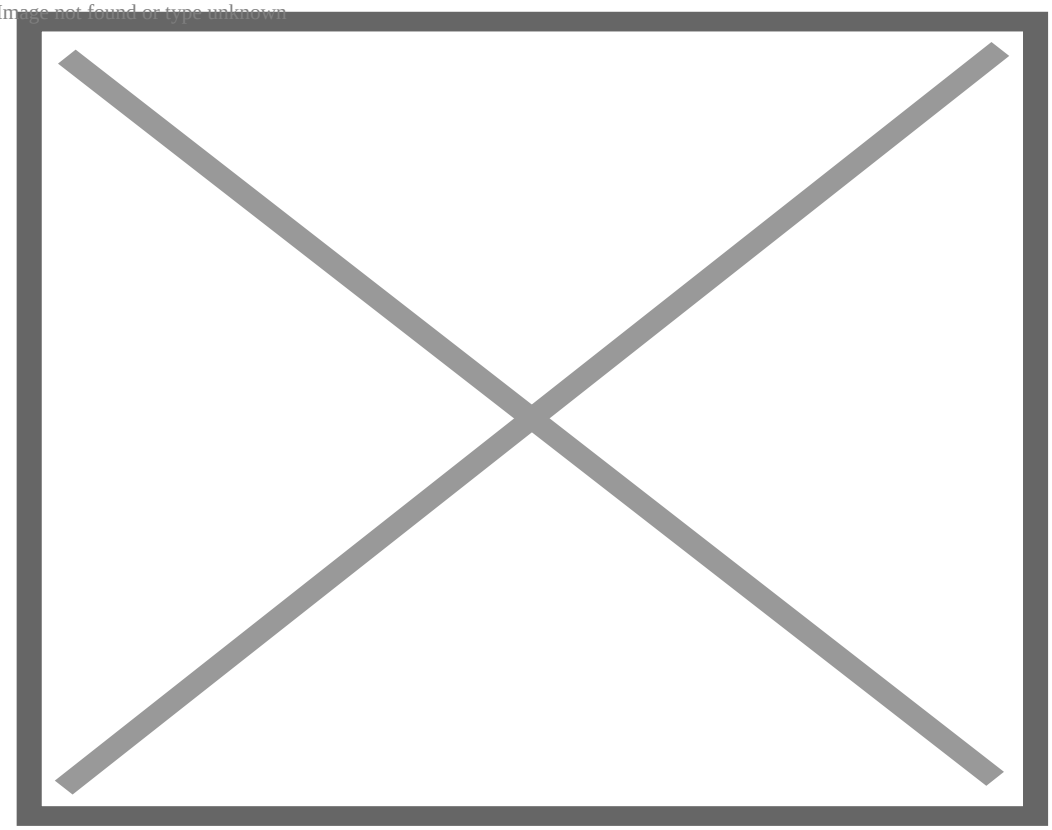
The programme was one of the first large-scale biogas projects certified by Gold Standard. Starting in 2017, MAFF has been utilizing funds generated from the sale of carbon credits to sustain and broaden the scope of this program. The private sector development arm of NBP is establishes independent enterprises in rural areas and builds capacity of these enterprises on marketing and promotion, internal quality control and after sales services

Targeted results

Expected annual ERCs generated from the program will be 78,699 tonnes.

Figure 2: Structure of Case Study PPP

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SNV, a Dutch non-governmental organization (NGO), signed an agreement with the Cambodian MAFF to create the NBP. Hivos, another Dutch NGO, joined the consortium in 2007, offering carbon finance. SNV representatives have a set term to start the initiative, with an "expiration date" built-in to ensure local ownership which means fully transferring complete operations of the program to MAFF once its term has ended. Hivos International also entered an Emissions Reduction Purchase Agreement in this program with Hivos committing to purchasing the ERCs at a predetermined price.

Summary of the model financials

The project's Net Present Value (NPV) without ERC in- and outflows is negative at - $2.43 million (M)[1]. With ERC cashflows, the NPV becomes less negative at -$1.3M. This is as the project has a high upfront investment cost and implementation cost but the project owner – in this case, the government or state-owned entity – does not generate additional revenues or cost savings through the project other than revenues from selling ERCs, and hence requires additional funding from financiers. On the other hand, the NPV of users from the inflows provided by cost savings and co-benefits from the biodigesters net of the outflows from the cost of the biodigesters provided by micro-loans is relatively high at $4.17M, which demonstrates the need for such household device projects to generate ERCs to enable financial viability for the project owners to take on the project and unlock benefits to end-users who otherwise would not have been able to afford such devices.

Table 2: Summary of sources of inflows and outflows and key assumptions

Value component	Assumptions	Sources

ERC revenues or inflows	• Two issuances across the project's 7-year crediting period, at year 3 and year 7 • $9.5 per tonne today for 275,488 estimated tonnes of ERCs likely generated in the first issuance • 10% price increase to $10.45 for 275,488 estimated tonnes of ERCs likely generated for the second issuance	Average Gold Standard (GS) price of household device project in Asia from Allied Offsets database (2022)
User benefit inflows from cost savings	• Savings in expenditure on cooking fuels of $140 per year per household, across 8,600 households and project's 7-year crediting period • Savings from bioslurry byproduct of $182 per year per household, across 8,600 households and project's 7-year crediting period	Intermediary selling case study's ERCs, Skoot; estimated economic co-benefits from biodigesters by Hyman & Bailis (2018)
Investment cost	• $150 subsidy per biodigester provided by the project for 8,600 biodigesters, provided upfront • 36% of the project's total cost (used for estimating other cost components)	Breakdown of cumulative NBP expenditure by Hyman & Bailis (2018)
Project implementation	• 56% of project's total cost, across the project's 7-year crediting period	Breakdown of cumulative NBP expenditure by Hyman & Bailis (2018)
ERC generation	• 7% of project's total cost, across the project's 7-year crediting period	Breakdown of cumulative NBP expenditure by Hyman & Bailis (2018)
User benefit outflows from cost of biodigesters for household users	• $250 per biodigester, estimated based on cheapest available biodigester, paid through supported micro-loans across 7-year crediting period • 15% annual simple interest rate for micro-loans assumed	Cost of biodigester by Hyman & Bailis (2018)

Table 3: Net cashflows summary (in USD)

Components	Sum of initial outlays	Sum of in- or outflows from crediting period	Total cashflow
ERC Component			

Components	Sum of initial outlays	Sum of in- or outflows from crediting period	Total cashflow
Revenues/Inflows	0	5,495,178	5,495,178
Costs/Outflows	0	-250,833	-250,833
Net value	0	5,244,344	5,244,344
Primary/Non-ERC Component			
Revenues/Inflows	0	0	0
Costs/Outflows	-1,290,000	-6,414,167	-7,704,167
Net value	-1,290,000	-6,414,167	-7,704,167
Total Net Value			
NPV		-$1,299,195	
NPV (ERC Component)		$1,130,490	
NPV (Non-ERC Component)		-$2,429,685	
NPV (Net user benefit)		$4,172,596	

Footnote 1: All prices are expressed in United States Dollars (USD)

Related Content

- **Guidance for Countries in Assessing ERC Projects (Download PDF version)**

Additional Resources

- Climate-Smart PPPs
- Finance Structures for PPP

This section is intended to be a living document and will be reviewed at regular intervals. The Guidelines have not been prepared with any specific transaction in mind and are meant to serve only as general guidance. It is therefore critical that the Guidelines be reviewed and adapted for specific transactions. Unless expressly stated otherwise, the findings, interpretations, and conclusions expressed in the Materials in this Site are those of the various authors of the Materials and are not necessarily those of The World Bank Group, its member institutions, or their respective Boards of Executive Directors or member countries. For feedback on the content of this section of the website or suggestions for links or materials that could be included, please contact the Public-Private Partnership Resource Center at ppp@worldbank.org.