Abstract Domestic biogas and CDM financing; perfect match or white elephant.

That sustainable energy supply and (agricultural) production methodologies, at any level, will become a critical factor in sustainable development is steadily becoming mainstream global awareness. Biogas technology for rural farming households would have the potential to fit into this picture in a modest but significant manner. To play this role, dissemination of domestic biogas would need up-scaling far beyond what currently is happening in most countries.

For selected countries in Asia, the Netherlands' Asia Biogas Programme aims to support large-scale dissemination of domestic biogas. In view of the significant investment costs (~ € 200 to € 400) for a high-quality biogas plant, one of the challenges the programme faces is the limited purchasing power of otherwise prospective client households and, not unrelated, the limited access for these clients to appropriate credit.

The Clean Development Mechanism could play a role in bridging this financial gap. Domestic biogas plants contribute to the reduction of greenhouse gasses for which –potentially- the CDM offers the opportunity of additional revenue. However, the match between large-scale biogas dissemination projects and the CDM seems a cumbersome one.

In this paper the outline of such a large scale biogas project (BP II in Vietnam) is discussed in relation with CDM financing. Without claiming to be exhaustive, the paper attempts to explain the "origins" of greenhouse gas reduction by domestic biogas plants and the potential and actual CDM revenue that would result from this. Subsequently, the paper presents the modality to apply this CDM revenue in the biogas project and its impact on the "finance gap" for the participating households. Finally, the monitoring requirements for the project, related with the CDM are briefly mentioned.

In summary, the paper concludes that:

- The GHG reduction potential of domestic biogas plants can be significant (5 tCO2eq per plant per year), but that the actual reduction will heavily depend on the local situation related to manure management practices and domestic fuel use.
- The potential CDM revenue for domestic biogas projects can be equally significant. However, if this revenue is required as a financing mechanism for investment subsidy, the amount will –at least for now- be limited by the duration of the first commitment period of the Kyoto Protocol.
- Although CDM revenue thus will not fully bridge the "finance gap", the paper shows that CDM could reasonably contribute to making the investment more interesting to the household.

Paper prepared for the International Seminar on Biogas Technology for Poverty Reduction and Sustainable Development in Beijing, China, 18 – 20 October by:

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0 Introduction

One (not necessarily the only) important stumbling block for large-scale dissemination of domestic biogas, particularly in poorer rural areas, is the combination of the significant upfront investment for the installation with the limited access to financing opportunities for farmers. Subsidy schemes as e.g. practiced by the biogas projects in Nepal and Vietnam, can only go so far; besides being under constant attack of the "sustainability argument", subsidy schemes still leave some 75% of the investment to be covered by the farmer. And then again, only to a certain extent and often against high transaction costs can this "finance gap" be filled by formal banks, micro-finance institutions and the informal banking sector. As a result, proper quality domestic biogas plants often stay out of reach for the poorer segment of our target group.

The Kyoto Protocol provides the framework under which countries, in particular in the industrialized world, will work to reduce their emission of greenhouse gasses (GHG). The KP's main achievements include the setting of national emission reduction targets for industrialized countries (Annex 1 Parties) and the establishment of three mechanisms -Joint Implementation (JI), the Clean Development Mechanism (CDM) and the International Emission Trading (IET)[i]- by which Parties can trade in emission permits.

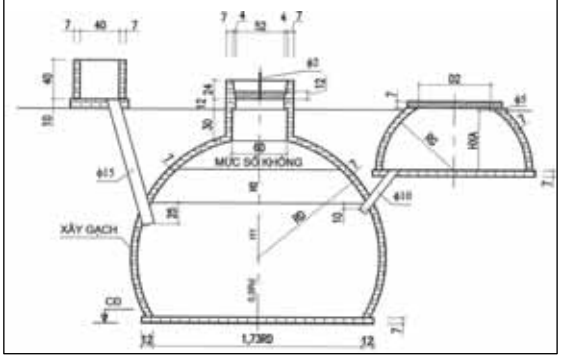
Introducing GHG emission reduction trade between Annex 1 Parties (the buyers) and non-Annex 1 Parties (the sellers), the CDM aims to stimulate –on a voluntary basis- to reduce GHG emissions in non non-Annex 1 countries and simultaneously assist these countries in achieving sustainable development.

Domestic biogas in its own right contributes to sustainable development[ii] and –by the virtue of conventional fuel substitution and changing traditional manure management practices- reduces the emission of greenhouse gasses.

The biogas project office in Vietnam –not unlike its counterpart in Nepal- explores the opportunities of the seemingly perfect match between the CDM and large-scale domestic biogas dissemination as a solution for the "finance gap".

1 The Biogas Project phase I.

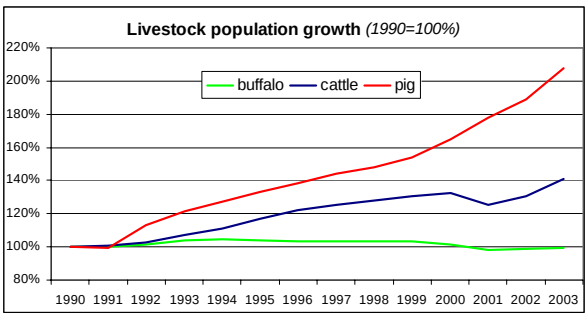
KT.1 model domestic biogas plant



In January 2003, the Vietnamese and Netherlands Governments signed the Memorandum of Understanding for the implementation of a domestic biogas dissemination project in 10 provinces of Vietnam. The project –*"Support Project to the Biogas Programme for the Agricultural Sector in some Provinces in Vietnam"* or "BP I"- uniquely joins Vietnam's technical knowledge on plant design and construction with Netherlands' experience with large-scale dissemination of domestic biogas. The Netherlands' Directorate General for International Cooperation financially supports the project with a grant of –initially- US$ 2 million.

The combination is successful; at an early stage the project expanded to 2 additional provinces and increased its target from 10,000 to 12,000 biogas plants. Even so, many more provinces had to be disappointed when they requested participation in the project. In July 2005, 6 months ahead of schedule, the project reached its numerical goal. In anticipation of a second phase, the Netherlands Government agreed to increase its grant with US$ 486,000 to fund the subsidy component for an additional 6000 installations, thus bringing the project target to 18,000 biogas plants by the end of January 2006.

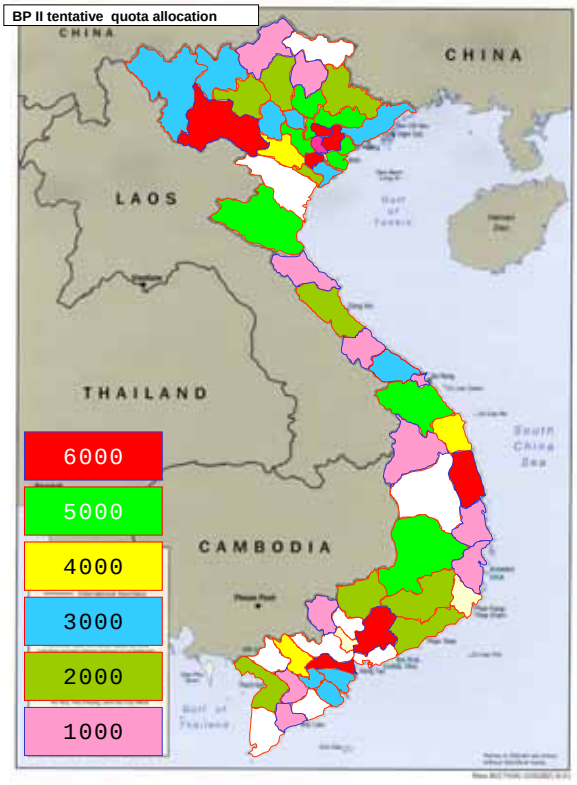
2 The potential for domestic biogas in Vietnam.



The market potential for domestic biogas in Vietnam is large. Vietnam's animal husbandry sector is vibrant, expanding and for a large part managed in family farms. Farmers and government embrace solutions, including biogas plants, to reduce the environmental load of the sector.

Alternatives to substitute inefficient conventional domestic fuel sources are welcomed, as are opportunities to improve the nutrient management of the fields. With a rural population that –in general- is accessible and well educated, awareness travels fast. Out of the technical potential of 2 million installations, an "active" demand of 1 million domestic biogas plants seems a realistic estimate.

3 The Biogas Project phase II.



Encouraged by the results of the project and in view of the potential for domestic biogas in Vietnam, the Department of Agriculture of the Ministry of Agriculture and Rural Development (MARD/DA) and SNV- the Netherlands Development Organization (SNV) agreed on the joint development of a second –nation wide- phase for the biogas project.

In outline, the Biogas Project phase II (BP II) aims to support construction of 180,000 domestic biogas plants in 58 provinces of Vietnam over a period of 5 years. The project plans to start in February 2006, accommodating a smooth transfer of phase I.
In preparation of the second phase, the Department of Agriculture of the Ministry of Agriculture and Rural Development (MARD-DA) called for expression of interests for participation of the provinces. By June 2005, 51 out of Vietnam's 64 provinces (including the 12 provinces participating in the current first phase) had submitted their interest. Based on the provincial request and an assessment of the Biogas Project Office (BPO), tentative production quotas have been allocated. The biogas absorption capacity[1] of provinces varies. Hence, provinces have been divided in six categories, with production targets ranging from 1000 to 6000 installations for the project period.

3.1 BP II main features.

The second phase of the project seeks to ignite a lasting marketing drive and consumer demand for domestic biogas plants and to encourage high quality services to meet this demand. BP II main features include:

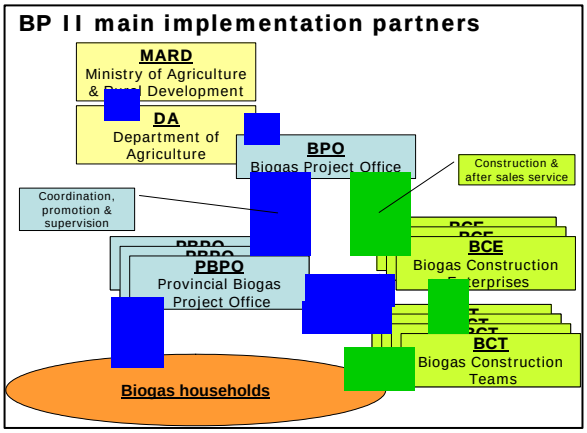
- *Building on past successes and lessons*: Using the experiences, structures, relationships and systems of BP I and the Nepal Biogas Programme, BP II will significantly upscale operations to facilitate the construction of 180 000 plants. BP II will also draw on the knowledge resources of a strong international biogas network in the form of SNV's Asia Biogas Programme and through relationships with other programmes in the region.
- *Creating a commercially viable sector*: Ultimately, successful dissemination of domestic biogas will to a large extent rely on the participation of the private sector. Therefore, BP II will place significant emphasis on the strengthening of private enterprise and market development.
- *Jump-starting provinces*: Over a period of 5 years, the project will assist provinces to establish the full infrastructure necessary to support a market oriented biogas sector. After this period, provinces are expected to carry on biogas development under their own steam, whereby a national support structure will remain available.
- *Decentralized biogas-training centres*: The project intends to support the establishment of three biogas training and reference centres over the country. These centres will not only train biogas masons and technicians, but will also act as support facilities (after Biogas Construction Enterprises and Biogas Technicians) for participating provinces and enterprises. These centres will be established through the development of partnerships with training and research institutes throughout the country.
- *Maximisation of biogas benefits*: BP II will put a renewed emphasis on the -varied and sometimes under utilised-

[1] Absorbtion capacity depends on population, lifestock holding and holding patterns, accessibility, climate etc.

benefits of biogas. This will be done by continuing research into slurry use, targeting disadvantaged households, improving stoves and other related technology, promoting the intangible (social) benefits, assessing the impact of biogas on women's lives and building on the benefits.

- *Innovative Financing Mechanisms*: There are four key elements to BP II's financing.
  - Anticipated Clean Development Mechanism (CDM) revenue to finance a loan that will -in turn- finance the subsidy scheme and part of the project support costs at provincial level
  - Targeted subsidy levels to encourage participation and improve access to the programme for poorer people
  - Including direct financial and in-kind contributions from participating provinces
  - Developing biogas credit products to provide participants with accessible finance for building their plants at a competitive rate.

3.2 BP II main implementation partners.



BP II, similar to the fist phase of the project, will be a joint venture between the *MARD/DA* and *SNV*[iii]. SNV's support, technical and advisory assistance, will take place in the framework of the "Asia Biogas Programme"[iv]. This regional programme, a cooperation of the Netherlands Ministry of Development Cooperation and SNV, seeks to promote commercial deployment of domestic biogas.

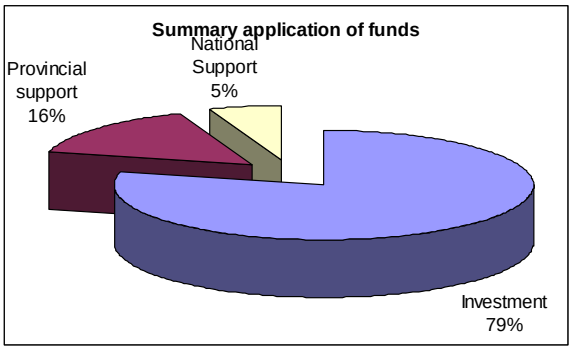
The *Biogas Project Office*, established for BP I, will continue to be responsible for the operational management of the project. For the second phase, the BPO will obtain an official "Project Management Unit" status under the Ministry of Agriculture and Rural Development.

At provincial level, the project works through *"Provincial Biogas Project Offices"* (PBPO) under the provincial Departments for Agriculture and Rural Development (DARDs). These PBPO's, will be responsible for supervision and coordination of project activities at provincial level. Currently, over 51 provinces indicated their interest to participate in the project's second phase.

Biogas Construction Enterprises (BCEs), consisting of local *Biogas Construction Teams*[v] (BCT), construct the biogas plants and provide after sales service. The project aims to establish 2 BCEs in each district (~ 20 per province). Enterprises and teams will be trained and supported by the project.

3.3 BP II project costs.

Total tentative[2] project costs amount to just over € 64.4 million[vi]. With an average investment of € 250 per plant[3], including accumulated investment financing costs[4], the total investment component results in € 50.8 million. Provincial support cost amount to € 10.2 million and National support costs to € 3.5 million.



[2] Although a detailed project budget is available, adjustments in support scope and resulting costs may occur. Finalization is expected before the end of the year.

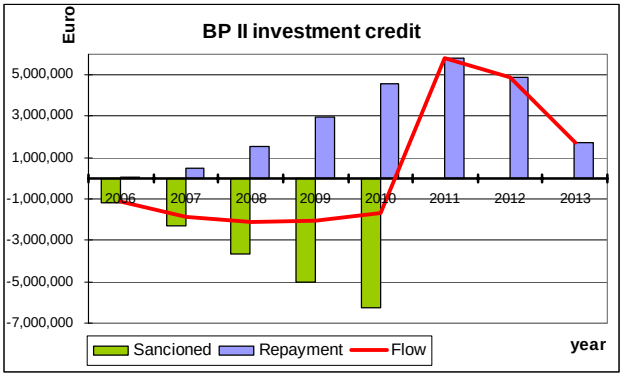
[3] Average costs for an 8 m^3 domestic biogas plant, corrected for inflation (5%) over the project period.

[4] Accumulated financing costs include financing costs for the project's subsidy component as well as the financing costs for the project's investment credit component. For the latter, it is assumed that 53% of the households will request investment credit to finance the remaining part (investment minus subsidy) of the plant.

The project will assist farmers with an investment subsidy (average 24% of the total investment[5]). Independent from the size of the plant, the project will provide three levels of subsidy, higher subsidy levels targeting poorer areas and under-privileged households. Similar to the practice under BP I, after testing and acceptance of the installation, subsidies will be transferred directly to the households through the facilities of Vietnam's national Post Office.

	VND	Euro
Normal	1,000,000	49.50
Medium	1,500,000	74.26
High	2,000,000	99.01
Avg subsidy	**1,238,450**	**61.31**

A dedicated biogas investment credit facility is currently under consideration. Experience shows that the project increasingly would reach poorer households, for whom the remaining investment will proof to high to be paid in cash[6]. The total credit volume results to € 18.4 million. However, taking into consideration repayments the actual required capital is considerably lower (max capital requirement ~ € 2.1 million in the 3rd project year).



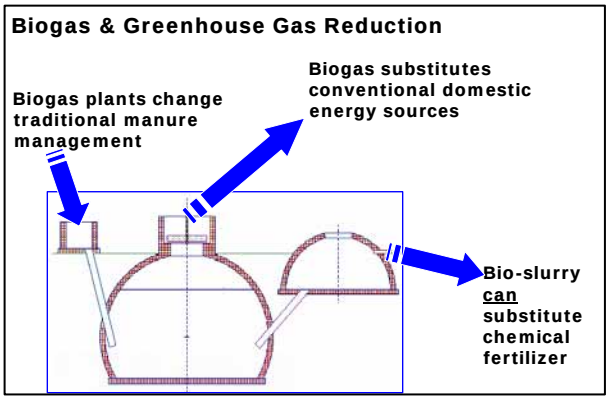
4 Biogas & GHG reduction

The fermentation of animal dung in domestic biogas digesters, and the subsequent application of biogas and bio-slurry, contributes to the global reduction of greenhouse gasses (GHG). As such, the project will qualify for the Clean Development Mechanism (CDM) of the UNFCCC[7].

Applying domestic biogas, GHG emissions can be reduced in three ways:

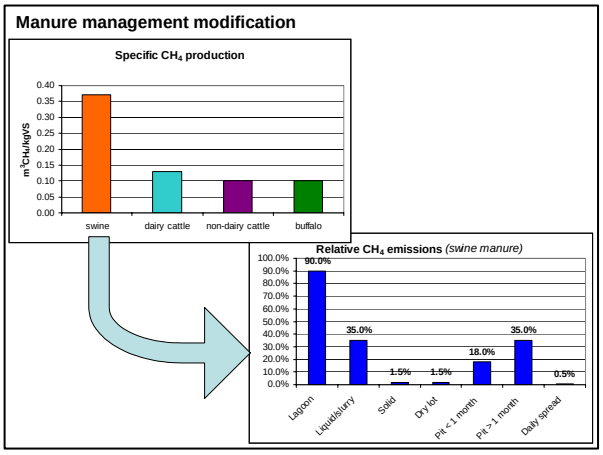
- Modification of the traditional manure management practice;
- Substitution of conventional domestic energy sources, and;
- Substitution of chemical fertilizer.

Please note that the actual level of GHG reduction depends to no small extent on the practices in situ.



4.1 Modification of the manure management practice.

Depending on the type and handling practice of manure the local manure management practice can become a significant source of GHG. Basically, when manure storage, discharge or application becomes more anaerobic, larger quantities of methane gas will be emitted. Biogas plants paradoxically aim to generate the maximum amount of CH_4 from the manure. But since the biogas is subsequently combusted in the kitchen stove, the generated methane is destroyed.

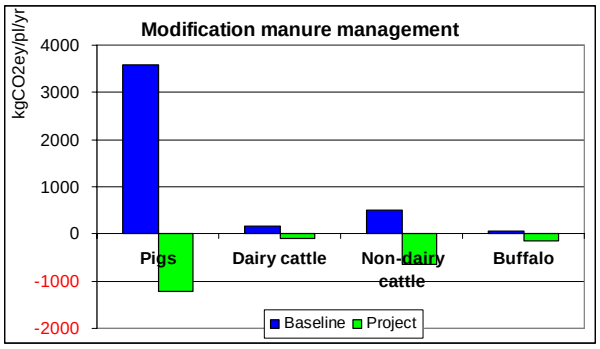


[5] Over the project period, the investment subsidy will remain constant and uncorrected for inflation. As a result, the actual investment subsidy share will decrease from 27% in the first to 22% in the last project year.

[6] Calculations assume that the credit requirement will increase from 30% of the households in the first year to 70% in the last.

[7] United Nations Framework Convention for Climate Change

For the exploratory calculations for a typical domestic biogas plant in Vietnam of 8m3, we assumed the (partial) feeding of the manure of 8 pigs, 1 dairy cattle, 1 non-dairy cattle and 0.5 buffalo and a conservative mix regarding the traditional manure management practices. Based on IPCC[8] default values, these calculations show that as a result of the modification of the traditional manure management, greenhouse gas emissions can be reduced with just over 2100 kg CO_2eq per plant per year.

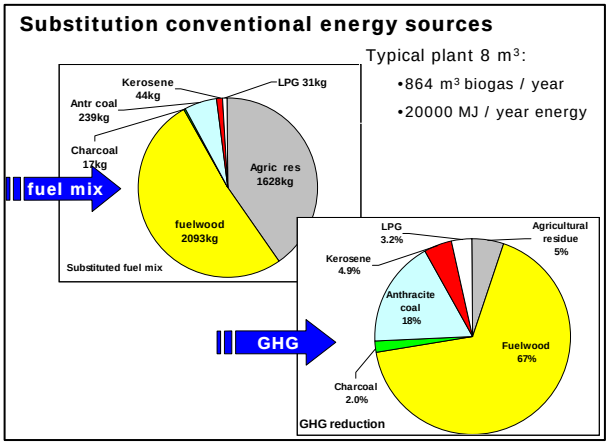


4.2 Substitution of conventional energy sources.

Burning of biogas releases carbon-dioxide. However, since this amount of CO2 is absorbed by the re-growth of the agricultural produce, biogas combustion is considered carbon-neutral. Therefore, to the extent that biogas substitutes conventional domestic fuels that are not carbon-neutral (in particular fossil fuels), biogas application contributes to the reduction of GHG emissions.

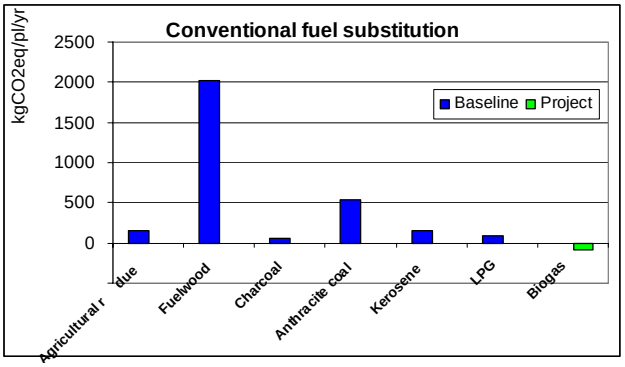
For the exploratory calculations we took as point of departure the gas production of a typical domestic biogas installation. Taking into account the differences in efficiency of the various combustion devices, the calorific value of the generated biogas was used to calculate how much of the traditional fuel mix[9] could be substituted. Calculations further assume that 50% of the substituted fuelwood is harvested in a non-sustainable way.

Based on these calculations, by substituting conventional fuels, domestic biogas plants reduce just of 2900 kgCO_2eq per installation per year



4.3 Substitution of chemical fertilizer.

The residue of the anaerobic fermentation process, bio-slurry, is a powerful organic fertilizer and soil conditioner. Field tests confirm a significant increase in agricultural yield through the application of bio-slurry. For farmers, therefore, it is possible (and advisable!) to substitute (part of) their chemical fertilizer application with bio-slurry. Not only from a (sustainable) agriculture point of view, but also for reducing GHG emissions related with the production and application of chemical fertilizer, bio-slurry would have advantages.



Again, exploratory calculations indicate that on a typical farm plot in Vietnam (0.5 ha) the available bio-slurry replacing the nutrient value of chemical fertilizer would reduce GHG emission to the tune of ~ 500 kg CO2eq/farm/year.

However, farmers may under or over-utilize chemical fertilizer. They may or may not apply bio-slurry to the full extent or in the most proper way. And the applied bio-slurry may or may not actually replace chemical fertilizer. Clearly, from a baseline and project monitoring point of view, chemical fertilizer substitution is “nightmarish”. It is for this reason that chemical fertilizer substitution is excluded from this project’s GHG reduction claim.

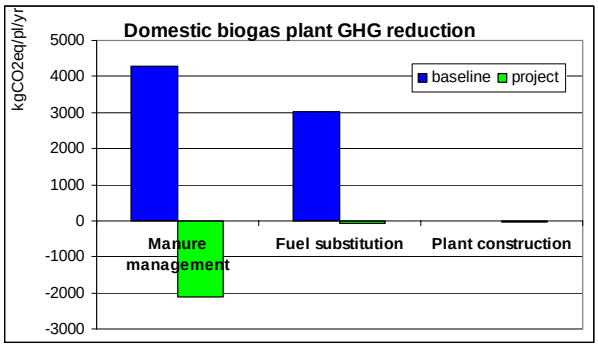
[8] International Panel for Climate Change

[9] Establishing the average traditional domestic fuel mix, due to lack of sufficient data, proofs cumbersome. For the calculations we used data from a survey of the Institute of Energy / RWEDP.

4.4 GHG reduction summarized.

As stated before, the actual GHG emission reduction by domestic biogas plants depends heavily on the local situation with regard to traditional manure management practices and domestic fuel mix.

However, our rather conservative approach would indicate that plants would reduce greenhouse gas emissions to the tune of ~ 5 tCO_2eq per plant per year.



5 Carbo–financing of large-scale biogas projects.

A key feature of the BP II is that the project seeks to generate revenue from the CDM to:

- finance its subsidy component, and;
- co-finance its provincial support component.

The exploratory calculations indicate that domestic biogas plants reduce GHG emissions to the tune of 5 tCO_2 eq per year. With a conservative price of € 6 per t CO_2 eq, a typical biogas plant would potentially generate € 300 over a crediting period of 10 years. During this crediting period, the total GHG reduction of the project would amount to over 7700 kt CO_2 eq[10], representing a value of € 46.3 million. However, two "formalities" will –at least initially- reduce the available CDM revenue, namely:

- CDM payment on delivery, and;
- the Kyoto Protocol "First Commitment Period".

5.1 Payment on delivery.

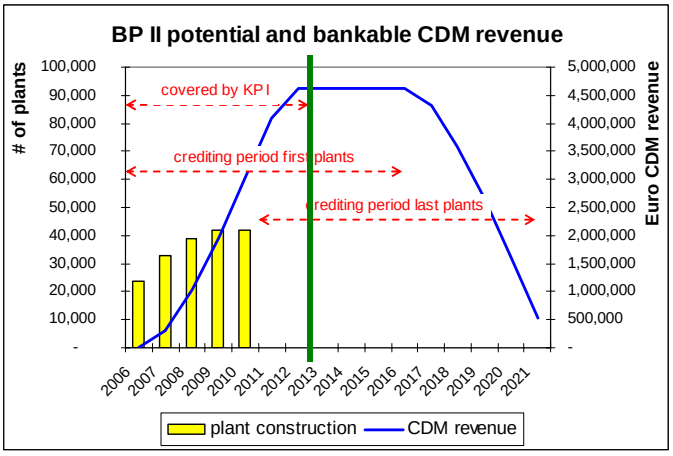
CDM revenue will only be made available "up on delivery". The implication for the project would be that, assuming an annual verification, farmers would be entitled for their annual CDM revenue amount after the particular verification year. Not only would the resulting financial transactions put a significant load on the project management, but –more importantly- the CDM revenue in this fashion would not assist the farmer in reducing the up front investment.

For this reason, the project is in dialogue with the Kreditanstalt fuer Wiederaufbau (KfW). KfW's carbon fund shows serious interest in purchasing the project's emission reductions to off-set emissions in Europe. At the same time, KfW –through the German Government's "Special Facility for Renewable Energies and Energy Efficiency"- is willing to consider providing the project, through the Government of Vietnam, a soft loan for which repayments will be made by the project's CDM revenue.

5.2 The "First Commitment Period".

The first commitment period, agreed by the parties to the Kyoto Protocol, terminates at the end of 2012. Greenhouse gas emission reductions after this period will resort under the second commitment period, for which negotiations will only start around 2008.

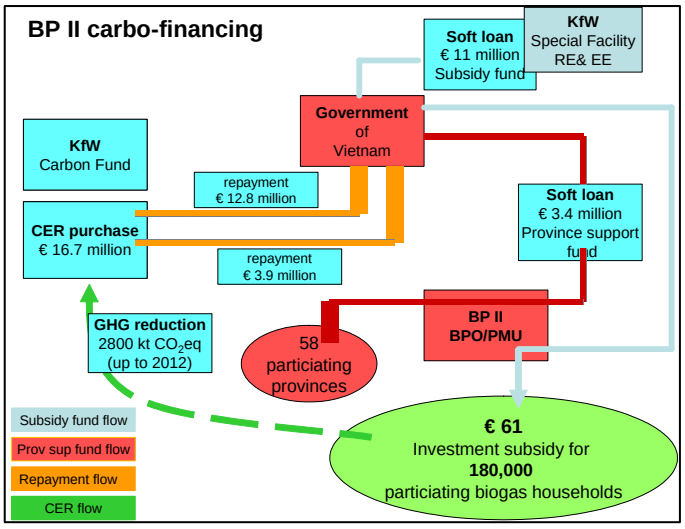
Although expectations are that after 2012 the mechanism, possibly in an adjusted version, will continue to be operational, GHG reductions after 2012 are not (yet) "bankable" as a source for loan repayment. The effect, as shown in the graph, is that at the moment some 42% of the total potential revenue will be available to debt servicing.



[10] The theoretical GHG reduction by the project would amount to 9,000 kt CO_2eq [180,000 plants * 10 years * 5 tCO_2 eq/plant/yr]. However, the calculations assume 10% of the plants not operational and 5% of the CERs remaining unsold, thus arriving at an effective GHG reduction of ~ 7,700 kt CO_2 eq.

As a result of the above "formalities", a CDM – loan combination would generate €16.7 million. The project proposes to apply the CDM – loan for two purposes:

- KfW, through the German "Special Facility for RE & EE" would, on request of the Vietnamese Government, consider providing Vietnam with a soft loan to the amount of € 11 million. This amount will suffice to provide an investment subsidy to 180,000 farmers at an average level of € 61.
- The Government of Vietnam will be requested to consider a soft loan to the project to the amount of € 3.4 million. This amount will suffice to contribute to the provincial project support costs at an average level of € 13,475 per province per annum for the project period of 5 years.

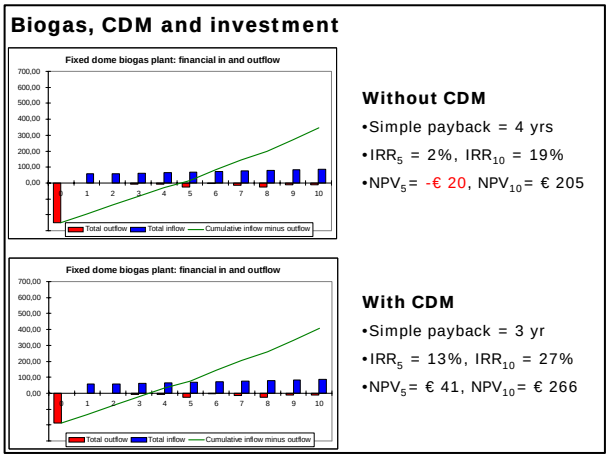


- The remaining loan CER revenue, € 2.3 million will cover the financing costs of the above mentioned two loans.

5.3 CDM impact at investor-level

Although CDM may be not a "silver bullet", the graphs indicate that CDM for domestic biogas -even if a loan has to be taken to make the revenue available up-front and even if not the full amount of CERs is available as bankable revenue- can make a reasonable impact:

- The simple repayment period reduces from 4 to 3 years
- The IRR[11] after 5 years improves from 2 to 13%
- The NPV[12] after 5 years improves from minus € 20 to € 41.



5.4 The CDM and project monitoring requirements.

To be eligible for the CDM, project implementers will have to prove the reduction of greenhouse gasses relative to the situation if the project would not take place. Simply put, in CDM language, one can distinguish between:

- The baseline situation, accounting for greenhouse gasses emitted without the project, and;
- The project situation, taking into account the GHG emission of the project.

Only the different (baseline minus project situation) can be claimed as GHG reductions by the project.

Mitsubishi Securities Co. Ltd[vii], a leading consultancy firm in the field of CDM, is currently assisting the project with the preparation of the official submission of the Project Design Document to the UNFCCC Executive Board. The monitoring methodology they are currently finalizing includes the following.

Baseline monitoring: For the participating households the current situation will have to be recorded. The minimum information requirement would be:

- Livestock type and population (pigs, dairy / non dairy cattle, buffalo)
- Average weight of livestock
- Household population
- Manure management practice
- Farming pattern (type of crops, number of harvests per year, etc)
- Fuel use (mix of domestic fuels used)
- Local / regional climate

[11] IRR: Internal Rate of Return: Return rate that equalizes the net present value of an investment with the current market price
[12] NPV: Net Present Value: Present value of investment based on future income and payments

The proposed baseline monitoring methodology will consist of a:

- one-off census of all participating farming households, and;
- the setting up of a sample group over the period of one year, consisting of at least 10 farms to establish in a detailed manner the baseline emission factors.

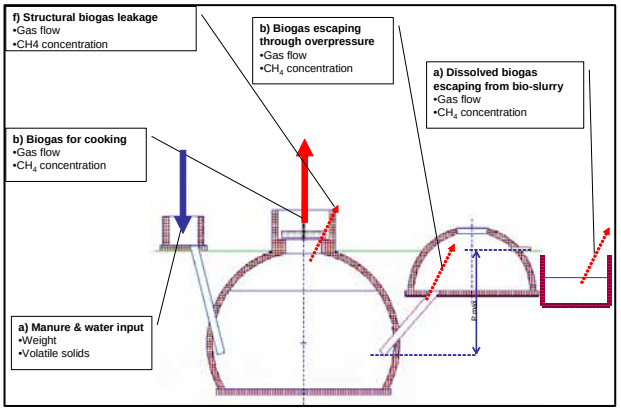
Project monitoring: Domestic biogas systems of the relatively simple "fixed dome" type as used in the project in Vietnam do not necessarily "destroy" all generated CH_4. "Leakage" can occur due to:

- Structural leakage of biogas as a result of lacking craftsmanship or maintenance.
- Biogas escaping through the compensation tank as a result of over-pressure in the system.
- Dissolved biogas escaping form the compensation tank.

The proposed project monitoring will consist of:

- The setting-up of a sample group consisting of at least 100 farmers to establish baseline as well as project emission factors over the period of one year, and;
- An annual census to compile data necessary for determining baseline and project activity levels, for the duration of the project.

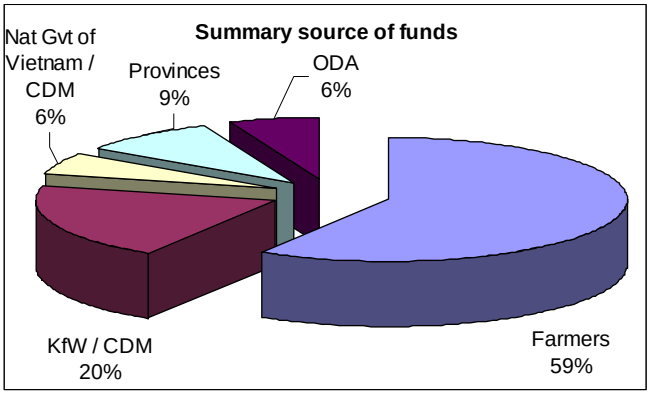
It will be clear that the required monitoring scope is large and detailed. Clearly, efforts and costs can only be justified if CDM-related monitoring –to a large extent- is integrated with regular project monitoring and quality management.



6 BP II project financing.

Funding sources for the project are divers[viii] and include farmers (direct investment), the German Kreditanstalt fuer Wiederaufbau (loan[13] and CDM[14]), the National Government of Vietnam (loan and CDM), Provincial Governments of Vietnam (contribution to project support), the Netherlands Directorate General for International Cooperation (ODA – project support) and SNV (ODA-TA).

*Farmers***:** The total average investment for a typical biogas plant ($8m^3$) amounts to ~ € 250. With an average investment subsidy component of ~ € 60, participating households will contribute ~ € 190. Thus, households will cover the lion share (75%) of the plant investment costs (€ 39 million). The remaining part 24% of the investment costs will be covered by the project's subsidy component.



KfW Carbon Fund[ix]**:** KfW's Carbon Fund has been approached for the purchase of the Certified Emission Reductions (CERs) generated by the project. With the revenue of the CER purchase, the project will repay the loans as outlined in 4.3 and 4.4 below. During the first commitment period of the Kyoto Protocol (2008 – 2012) the total "bankable" amount of CERs is estimated on € 19.7 million.

The Special Facility for Renewable Energies and Energy Efficiency[x]: The German Federal Government's Special Facility for Renewable Energy and Energy Efficiency (administered by KfW), has been approached for a soft loan to the amount of € 12.2 million to will finance the project's subsidy component. The loan will be repaid by the project's CDM revenue (see chapter 5 hereunder)

[13] KfW administers the German Federal Government's "Special Facility for Renewable Energies and Energy Efficiency. The project would apply for a soft loan from this facility.
[14] KfW's Carbon Fund.

Government of Vietnam: The National Government of Vietnam will be requested to participate with a loan in co-financing the project's provincial support costs to the extent of € 3.9 million. This loan too will be repaid by CDM revenue.

Provincial governments: Participating provincial governments will be requested to contribute on average € 100,000 (€ 20000 per annum) each to participate. In total, provinces will furnish € 5.8 million to the project budget.

DGIS / the Netherlands Ministry for Development Cooperation: DGIS financially supports the DGIS / SNV Asia Biogas Programme. For the second phase of the Biogas Project in Vietnam, an ODA grant-contribution of € 3 million for national project support costs has been committed within the framework of this programme.

*SNV / the Netherlands Development Organization***:** As a partner to the Asia Biogas Programme, SNV has committed itself to an amount of € 0.65 million to finance Technical Assistance expenses at national level.

Endnotes

[i] **Main differences between the Kyoto Protocol mechanisms.**
The Kyoto Protocol established three mechanisms by which the Parties to the KP can buy and sell emission permits: Joint Implementation (JI); the Clean Development Mechanism (CDM), and; the International Emission Trading (IET). JI and IET involve Annex I Parties only, while the CDM involves non-Annex 1 countries as sellers of certified emission reductions. The CDM and JI are project-based, whereas the IRT is target-based. The CDM aims to assist non-Annex 1 Parties to achieve sustainable development; JI and IET simply aim to reduce the costs of meeting the Kyoto commitments. The KP's provisions for the CDM also include more elaborate governance than the other two mechanisms

[ii] **Biogas and Sustainable Development.**
In 1987 the generally accepted definition of Sustainable development was published in the Bruntland Report as "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Domestic biogas is compatible with this definition as it contributes to household energy and income generation needs; reduces greenhouse gas emissions; reduces reliance on fire wood therefore pressure on forest resources; reduces ground and surface water pollution; reduces reliance on non-renewable energy sources; provides a long term solution to pollution and energy needs and -through proper application of slurry- improves soil health and reduces reliance on chemical fertiliser.

[iii] **Involvement of SNV in domestic biogas**
Fifteen years ago, SNV – the Netherlands Development Organization started in cooperation with national partners the biogas activities in Nepal. In 2003, the programme was extended to Vietnam. In the past decade, SNV further developed the use of the technology as well as a sector wide approach to stimulate the emergence of a national biogas industry. Working simultaneously with government agencies, private enterprises, NGOs, credit agencies and research institutions, all key aspects of the biogas sector received managerial and advisory support from SNV. The success of the programme in Nepal and since a few years in Vietnam can be attributed to the comprehensive market-driven approach, the strong partnerships between international development agencies and national organisations and the long-term commitment of the partners involved. Application of smart consumer subsidies coupled with strict quality standards for producers played a key role in the acceleration of demand for biogas plants by individual farmers. Worldwide, about two billion people lack clean and safe cooking fuel. To improve their lives, they need access to sustainable energy services. SNV has demonstrated in Nepal and Vietnam that domestic biogas is very well able to fulfil in the basic energy needs for cooking and lighting in rural areas. About 790,000 people benefit from biogas plants installed in the period July 1992 up to December 2004. Multiple benefits are achieved at household, local, national and global level. The current programmes in Nepal (Biogas Support Programme phase IV up to 2009) and Vietnam (Biogas Project phase I up to 2005) are set to reach another 1.15 million people and to achieve even larger benefits.

[iv] **The Asian Biogas Programme**
To up-scale its domestic biogas activities, SNV sought additional support from the Netherlands Directorate for International Cooperation (DGIS) for the implementation of the Asia Biogas Programme covering Vietnam (phase II), Bangladesh, Cambodia and Lao PDR. In addition, SNV requested assistance in setting up strategic biogas partnerships and a regional biogas network in Asia. It is estimated that an additional 1.3 million people will be reached through this Programme in the period from 2005 up to 2010. In addition, viable biogas markets will be established with good prospects for continued deployment of biogas plants after the Programme period, being after 2009 for Bangladesh, Cambodia and Lao PDR and after 2010 for Vietnam. SNV requested DGIS for a grant of € 12.9 million. A Memorandum of Understanding on the Asia Biogas Programme was signed between DGIS and SNV on the 14th of December 2004. The grant document covering the first two years of the Programme (2005 and 2006) was issued by DGIS on the 17th of May 2005, with the commitment that an agreement for the rest of the programme period will be reached in due course.

[v] **Involvement of the private sector.**
BCTs, as established under BP I, are proto-commercial biogas construction entities. To manage the demand, each district will need minimally 2 BCTs, resulting in –on average- at least 20 BCTs per province. BCTs typically consist of 3 or 4 local masons, selected from the commune for biogas construction. During BP II, more attention will be directed towards guiding these BCTs towards proper private enterprises. To this extent, following the successful model in Dak Lak province, BCTs will be encouraged to merge into Biogas Construction Enterprises (BCEs) that work on a more provincial level. Per province BP II foresees establishment of at least 2 BCEs.

[vi] **BP II Application of Funds.**

Application of funds		[Euro]	[%]	per plant	[Euro]
1	**Investment**				
1a	Direct investment (farmer)	34,265,911	67%	190.37	
1b	Investment subsidy	11,035,360	22%	61.31	
1c	Investment subsidy financing costs	1,774,468	3%	9.86	
1d	Investment credit financing costs	3,707,408	7%	20.60	
	Total investment		**50,783,147**	79%	***282.13***
3	**Provincial support**				
2a	Provincial support PBPO	9,665,634		53.70	
2b	Provincial support financing costs	508,515		2.83	
	Total provincial support		**10,174,149**	16%	***56.52***
3	**National support**				
3a	National support BPO	2,859,704		15.89	
3b	Technical assistance	645,791		3.59	
	Total national support		**3,505,495**	5%	***19.47***
	Total application		**64,462,792**	100%	***358.13***

vii **Mitsubishi Securities Co. Ltd.**

MSCL is a globally leading organization in the field of Clean Development Mechanism consultancy. MSCL, in the framework of its "Social Responsibility Policy" offered to MARD / Department of Agriculture to develop Project Design Document, Baseline Methodology and Monitoring Methodology for BP II free of charge. These documents are crucial for approval of the CDM component of the BP II by the UNFCCC Executive Board, and thus are key to mobilizing the potential CDM revenue for the project.

viii **BP II Source of funds**

Source of funds		[Euro]	[%]	per plant	
a	**Farmers**				
a1	Remaining investment *(tot inv minus subs)*	34,265,911		190.37	
a2	Credit financing costs	3,707,408		20.60	
	Total source investment		**37,973,319**	59%	***210.96***
b	**KfW / CDM revenue**				
b1	Investment subsidy	11,035,360		61.31	
b2	Investment subsidy financing costs	1,774,468		9.86	
	Total KfW / CDM revenue		**12,809,828**	20%	***71.17***
c	**National Gvt of Vietnam / CDM revenue**				
c1	Contribution to provincial support	3,364,200		18.69	
c2	Provincial support financing costs	508,515		2.83	
	Total Nat Gvt of Vietnam		**3,872,715**	6%	***21.52***
d	**Provinces**				
d1	Provincial contribution	5,800,000		32.22	
	Total provinces		**5,800,000**	9%	***32.22***
e	**Official Development Assistance**				
e1	DGIS - ABP *(Provincial support costs)*	501,434		2.79	
e1	DGIS - ABP *(National support costs)*	2,859,704		15.89	
e2	SNV - ABP *(Techn assistance costs)*	645,791		3.59	
	Total ODA		**4,006,929**	6%	***22.26***
	Total source		**64,462,792**	***100%***	***358.13***

ix **KfW Carbon Fund**

From KfW's website: "KfW Banking Group has set up a carbon fund in cooperation with the Federal German Government to purchase emission credits from JI and CDM projects. As recipients of these emission credits mainly German and European companies are to be considered who are expecting reduction obligations and wish to use project-based Kyoto mechanisms. At an early stage they can assure this way obtaining valuable emission credits at favourable prices for the 2nd phase of the ETS."

x **The Special Facility for Renewable Energies and Energy Efficiency.**

From KfW's website: "In the period 2005 – 2009 KfW Entwicklungsbank will make up to € 500 million available in the form of low-interest loans for investment in renewable energies and energy efficiency in developing countries. Up to 50 investment projects in natural resources conservation and environmental protection with an average volume of € 10 million each can be co-financed through the Special Facility, thereby mobilizing a much greater overall investment volume. KfW applies the funds on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). On the occasion of the international "Renewables 2004" conference the German federal government announced to make funds of up to € 500 million available to developing countries to spread the use of renewable energies and improve energy efficiency. The programme module "Renewable Energies" promotes investment in wind farms, biomass use and biogas plants, photovoltaic systems and solar thermal energy, geothermal power plants or hydro power plants. This supports the partner countries in an energy management that conserves natural resources and preserves the environment."