



**The Gold Standard**  
Premium quality carbon credits


**THE GOLD STANDARD:  
Project Design Document for Gold Standard  
Voluntary Offset projects  
(GS-VER-PDD)**

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Explanatory information on how to complete the PDD and how to obtain Gold Standard registration can be found in the project developer's manual available on the Gold Standard website.

This template of the PDD is applicable for micro-, small- and large-scale projects. Note that the shaded boxes present information on the Gold Standard VER project development procedures. Project developers should delete these shaded boxes when preparing their PDD.

**VOLUNTARY OFFSET PROJECTS**

**PROJECT DESIGN DOCUMENT FORM (GS-VER-PDD)**  
**Version 01 - in effect as of: January 2006)**

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## **SECTION A. General description of project activity**

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<b>A.1 Title of the project activity</b>
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Title: Biogas Tanks in Guizhou Province in China

Version: 2

Date: 27 January 2009

<b>A.2. Description of the project activity</b>
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### **Introduction**

Guizhou province, mainly constituted of a rural population, is one of the poorest provinces in China. This population still relies on traditional energy sources for cooking, such as firewood, charcoal and/or coal. As a consequence, Guizhou province is severely affected by a strong deforestation. Furthermore, the immeasurable use of coal contributes to the increase of global warming.

Moreover, the smoke coming out of the energy-inefficient stoves has a negative health impact on women and children who are the main players in the kitchen. According to the World Health Organization, Indoor Air Pollution is one of the major global concerns that remains unattended.

Since Guizhou's rural population is mainly made out of farmers, a biogas tank project that will valorize the wastes from the farming activity into a clean and convenient energy particularly fits to the local situation. The tank is built underground and is directly linked to toilets and a pigsty, constructed beside the tank. Once produced, the gas will be used in a specifically designed biogas cook stove and a biogas lamp.

### **Purpose of the Project Activity**

The purpose of the project is to provide to villagers of Guizhou's countryside a new, free and clean energy source: biogas. Beneficiaries of the project will then save money from the purchase of traditional fuels (for cooking and for lighting), and save considerable time from firewood collection. The project will also improve the living conditions of the beneficiaries. On the one hand, biogas will replace traditional fuels which combustion produces a lot of smoke, so that biogas will prevent lung and eye diseases. On the other hand, biogas will be produced through the anaerobic fermentation of organic wastes, mainly excrements, introduced in the biodigester. This, coupled with the installation of new toilets and pigsties, will improve the hygiene of the house and its surroundings. In addition to the biogas production, the residual waste will be used as a fertilizer. Finally, the project will reduce the pressure on the forest and reduce local deforestation, fighting then against global warming.

### **Implementation of the project**

Between 2007 and 2009, 1250 biogas tanks will be constructed: 250 in 2007, 600 in 2008 and 400 in 2009. The project will mainly target two districts of Guizhou province: Weining district and Danzhai district.

The first step of the implementation of the project consists in identifying the beneficiary villages. A selected village should be fairly accessible in order to bring the equipment and materials for the tanks' construction. Also, the villagers should be able to provide enough work forces since the beneficiaries will actively take part in the

construction of their tanks. Finally, the villages should be among the poorest villages because the project targets the most disfavored areas.

Once the villages are identified, the villagers will be selected according to their income, livestock and motivation to join the project and build a tank.

Biogas tank technicians will then work in the villages and help the villagers to construct the biodigesters.

### **How does the project mitigate GHG emissions?**

Depending on the area, villagers mainly use firewood and/or coal for cooking. Basically, the project will replace these traditional fuels with biogas, partly or fully. There will be then a clear traditional fuel consumption reduction. The coal consumption savings will directly be converted into CO<sub>2</sub> emissions reductions, while the wood consumption related savings will be converted to CO<sub>2</sub> emissions reductions, according to a biomass non-renewability rate.

The physical leakage and incomplete combustion of biogas is a major source of CH<sub>4</sub> emissions in the project scenario. And these emissions are higher than the emissions due to the degradation of animal waste (see Section E). Therefore, the CH<sub>4</sub> emissions are not to be reduced by the project but increased. However, even if the CH<sub>4</sub> emissions are increased, the overall greenhouse gas emissions (in unit of CO<sub>2</sub> equivalent) are reduced by the project activity. The reduction of CO<sub>2</sub> equivalent emissions (due to traditional fuel combustion) is greater in magnitude than the increase of CH<sub>4</sub> (see Section E).

### **View of the project participants of the contribution of the project to Sustainable Development**

The Initial Stakeholder Consultation (see Section G) witnessed many interests in the biogas tank project, in terms of sustainable development. The project will contribute to the local development of the beneficiaries' villages through the following ways:

#### Impact on Natural Resources

- *Avoided deforestation*  
The project slows down deforestation and preserves biodiversity and local ecosystems in general.
- *Water quality*  
Thanks to a better management of the excrements, there are less viruses and bacteria in the local environment<sup>1</sup>, which improves indirectly the water quality.

#### Socio-economic Impacts

- *Reduction of time spent for firewood collection*  
For the project's beneficiaries who used to collect firewood in the forest to satisfy their energy demand, a biogas tank will make them reduce their firewood consumption; hence they will save time spent on collecting firewood.
- *Reduction of time spent for cooking*  
Biogas is more convenient to use than firewood and coal: the stove is more efficient, so that cooking needs less time; moreover, cooking with biogas doesn't require getting the fuel and launching the fire before using it. That's why the beneficiaries agree that biogas is more convenient and requires less time for cooking.
- *Money saved from the purchase of fuel, electricity and fertilizers*

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<sup>1</sup> SOLAGRO, 2002. *Effets de la digestion anaérobie sur les micropolluants et germes pathogènes.*

For the project's beneficiaries who used to buy their fuel for cooking (coal or charcoal), a reduction of their traditional energy consumption will also mean a reduction of the money spent in their cooking fuel. Also, the biogas tank comes with a biogas lamp, which will replace electric lamps, and then reduce the money spent by the households for their electricity consumption.

#### Impact on health

- *Enhanced hygiene of the house*  
The biogas tank will be directly fed with animal and human excrements, through the toilets and pigsty specifically built for this project. The hygiene level and living conditions of local populations will be improved due to the installation of toilets and pigsties close to the biodigesters.
- *Reduction of smoke emissions in the kitchen*  
Cooking with firewood and coal indoors fills the house with smoke, which contains airborne particles, carbon monoxide and other toxic elements. All of these emissions can cause lung diseases and other health problems. Biogas stoves are smoke-free.

### **Sustainable Development Matrix**

#### Explanation of the Grid

1. As explained in the previous section, the water quality is indirectly improved due to the new management system of the excrements. Some project areas have a poor access to water, although water is necessary for the running of the biogas system. However, it doesn't seem to be a problem for the beneficiaries, as the tank is filled with waste water.
2. As explained in the previous section, the air quality is improved thanks to a reduction of the combustion of traditional fuels (coal and firewood), which emits smokes, carbon monoxide, toxic elements and airborne particles. This is one of the main purposes of the project. At the same time, nasty odors coming from manure are reduced due to the organic elements decomposition occurring in the tank.
3. Besides the production of methane, the anaerobic decomposition that occurs in the tank also produces hydrogen sulfide (H<sub>2</sub>S), which combustion releases sulfur dioxide (SO<sub>2</sub>), both considered as toxic and responsible for respiratory ailments<sup>2</sup>. However, a filter located in the manometer prevents the emission of this H<sub>2</sub>S, therefore of SO<sub>2</sub>. Anaerobic digestion enhances ammoniac (NH<sub>3</sub>) production, which is mainly found in the residual wastes of the tank. NH<sub>3</sub> spreads easily in the air when the wastes are withdrawn from the tank. For high concentrations, it may be harmful. That is why beneficiaries are trained on a proper management of the tank's sewage. The difference of NH<sub>3</sub> production between the natural outdoor and anaerobic decomposition of the excrements depends on multiple external factors such as outside temperature, means of excrements spreading, etc. No in-depth studies were conducted to assess this difference. Finally, the nitrous oxide (N<sub>2</sub>O) emissions, a GHG with a high global warming potential (298; IPCC, AR4, 2007), seem to be decreased with an anaerobic waste management compared to a natural outdoor decomposition<sup>3</sup>.
4. The residual wastes in the tank can be used as a natural fertilizer. Its impact on the local soil fertility has not been studied in details.
5. The project avoids local deforestation and protects the forest's ecosystem.

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<sup>2</sup> R.A.Hamburg, 1989. *Household Cooking Fuel Hydrogen Sulfide and Sulfur Dioxide Emissions from Stalks, Coal and Biogas*.

<sup>3</sup> Fédération des producteurs de porcs du Québec, 2004. *Les sous-produits liquides de traitement des lisiers*.

6. No significant impact on social sustainability and development, in terms of employment.
7. As explained in the previous section, poverty alleviation is one of the expected results of the project. Villages of Guizhou province are among the poorest areas of the whole China, so the biogas tanks provide to the villagers with a free energy source. Thanks to the biogas produced, the villagers save money from fuel expenditures and electricity bills.
8. As explained in the previous section, a better access to energy is one of the main objectives in the project. Firewood users save time on firewood collection in the forest. Beneficiaries of the project expressed that biogas is more convenient to use and free, compared to traditional fuels.
9. Beneficiaries of the project are fully active in the construction of the tank, so that they develop new skills, such as in masonry, in wastes management, in residual wastes use, or more generally, in biogas production.
10. The project needs biogas technicians, as well as local promoters who will explain and help the beneficiaries in the construction of their tanks. These promoters are hired to check the project and to monitor it. Moreover, they help the villagers in case of malfunctions of the tank. The promoters come from Guizhou villages.
11. No significant impact was found.
12. Biogas production in tanks already exists in China, but as far as the time of the writing, the biodigesters are installed in more economically privileged areas, since the users have to purchase their tanks. On the other hand, the project focuses on the most disfavored areas of Guizhou, mainly ethnic minorities of China. Many NGOs are now interested to implement biogas projects in those areas.

<b>Local/regional/global environment</b>	
1. Water quality and quantity	1
2. Air quality (emissions other than GHGs)	+ 2
3. Other pollutants (where relevant, toxicity, radioactivity, POPs, ozone depleting gases)	0
4. Soil condition (quality & quantity) – use of organic fertilizer or sludge for land application	1
5. Biodiversity (species and habitat conservation)	+ 1
<i>Sub total</i>	+ 5
<b>Social sustainability and development</b>	
6. Employment (including job quality, fulfilment of labour standards)	1
7. Livelihood of the poor (including poverty alleviation, distributional equity, and access to essential services)	+ 2 (*)
8. Access to energy services	+ 2 (*)
9. Human and institutional capacity (including empowerment, education, involvement, gender)	+ 1
<i>Sub total</i>	+ 6
<b>Economic and technological development</b>	
10. Employment (numbers)	+ 1
11. Balance of payments (sustainability)	0
12. Technological self reliance (including project replicability, hard currency liability, skills development, institutional capacity, technology transfer)	+ 1
<i>Sub total</i>	+ 2
<b>TOTAL</b>	<b>13</b>

**A.3. Project participants:**

Name of Party involved (Host) indicates a host Party)	Private and/or public entities project participants (As applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Initiative Développement (Project Coordinator)	French-based NGO	Yes

**A.4. Technical description of the project activity:**

**A.4.1. Location of the project activity:**

**A.4.1.1. Host Party:**

People's Republic of China

**A.4.1.2. Region/State/Province etc.:**

Guizhou Province

**A.4.1.3. City/Town/Community etc:**

The biogas tanks will be constructed in several villages of Guizhou's countryside. 1250 will be constructed in the districts of Weining and Danzhai. Other districts may be identified later during the implementation of the project.

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):**

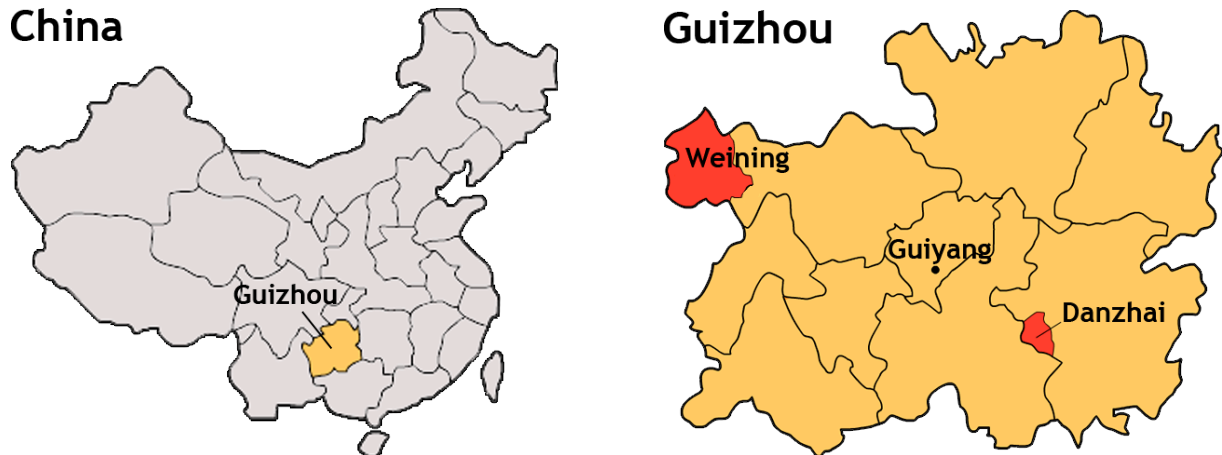
The Office of ID China in Guiyang keeps a list of the beneficiaries. On the field, the beneficiaries will be identified thanks to a sign on their tank with their identification number. The first tanks are constructed in the districts of Weining and Danzhai.

Address of ID China Office

Initiative Développement – N°25 – 2<sup>nd</sup> floor 5#, Wufeng Road  
YunYan District - GuiYang City  
GuiZhou Province CHINA 550001

Contact <http://www.id-ong.org>

Christophe Barron: [c.barron@id-ong.org](mailto:c.barron@id-ong.org)



**Figure 1 – Maps of People's Republic of China and of Guizhou Province**

**A.4.2. Size of the project:**

As the assessed project emission reductions are at the most 4 999 tCO<sub>2</sub>e per year, the project falls under the micro-scale category.

**A.4.3. Category of project activity:**

Domestic Renewable Energy, Biogas, Agro processing and other residues.  
 (Point A.1.1.2.2 of the Appendix A of the Gold Standard VER Project Developer's Manual)

**A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectorial policies and circumstances:**

**How does the project mitigate GHG emissions?**

As explained before, project's participants will save firewood and/or coal, which they use as cooking fuels, thanks to the introduction of the biodigester technology. The non-renewable biomass ratio is assessed in order to claim the emission reductions concerning the wood savings. Furthermore, the coal savings are translated into emission reductions as well.

In the project scenario, methane emissions are rather increased than reduced. The physical leakage of methane and incomplete combustion of biogas will be accounted and will be deducted from the overall emission reductions. In a nutshell, the project will mitigate GHG emissions that would have been released to the atmosphere in the absence of the project.

### Estimation of total reductions

The total emission reductions achieved by the project are estimated at 46,551 tCO<sub>2</sub>e during a fixed crediting period of ten years.

### Additionality or “why the GHG emissions reductions wouldn’t occur without the project?”

Because of financial barriers (the project doesn’t provide sources of income), the biogas tank project couldn’t be implemented without the VER credits. Moreover, alternative situations such as biogas tank constructed by the government, or sold directly to the beneficiaries are not feasible since the beneficiaries targeted by the project are among the poorest populations of the whole China and can’t afford a biogas tank. A biogas set (tank, toilets and pigsty) should be sold at a higher price than 315 Euros (including material, human resources, training, etc., while the beneficiaries earn less than 1000 CNY per year per person, which means less than 2000 CNY per year per household (around 200 Euros). Finally, it may be assumed that beneficiaries of the project wouldn’t have switched to other energy sources placed higher in the energy ladder, such as LPG and Kerosene, because those fuels are far more expensive than free firewood, cheap charcoal and coal. Since electricity is a more convenient and available source, beneficiaries have already switched, to some extent, to electricity used for cooking (boiling water mainly). This is why the project wouldn’t be implemented without the VER credits; neither would be the governmental biogas project or the biogas tanks sold through the economic market. The only realistic alternative to the project is the current situation, where a switch to cleaner energy sources wouldn’t occur: the GHG emissions reduced by the project wouldn’t occur without the project.

#### A.4.4.1. Estimated amount of emission reductions over the crediting period:

Years	Annual estimation of emission reductions (in tCO <sub>2</sub> e)
2008	1250
2009	3966
2010	4999
2011	4999
2012	4999
2013	4999
2014	4999
2015	4999
2016	4999
2017	4999
2018	1343
<b>Total emission reductions (tCO<sub>2</sub> e)</b>	<b>46551</b>
<b>Total number of crediting years</b>	<b>10 years</b>
<b>Annual average over the crediting period of estimated reductions (tCO<sub>2</sub>e)</b>	<b>6846</b>

**Table 1 – Estimated amount of emission reductions over the crediting period**

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**SECTION B. Application of a baseline methodology**

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**B.1. Title and reference of the approved baseline methodology applied to the project activity:**

Indicative programme, baseline, and monitoring methodology for Small Scale Biogas Voluntary Gold Standard.

**B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:**

This methodology is applicable as per definition of Section I of the Indicative programme, baseline, and monitoring methodology for Small Scale Biogas, Voluntary Gold Standard:

This methodology is applicable to programmes of activities involving the implementation of biogas in households within the project's boundaries. The project activity is implemented by a project coordinator who acts as the project participant. The individual households will not act as project participants. The consumption of biogas from the biogas plants replaces the consumption of fossil fuel and/or biomass.

Furthermore, the following conditions apply to the methodology:

- The biogas programme promotes the wide-scale use of biogas as substitute for wood, agricultural residues, animal dung and fossil fuels that are presently used for the cooking, space heating and lighting needs of most rural households.
- The methodology applies to project with biogas plants with a maximum total biogas plant volume of 20 m<sup>3</sup>.
- The biogas plants in the programme are not included in another CDM or voluntary market project (i.e. no double counting takes place),
- If more than one climate zone is included in the project, the project should make a distinction per climate zone.

Under the presented scheme:

- The biogas tank project is implemented by Initiative Développement who acts as the project participant.
- The volume of implemented biogas plants is 8 m<sup>3</sup> and biogas is used for cooking purposes in replacement of fossil fuel and biomass (firewood and charcoal).
- All the tanks of the Initiative Développement Biogas Tank programme are included in only this voluntary carbon project. Initiative Développement gets some co-funding for this project from private sponsors, but the partnerships with these sponsors are not based on GHG emission reductions.
- Finally, since the geographical project boundaries are wide, the project may include several climate zones, so that the project will make a distinction per climate zone.

**B.2. Description of how the methodology is applied in the context of the project activity:**

As determined in the section II of the methodology, two main points are studied to determine the baseline scenario: The most plausible scenario and the assessment of suppressed and satisfied demand.

**1) The most plausible scenario**

The methodology offers two possibilities:

- The baseline scenario is the pre-project scenario i.e. the situation before the implementation of the project.
- The baseline scenario is the situation where fossil fuels are used to meet energy service needs (even if they are not currently being used).

LPG tanks of 11.5 Kg cost around 90 CNY in Guizhou province. Since the baseline energy demand is high, in order to switch from traditional cooking fuels (firewood and coal) to LPG, a household would need around 30 LPG tanks per year to meet their energy demand<sup>4</sup>, which represent annual expenses of 2700 CNY. This is greater than the annual income of the households.

A switch to LPG is then too expensive for the populations targeted by the project. Besides, a switch to Kerosene is not likely to occur since cooking with kerosene is not a common practice in Guizhou's countryside. In any case, it would be too expensive as well.

Therefore, as a switch to fossil fuel is not likely to occur in the next few years, the most plausible baseline scenario is the pre-project situation, in which firewood and coal remain the main fuels used for cooking.

## 2) Suppressed and Satisfied demand

The two main energy profiles for cooking are: first, households who use mainly firewood for cooking; second, households who mainly use coal as their main fuel, including for cooking.

- Firewood is always collected in the forest and never bought in the market, so that it's a free energy source, which only requires time for collection. Even though the forest suffers from a severe deforestation, the wood remains available; therefore, the energy demand of the villagers can be fully satisfied, without the biogas project. That's the case for Danzhai district.
- For the second profile, coal is bought a few times in a year in large quantities because it's a fuel used for both space heating and cooking. During the winter, beneficiaries heat their houses almost the whole day, so that space heating requires far more energy than cooking. During summer, beneficiaries don't heat their households anymore. In any case, beneficiaries resort to coal instead of firewood when coal is easily available at low prices satisfying the energy demand for cooking. That's the case for Weining district.

Moreover, the project helps to replace traditional cooking fuels with biogas. It might be considered that the energy demand for cooking is rarely suppressed, contrary to the energy demand for space heating. When energy sources are not available in large quantities or are too expensive, household members would rather reduce their energy consumption for space heating instead of decreasing their consumption for cooking, which is less flexible.

Therefore, the villages targeted by the biogas project are not considered to present a suppressed demand.

The baseline scenario chosen is then the pre-project situation with no suppressed demand.

## 3) Parameters to determine in order to quantify the baseline

The key parameters needed to determine the baseline scenario are displayed in the next table. Baseline emissions are calculated for a period  $p$  and for a climatic area (see Annex 3.).

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<sup>4</sup> Estimation based on the comparison between LPG and Firewood NCVs, and LPG stoves and Firewood stoves efficiencies.

$NCV_{\text{firewood}} = 15.6 \text{ Tj/Gg}$ ,  $NCV_{\text{lpg}} = 47.3 \text{ Tj/Gg}$ ,  $\text{Efficiency}_{\text{Firewood}} = 10\%$ ,  $\text{Efficiency}_{\text{LPG}} = 80\%$ .

$\text{Consumption} = 23 \text{ kg of firewood / day} \approx 23 * (NCV_{\text{firewood}} / NCV_{\text{lpg}}) * (\text{Efficiency}_{\text{Firewood}} / \text{Efficiency}_{\text{LPG}}) \text{ kg of LPG / day}$

$\text{Consumption} \approx 0.95 \text{ kg of LPG / day} = 30.1 \text{ LPG Tank / year}$

Name	Description	Source
$N_{\text{sample},p}$	Number of households in the baseline sample.	ID
$N_{\text{hh},p}$	Number of households participating in the project in the climatic area.	ID
$F_{i,p,h}$	Daily amount of fuel $i$ consumed by household $h$ of the baseline sample during the period $p$ (kg)	Survey conducted by ID
$MS_h$	Fraction of livestock's manure put into the tank by household $h$ of the baseline sample.	Survey conducted by ID
$MCF_h$	Methane conversion factor of the manure management system of the household $h$ .	Survey conducted by ID
$LC_{T,p,h}$	Number of livestock of category $T$ in household $h$ of the climatic area during the period $p$ .	Survey conducted by ID
$D_{\text{hh},p}$	Duration of use of the biogas of household $h$ of the climatic area during the period $p$ (days).	Monitoring of ID
$\square_{\text{NRB},h}$	Non-renewability rate of biomass consumed by household $h$ of the baseline sample	Study undertaken by ID
$EF_{\text{CO}_2,i}$	CO <sub>2</sub> Emission Factor per unit of energy of fuel $i$ (MJ/kg)	IPCC Guidelines
$NCV_i$	Net Calorific Value per mass unit of fuel $i$ (kgCO <sub>2</sub> eq/MJ)	IPCC Guidelines
$GWP_{\text{CH}_4}$	Global Warming Potential of methane.	IPCC Guidelines
$VS_T$	Daily volatile solid excreted for livestock category $T$ (Kg dry matter/animal/day).	IPCC Guidelines
$Bo_T$	Maximum methane producing capacity for manure produced by livestock category $T$ (m <sup>3</sup> CH <sub>4</sub> /kg of VS <sub>T</sub> )	IPCC Guidelines

**Table 2 – Key Parameters to determine the Baseline Situation**

#### 4) Evolving Baseline

For the years 2007 and 2008, the project is implemented in several villages of Danzhai and Weining districts. These two districts constitute two different climate areas and different baselines are required for each. The main energy sources used for cooking are firewood in Danzhai and coal in Weining.

In case a new climatic area is added to the project, a new baseline will be needed. Moreover, the contexts may be different in different villages of the same climatic area, according for example to the availability of firewood. In a climatic area, an update baseline study could then be needed, as well as a new non-renewable-biomass study.

As the time of writing, two baseline studies were carried out: one for a typical Miao village of Danzhai, Jiao Gui village and one for the project area of Weining district.

For more details on the evolving baseline, see Annex 3.

**B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered VER project activity:**

##### 1) Description of the Baseline scenario

As determined in the section B.2, the baseline scenario is the pre-project situation without suppressed demand. Therefore Baseline Option I (b) (survey on a sample) of the methodology has been applied. Two different areas in the project boundaries are already identified and two baseline surveys have been carried out, one for Jiao Gui village

of Danzhai (typical Miao village of Danzhai district, in Long Quan Municipality), and one for the project area in Weining district. The results of the baseline surveys give information on the pre-project scenario.

The results and reports of the baseline surveys are available at <http://ftp.web.free.fr/odd/docs/docsfc/acces.php> (login = carbonfin & password = ctx56m).

A) Jiao Gui village – Danzhai district

A survey was conducted in February and March 2008 in the Jiao Gui village of Danzhai district (Guizhou Province). Jiao Gui is a common Miao village of Danzhai district, one of the poorest areas in China. The survey was carried out among a random selection of project beneficiaries, at least less than three months after the biogas tank construction. 88 villagers were interviewed (another 30 respondents were interviewed in other villages, in order to compare the end users' behavior in different Miao villages).

The survey revealed that Miao people in Danzhai mainly use firewood for cooking and they collect it by cutting small trees or branches in the forest nearby their houses. Some agricultural waste (mainly corn) and dead wood are also used for cooking by the villagers. They use other cooking fuels such as coal and charcoal, but their main use remains space heating, while firewood is only used to cook food (for people or animals).

Two different periods with different energy consumption were identified in the year: summer and winter. Even though firewood is not used for space heating even during winter (but coal or charcoal), the firewood consumption remains higher in the winter, since the meals and the cooking related practices vary from season to season. In the baseline situation, the beneficiaries of the biogas tank project used to consume an annual average of 22.97 kg of equivalent dry firewood collected on trees for cooking per day per household (the actual consumption is higher because the wood is partly wet, and because villagers also consume dead wood simply collected in the forest).

The main energy source for Miao people in Danzhai remains firewood. Nonetheless, they still rely on other energy sources such as coal, charcoal and even electricity. For lighting in the baseline situation, depending on the way of calculation, their electricity consumption was at least 57.4 kWh per year per household (the baseline figure 57.4 kWh is then conservative because it may underestimate the actual baseline consumption).

Finally, about the farming activity, it was observed that Miao villagers owned an average of 2.42 pigs, 0.76 piglets, 1.14 buffalos and 0.26 horses. All the respondents use the manure as a fertilizer in the fields, but also employ chemical fertilizers and pesticides.

Some other Miao villages of Danzhai were visited during the survey. The interviews revealed that the average baseline consumption of dry firewood for cooking was similar to Jiao Gui village, which means that the cooking behavior of Miao people in Danzhai could be considered homogenous. The average baseline consumption for other villages in the sample was found to be about 23.16 kg of dry firewood for cooking per day per household, so that the difference with Jiao Gui village is only 0.8%. The conclusion is then an average firewood baseline consumption of 23 kg per day per household in Danzhai district. This consumption compared to the sustainable yield of the local forest provides a non-renewability rate of the biomass for Long Quan (a municipality of Danzhai district, which includes Jiao Gui natural village) of 85%.

B) Weining district

A second survey was conducted in March 2008 in the municipality of Weining targeted by the project: Dong Shan. It revealed that Dong Shan villagers mainly use coal for their thermal energy needs. The sample size was 58 respondents.

As for Danzhai district, two different periods were identified: winter where people use fuel for space heating (from October-November to February-March) and summer (from March-April to September-October).

Villagers buy trucks of coal few times a year and use it for cooking, space heating, water boiling and cooking animals' food. The survey revealed that they consume a daily average of 18.86 kg of coal for both cooking and space heating, and consume 6.37 kg of coal for cooking only, which can be conservatively considered as the summer consumption when villagers don't heat their houses.

For lighting, the annual electricity consumption was found to be approximately 49 kWh per household per year.

Finally, about the farming activity, it was evaluated that Dong Shan villagers owned an average of 3.51 pigs, 4.07 piglets, 0.38 buffalos and 0.09 horses.

## 2) Description of the Project scenario

The Project scenario is the situation where beneficiaries are using the biogas produced from their waste management in the tank.

Baseline surveys were carried out among beneficiaries of the biogas tank project a few months after the construction of the tanks. They were able to answer about their baseline consumption as well as their project consumption, in order to quantify the project scenario. As expected, the fuel consumption was sensibly reduced and was converted into CO<sub>2</sub> emission reductions (please refer to Section E).

In Jiao Gui village (Danzhai), the average consumption of dry firewood, obtained from cutting trees in the forest, was 13.03 kg per day per household (average between summer and winter consumptions). In Dong Shan, the coal consumption was 13.72 kg per day per household (including space heating), and 0.76 kg per day per household (just for cooking, which may account for the summer consumption).

## 3) What are the ERs?

In Danzhai district, villagers mainly use firewood for cooking. Basically, the project will replace this firewood with biogas, partly or fully. The firewood consumption of Jiao Gui village was estimated to be 85 % non-renewable. 85 % of the firewood savings accomplished by the project are then converted into CO<sub>2</sub> emission reductions.

In Weining, the cooking fuel is mainly coal. Coal savings due to the project's implementation were translated into CO<sub>2</sub> emission reductions.

The physical leakage and incomplete combustion of biogas is a major source of CH<sub>4</sub> emissions in the project scenario. These emissions were accounted and deducted from the whole estimation of ERs.

## 4) Additionality of the ERs

As required in the methodology, the additionality is demonstrated using the latest version (version 04) of the "Tool for the demonstration and assessment of additionality" which is available on the UNFCCC website. The assessment was made from the perspective of the project coordinator undertaking the project activity which is Initiative Développement (ID).

### Step 1. Identification of alternatives to the project activity

#### *Sub-step 1a. Define alternatives to the project activity*

The following options are identified as alternative baseline scenarios:

- EBL1: Continuation of the current situation
- EBL2: Biogas Tank project undertaken without the VER credits
- EBL3: Biogas Tanks sold through the market
- EBL4: Biogas Tank project implemented by the government
- EBL5: Switch to LPG and/or Kerosene

*Sub-step 1b. Consistency with mandatory laws and regulations*

All the alternatives are complying with the existing regulations and laws.

Step 2. Investment analysis

*Sub-step 2a. Determine appropriate analysis method*

Contrary to the alternative EBL3, the project situation doesn't generate any income for the project coordinator other than VER credits. Therefore, simple cost analysis (Option I) was applied.

*Sub-step 2b. – Option I. Apply simple cost analysis*

Initiative Développement (ID) is implementing two projects in China: first, a water tank project and; second, the biogas tank project. A French sponsor, who has supported the activities of ID for many years, is mainly funding the water tank project. Actually, the sponsor already supported ID before the biogas tank project, when ID was only implementing projects on hygiene and water supply. Now, ID is relying on VERs for covering the expenses of the biogas tank project, which is becoming its main activity in China. For the years 2007, 2008 and 2009, 1350 biogas tanks will be constructed. For these three years, the estimated budget for the overall project (water supply and biogas tank) is shown below. It breaks down the project's costs of ID's activities in China:

Description	Costs (in Euros)	
	2007-2008	2009
Human Resources (coordinator, assistant, field teams)	58 985	49 380
Biogas tanks and ater tanks Construction	241 202	131 170
Equipment (office, cars, transportation, etc.)	27 536	19 200
other costs	11 739	5 000
inflation	0	10 776
Administrative costs (10%)	42 433	29 096
<b>TOTAL</b>	<b>381 895</b>	<b>244 622</b>
Revenue from selling of VERs	25 9717	134 750
Total costs of the project covered by VERs revenue	68%	55%

**Table 3 – Estimated Cost of the Biogas Tank and water supply project for the years 2007, 2008 and 2009 (1350 tanks)**

ID may receive some help from local offices (some material) and relies on the active participation of the beneficiaries of the project, to lower the costs of each tank, but without receiving financial support from them.

On the other hand, the tanks don't provide new sources of income once constructed. Project's participants see an economic benefit once the tanks are constructed. They save a percentage of their personal fuel consumption.

Therefore, ID does not rely on any source of income from the project activity, except from the VERs: The project is not financially attractive for ID, an NGO with non-lucrative purposes. In other words, it means that the no-project situation (alternative EBL1) is more financially attractive.

Step 4. Common practice analysis

The biogas tank is a well-known practice in China, since the Chinese government developed projects of construction and diffusion of biogas tanks in many parts of the country. However, the government selects its intervention areas according to its own criteria, and the areas selected are rarely among the poorest of the country. The government requires that a beneficiary participates financially and substantially to the biogas tank construction, so that the poorest families and the poorest areas can't afford a governmental biogas tank. Moreover, ethnic minorities in China are often forgotten by the government, therefore the poorest Miao villages are not likely to benefit from the government biogas tank projects. That's why alternative EBL4 (Governmental project) is not realistic, since the poorest Miao villagers of Guizhou are not targeted by the governmental projects, and since they can't afford a biogas tank. For the same reason as the financial barrier, the alternative EBL3 (Biogas tanks sold through the market) is not realistic either, neither is EBL2 (project without VER).

Finally, in the no-project situation, the beneficiaries wouldn't switch to other fossil fuels such as LPG or Kerosene, for the reason that LPG and Kerosene are far more expensive than firewood, charcoal and coal. Alternative EBL5 (Switch to LPG and Kerosene) is then also not realistic.

Conclusion

The only realistic alternative is EBL1 (continuation of the current situation). Because the project doesn't create sources of income for the project developer (ID), this alternative EBL1 is financially more attractive. That's why there's a strong need of VER credits to implement the project. The project is additional.

**B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:**

As per chapter I section II of the methodology, "*the physical, geographical site of the renewable energy generation delineates the project boundary*", in the case of this project, the physical boundaries are limited to the areas where the biodigesters are built. They are currently constructed in Danzhai and Weining districts and may be identified thanks to a sign with an identification number. The complete list is available in the offices of Initiative Développement.

According to the same chapter, the greenhouse Gases that could be included in the project boundary are listed in the table below:

	Source	Gas	Included	Justification/ Explanation
Baseline	Thermal energy need	CO <sub>2</sub>	Yes	Major source of emission
		CH <sub>4</sub>	No	Excluded for simplification, this is conservative
		N <sub>2</sub> O	No	Excluded for simplification, this is conservative
	Animal waste handling and storage	CO <sub>2</sub>	No	Excluded as CO <sub>2</sub> emissions from animal waste are CO <sub>2</sub> neutral
		CH <sub>4</sub>	Yes	Major source of emission
		N <sub>2</sub> O	No	Excluded for simplification, this is conservative

Project Activity	Direct Emission from biodigesters	CO <sub>2</sub>	No	Excluded as CO <sub>2</sub> emissions from biogas incineration are CO <sub>2</sub> neutral
		CH <sub>4</sub>	Yes	Emissions from physical leak or incomplete combustion of biogas
		N <sub>2</sub> O	No	Excluded for simplification, this is conservative

**Table 4 – GHG included in the project boundaries**

**B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:**

**Date of Completion**

31/03/2008 for both Danzhai and Weining Baselines.

As the Baseline is evolving, the Baseline may be completed later with new studies. These eventual updated baseline studies would be made by ID.

**Contact Information**

Initiative Développement (in Annex 1)  
GoodPlanet / Action Carbone [www.goodplanet.org](http://www.goodplanet.org) / [www.actioncarbone.org](http://www.actioncarbone.org)

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**SECTION C. Duration of the project activity / Crediting period**

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**C.1 Duration of the project activity:**

**C.1.1. Starting date of the project activity:**

The project activity started its construction phase on the 1<sup>st</sup> of September 2007. However, it takes approximately 3 to 4 months for the biodigesters to start up and begin producing biogas. Furthermore, monitoring activities were put in place until the summer period began. Therefore, the project will start claiming credits from the beginning of the summer period of 2008.

**C.1.2. Expected operational lifetime of the project activity:**

A biogas tank is usually constructed for more than 20 years. The Agriculture Office of the districts targeted will implement a management and maintenance system (see Annex 3.) Therefore, the expected operational lifetime of the project activity is greater than 20 years.

**C.2 Choice of the crediting period and related information:**

The project activity will use a fixed crediting period.

**C.2.1. Renewable crediting period**

**C.2.1.1. Starting date of the first crediting period:**

Not applicable

**C.2.1.2. Length of the first crediting period:**

Not applicable

**C.2.2. Fixed crediting period:**

**C.2.2.1. Starting date:**

April 2008

**C.2.2.2. Length:**

10 years

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## **SECTION D. Application of a monitoring methodology and plan**

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**Note:** The following monitoring methodology and plan has to be applied to each climate region identified in the project area.

**D.1. Name and reference of approved monitoring methodology applied to the project activity:**

Indicative programme, baseline, and monitoring methodology for Small Scale Biogas Voluntary Gold Standard.

**D.2. Justification of the choice of the methodology and why it is applicable to the project activity:**

See section B.1.1.

### **D.2.1. OPTION 1: Monitoring of the emissions in the project scenario and the baseline scenario**

The project area is divided in climatic areas, and each climatic area in villages or groups of villagers. During each period  $p$  (summer or winter of a year  $y$ ), a monitoring survey is carried out on each climatic area, and the sample has to be geographically representative of its climatic area. Then, the project emissions are assessed for each period  $p$  and for all the beneficiaries of the climatic area concerned by the monitoring survey. The baseline emissions are also assessed for each period  $p$  and the same climatic area. For more explanations, see annex 3.

**D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

The following data concern a period  $p$ .

ID number	Data variable	Source of data	Data unit	Measured, calculated, estimated	Recording frequency	Proportion of data to be monitored	How will the data be archived?	Comment
PE.1	<i>Number of households in the monitoring sample</i>	ID	Households	-	Twice a year	-	Electronic	<i>A monitoring survey is conducted during each period <math>p</math>.</i>
PE.2	<i>Number of households in the climatic areas</i>	ID	Households	-	Twice a year	-	Electronic	<i>Updated as long as new biodigesters are built.</i>
PE.3	<i>Daily consumption of fuel <math>i</math> of households of the monitoring sample</i>	Survey	Kg	<i>estimated</i>	Twice a year	<i>Sample (at least 60 households)</i>	Electronic and paper	<i>The daily consumption concerns different activities according to the type of period and climatic area. Cooking is always one of these activities.</i>
PE.4	<i>Fraction of livestock's manure fed into the biodigester</i>	Survey	%	<i>estimated</i>	Twice a year	<i>Sample (at least 60 households)</i>	Electronic and paper	<i>The fraction is estimated for all the animals whose manure is put into the biodigester. No differentiation is made by type of animal.</i>
PE.5	<i>Number of heads of livestock category <math>T</math></i>	Survey	Animals	<i>estimated</i>	Twice a year	<i>Sample (at least 60 households)</i>	Electronic and paper	<i>The animals are the ones whose share of manure is put into the biodigester.</i>
PE.6	<i>Starting date of use of biogas for the new households selected</i>	ID	Date	-	Monthly	-	Electronic	<i>During a period <math>p</math>, a new biodigester might need time to be in use, hence the monitoring of the starting date of use.</i>
PE.7	<i>Starting date of the period <math>p</math></i>	ID	Date	<i>estimated</i>	Twice a year	-	Electronic	<i>This date is estimated by monitoring the period of heating of households in the climatic areas.</i>
PE.8	<i>Ending date of the period <math>p</math></i>	ID	Date	<i>estimated</i>	Twice a year	-	Electronic	<i>This date is estimated by monitoring the period of heating of households in the climatic areas.</i>
PE.9	$GWP_{CH_4}$	IPCC Guidelines	-	-	According to IPCC's publications	-	Electronic	-

PE.10	NRB Rate of Non Renewable Biomass	Study	%	estimated	Every two years	-	Electronic and paper	Original NRB studies have already been conducted. It may be updated every two years. The methodology is given in a specific document.
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**D.2.1.2. Data to be collected in order to monitor project performance on the most sensitive sustainable development indicators:**

Sustainable Development Indicator	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Comments
Livelihood of the poor	Financial amount	Money savings of the beneficiaries	CNY	Calculated	The average price and the amount of the traditional fuels replaced by the biogas will be monitored. The Monitoring survey also asks for the benefits felt by the beneficiaries, which include the choice "Money Savings".
Access to energy	Percentage	Share of the biogas in the total energy mix of the household	%	Calculated	The amount of traditional fuel consumed by the beneficiaries for their energy needs will be monitored. The use of the biogas lamp will be also monitored.

Besides monitoring the data shown above, the hygiene related improvements due to the project's implementation will be evaluated qualitatively (see Annex 3.)

**D.2.1.3. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO2 eq.)**

In the next formulae, the term "sample" refers to the sample of the monitoring survey conducted during the period  $p$ . The emissions are estimated for each climatic area, and the calculation has to be done as many times as there are climatic areas. The averages are made for the sample.

**Project emissions of the period  $p$**

$$PE_p = (PE_{FC,d,p} + PE_{biogas,d,p}) \cdot N_{hh,p} \cdot D_{uss,p} \cdot 0.001 \quad (1)$$

Where:

$PE_p$  = Project emissions of the period  $p$  (tCO<sub>2</sub>e).

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$PE_{FC,d,p}$	=	Daily project emissions per household of the period p due to fuel consumption (kgCO <sub>2</sub> e).
$PE_{biogas,d,p}$	=	Daily project emissions per household of the period p due to biogas leakage (kgCO <sub>2</sub> e).
$N_{hh,p}$	=	Number of households within the climatic area participating in the project.
$D_{use,p}$	=	Average duration of use of the biogas during the period p (days).
0.001	=	Conversion factor of KgCO <sub>2</sub> e to tCO <sub>2</sub> e.

$$D_{use,p} = \frac{\sum_h D_{hh,p}}{N_{hh,p}} \quad (2)$$

Where:

$D_{hh,p}$	=	Duration of use of the biogas of household h in the climatic area during the period p (days). It's determined with the starting date of use of biogas for the household h and the starting and ending dates of the period p.
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#### Daily project emissions per household of the period p due to fuel consumption

$$PE_{FC,d,p} = \mu_{PE_{FC,d,p}} + 1.96 \cdot \frac{\sigma_{PE_{FC,d,p}}}{\sqrt{N_{samples,p}}} \quad (3)$$

Where:

$\mu_{PE_{FC,d,p}}$	=	Mean of daily CO <sub>2</sub> emissions due to fuel consumption of households of the sample (kgCO <sub>2</sub> e).
$\sigma_{PE_{FC,d,p}}$	=	Standard deviation of daily CO <sub>2</sub> emissions due to fuel consumption in the period p.
$N_{samples,p}$	=	Number of households in the sample.

$$\sigma_{PE_{FC,d,p}} = \sqrt{\frac{\sum_h (PE_{FC,d,p,h} - \mu_{PE_{FC,d,p}})^2}{N_{samples,p} - 1}} \quad (4)$$

Where:

$PE_{FC,d,p,h}$	=	Daily project emissions due to fuel consumption of household h of the sample during the period p (kgCO <sub>2</sub> e).
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$$\mu_{PEFC,d,p} = \frac{\sum_h PEFC,d,p,h}{N_{sample,p}} \quad (5)$$

$$PEFC,d,p,h = \sum_i F_{i,p,h} \cdot NCV_i \cdot EF_{CO_2,i} \quad (6)$$

Where:

- $F_{i,p,h}$  = Daily amount of fuel i consumed by household h of the sample during the period p (kg)  
 $NCV_i$  = Net Calorific Value per mass unit of fuel i  
 $EF_{CO_2,i}$  = CO<sub>2</sub> Emission Factor per unit of energy of fuel i

Fuel i is a fossil fuel or non-renewable biomass. If fuel i is non-renewable biomass,

$$F_{nr\ biomass,p,h} = F_{biomass,p,h} \cdot \mu_{nr,h} \quad (7)$$

Where:

- $F_{nr\ biomass,p,h}$  = Daily amount of non-renewable biomass consumed by household h of the sample during the period p (kg)  
 $F_{biomass,p,h}$  = Daily amount of biomass consumed by household h of the sample during the period p (kg)  
 $\mu_{nr,h}$  = Non-renewability rate of the biomass consumed by household h of the sample

#### Daily project emissions per household of the period p due to biogas leakage

$$PE_{biogas,d,p} = \mu_{PE_{biogas,d,p}} + 1.96 \cdot \frac{\sigma_{PE_{biogas,d,p}}}{\sqrt{N_{sample,p}}} \quad (8)$$

Where:

- $\mu_{PE_{biogas,d,p}}$  = Mean of daily CO<sub>2</sub> emissions due to biogas leakage of households of the sample (kgCO<sub>2</sub>e).  
 $\sigma_{PE_{biogas,d,p}}$  = Standard deviation of daily CO<sub>2</sub> emissions due to biogas leakage in the period p.  
 $N_{sample,p}$  = Number of households in the sample.

$$\sigma_{PE_{biogas,d,p}} = \sqrt{\frac{\sum_h (PE_{biogas,d,p,h} - \mu_{PE_{biogas,d,p}})^2}{N_{sample,p} - 1}} \quad (9)$$

Where:

$PE_{biogas,d,p,h}$  = Daily project emissions due to biogas leakage of household h of the sample during the period p (KgCO<sub>2</sub>e).

$$\mu_{PE_{biogas,d,p}} = \frac{\sum_h PE_{biogas,d,p,h}}{N_{sample,p}} \quad (10)$$

$$PE_{biogas,d,p,h} = \left( \sum_T LC_{T,p,h} \cdot EF_{biodigester,T} \right) \cdot MS_h \cdot PL + \left( \sum_T LC_{T,p,h} \cdot EF_{biodigester,T} \right) \cdot MS_h \cdot (1 - \mu_{biogastove}) \cdot (1 - PL) \quad (11)$$

Where:

$LC_{T,p,h}$  = Number of livestock of category T in household h during the period p.

$EF_{biodigester,T}$  = Daily CH<sub>4</sub> emission factor for livestock category T and manure management system corresponding to anaerobic digester (kgCO<sub>2</sub>e/animal).

$PL$  = Physical Leakage of the biodigester (default IPCC value 10%)

$\mu_{biogastove}$  = Combustion efficiency of the biogas stove (default value 98%)

$MS_h$  = Fraction of livestock's manure put into the tank by household h of the sample.

$$EF_T = VS_T \cdot GWP_{CH_4} \cdot BO_T \cdot 0.67 \cdot MCF_{biodigester} \quad (12)$$

Where:

$VS_T$  = Daily volatile solid excreted for livestock category T (Kg dry matter/animal/day).

$GWP_{CH_4}$  = Global Warming Potential of methane.

$BO_T$  = Maximum methane producing capacity for manure produced by livestock category T (m<sup>3</sup> CH<sub>4</sub>/Kg of VS<sub>T</sub>).

$MCF_{biodigester}$  = Methane conversion factor for manure managed in an anaerobic digester.

0.67 = Conversion factor of m<sup>3</sup> CH<sub>4</sub> to Kg CH<sub>4</sub>.

**D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived:**

The baseline emissions are assessed for each period p.

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived?	Comment
BE.1	Number of households in the baseline sample	ID	Households	-	Twice a Year	-	Electronic	The baseline sample is representative of the climatic area concerned.
PE.2	Number of households in the climatic areas	ID	Households	-	Twice a Year	-	Electronic	Updated as long as new biodigesters are built.
BE.2	Daily consumption of fuel <i>i</i> of households of the baseline sample	Survey	Kg	estimated	Twice a Year	Sample (at least 60 households)	Electronic and paper	The daily consumption concerns different activities according to a period and a climatic area. Cooking is always one of these activities.
PE.4	Fraction of livestock's manure fed into the biodigester	Survey	-	estimated	Twice a Year	Sample (at least 60 households)	Electronic and paper	This data comes from the monitoring survey conducted during the period p.
PE.5	Number of head of livestock category T	Survey	Animals	estimated	Twice a Year	Sample (at least 60 households)	Electronic and paper	This data comes from the monitoring survey conducted during the period p.
PE.6	Starting date of use of biogas for the new households selected	ID	Date	-	Monthly	-	Electronic	During a period p, a new biodigester might need time to be in use, hence the monitoring of the starting date of use.
PE.7	Starting date of the period p	ID	Date	estimated	Twice a Year	-	Electronic	This date is estimated by monitoring the period of heating of households in the climatic areas.
PE.8	Ending date of the period p	ID	Date	estimated	Twice a Year	-	Electronic	This date is estimated by monitoring the period of heating of households in the climatic areas.
PE.9	GWP <sub>CH4</sub>	IPCC Guidelines	-	-	According to IPCC's publications	-	Electronic	-

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

PE.10	NRB Rate of Non Renewable Biomass	Study	%	estimated	Every 2 years	-	Electronic and paper	Original NRB studies have already been conducted. It may be updated every two years. The methodology is given in a specific document.
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#### D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO2 eq.)

In the next formulae, the term “sample” refers to the sample of the monitoring survey conducted during the period  $p$ . The emissions are estimated for each climatic area, and the calculation has to be done as many times as there are climatic areas. The averages are made for the sample.

##### Baseline emissions of the period $p$

$$BE_p = (BE_{FC,d,p} + BE_{aw,d,p}) \cdot N_{hh,p} \cdot D_{use,p} \cdot 0.001 \quad (13)$$

Where:

- $BE_p$  = Baseline emissions of the period  $p$  (tCO<sub>2</sub>e).
- $BE_{FC,d,p}$  = Daily baseline emissions per household of the period  $p$  due to fuel consumption (kgCO<sub>2</sub>e).
- $BE_{aw,d,p}$  = Daily baseline emissions per household of the period  $p$  due to animal waste handling (kgCO<sub>2</sub>e).
- $N_{hh,p}$  = Number of households participating in the project in the climatic area.
- $D_{use,p}$  = Average duration of use of the biogas during the period  $p$  (days).

$$D_{use,p} = \frac{\sum_h D_{hh,p}}{N_{hh,p}} \quad (14)$$

Where:

- $D_{hh,p}$  = Duration of use of the biogas of household  $h$  of the climatic area during the period  $p$  (days).  
It's determined with the starting date of use of biogas for the household  $h$ , the starting and ending dates of the period  $p$ .

##### Daily baseline emissions per household of the period $p$ due to fuel consumption

$$BE_{FC,d,p} = \mu_{PEFC,d,p} - 1.96 \cdot \frac{\sigma_{BEFC,d,p}}{\sqrt{N_{sample,p}}} \quad (15)$$

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

Where:

- $\mu_{BEFC,d,p}$  = Mean of daily CO<sub>2</sub> emissions due to fuel consumption of households of the sample (kgCO<sub>2</sub>e).  
 $\sigma_{BEFC,d,p}$  = Standard deviation of daily CO<sub>2</sub> emissions due to fuel consumption in the period p.  
 $N_{samples,p}$  = Number of households in the sample.

$$\sigma_{BEFC,d,p} = \sqrt{\frac{\sum_h (BEFC_{d,p,h} - \mu_{BEFC,d,p})^2}{N_{samples,p} - 1}} \quad (16)$$

Where:

- $BEFC_{d,p,h}$  = Daily baseline emissions due to fuel consumption of household h of the sample during the period p (kgCO<sub>2</sub>e).

$$\mu_{BEFC,d,p} = \frac{\sum_h BEFC_{d,p,h}}{N_{samples,p}} \quad (17)$$

$$BEFC_{d,p,h} = \sum_i F_{i,p,h} \cdot NCV_i \cdot EF_{CO_2,i} \quad (18)$$

Where:

- $F_{i,p,h}$  = Daily amount of fuel i consumed by household h of the sample during the period p (kg)  
 $NCV_i$  = Net Calorific Value per mass unit of fuel i  
 $EF_{CO_2,i}$  = CO<sub>2</sub> Emission Factor per unit of energy of fuel i

Fuel i is a fossil fuel or non-renewable biomass. If fuel i is non-renewable biomass,

$$F_{nr\ biomass,p,h} = F_{biomass,p,h} \cdot \mu_{nr,h} \quad (19)$$

Where:

- $F_{nr\ biomass,p,h}$  = Daily amount of non-renewable biomass consumed by household h of the sample during the period p (Kg)

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

$F_{biomass,p,h}$  = Daily amount of biomass consumed by household h of the sample during the period p (Kg)  
 $\mu_{nr,h}$  = Non-renewability rate of the biomass consumed by household h of the sample

### Daily baseline emissions per household of the period p due to animal waste handling

$$BE_{aw,d,p} = \mu_{BE_{aw,d,p}} - 1.96 \cdot \frac{\sigma_{BE_{aw,d,p}}}{\sqrt{N_{sample,p}}} \quad (20)$$

Where:

$\mu_{BE_{aw,d,p}}$  = Mean of daily CO<sub>2</sub> emissions due to animal waste handling of households of the sample (kgCO<sub>2</sub>e).  
 $\sigma_{BE_{aw,d,p}}$  = Standard deviation of daily CO<sub>2</sub> emissions due to animal waste handling in the period p.  
 $N_{sample,p}$  = Number of households in the sample.

$$\sigma_{BE_{aw,d,p}} = \sqrt{\frac{\sum_h (BE_{aw,d,p,h} - \mu_{BE_{aw,d,p}})^2}{N_{sample,p} - 1}} \quad (21)$$

Where:

$BE_{aw,d,p,h}$  = Daily baseline emissions due to animal waste handling of household h of the sample during the period p (kgCO<sub>2</sub>e).

$$\mu_{BE_{aw,d,p}} = \frac{\sum_h BE_{aw,d,p,h}}{N_{sample,p}} \quad (22)$$

$$BE_{aw,d,p,h} = \left( \sum_T LC_{T,p,h} \cdot EF_{T,h} \right) \cdot MS_h \quad (23)$$

Where:

$LC_{T,p,h}$  = Number of livestock of category T in household h during the period p.  
 $EF_{T,h}$  = Daily CH<sub>4</sub> emission factor for livestock category T and manure management system corresponding to the one of household h

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

$MS_h$  = (kgCO<sub>2</sub>e/animal).  
= Fraction of livestock's manure put into the tank by household h of the sample.

$$EF_T = VS_T \cdot GWP_{CH_4} \cdot Bo_T \cdot 0.67 \cdot MCF_h \quad (24)$$

Where:

$VS_T$  = Daily volatile solid excreted for livestock category T (Kg dry matter/animal/day).  
 $GWP_{CH_4}$  = Global Warming Potential of methane.  
 $Bo_T$  = Maximum methane producing capacity for manure produced by livestock category T (m<sup>3</sup> CH<sub>4</sub>/Kg of VS<sub>T</sub>).  
 $MCF_h$  = Methane conversion factor of the manure management system of the household h.  
0.67 = Conversion factor of m<sup>3</sup> CH<sub>4</sub> to Kg CH<sub>4</sub>.

### **D.2.3. Treatment of leakage in the monitoring plan**

No significant sources of leakage are identified.

### **D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO<sub>2</sub> eq.)**

#### **Emission reductions of the period p**

$$ER_p = (BE_p - PE_p)$$

Where:

$ER_p$  = Emission reductions of the period p (tCO<sub>2</sub>e).  
 $BE_p$  = Baseline emissions of the period p (tCO<sub>2</sub>e).  
 $PE_p$  = Project emissions of the period p (tCO<sub>2</sub>e).

**D.3. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored**

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
PE.1;BE.1	Low	<i>The samples of the surveys have to be geographically representative of the climatic area concerned. A climatic area is divided in villages or groups of villages. The geographical repartition is made thanks to a simple proportion formula, so that the representativeness of a sample shouldn't be uncertain. Moreover, as the baseline is evolving, the sample of the baseline is also evolving and need to be corrected in order to be representative, with the same simple proportion formula.</i>
PE.2	Low	<i>The construction of tanks is monitored in each climatic area by local coordinators. As this data might be encoded in the database for each household of each climatic area, the uncertainty on the number of households in the climatic areas is very low.</i>
BE.2	Medium	<i>During the baseline survey, the daily consumption of traditional fuel for both winter and summer period is asked. Then, the best approach is to conduct the survey during those 2 periods. However, due to time and methodology restrictions, it's not possible. Therefore, surveyors should know quite well the situation on the field and the concept of conservativeness (see Annex C.)</i>
PE.3	Medium	<i>The uncertainty on this data is lower than the previous one as the survey is conducted during the period for which daily consumption of traditional fuel is expected. In order to get accurate data, the survey should take place during average days of summer or winter (this does not mean during the warmest or coldest days of a season).</i>
PE.4	Medium	<i>It's quite hard for households to distinguish the quantity of manure put into the biodigester for each type of animal. Then, an average figure for all the types of animal will be estimated.</i>
PE.5	Low	<i>Household members know quite well the number of animals they own. Only the ones whose manure is put into the biodigester are taken into account.</i>
PE.6	Low	<i>Local coordinators often visit beneficiaries of the project and know when they should have started using biogas. Principle of conservativeness should be applied if there are uncertainties on the exact starting date.</i>
PE.7; PE.8	Medium	<i>Local coordinators should inform ID when beneficiaries stop heating themselves all daylong and when they completely stop the space heating practices. Then, ID could choose an average starting and ending dates of the seasons.</i>
PE.9	Low	<i>Data comes from IPCC guidelines.</i>
PE.10	Low	<i>The Monitoring of the non-renewable biomass rate isn't uncertain since a new study has to be fully conducted each time.</i>

**D.4. Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity**

The electronic database will be developed by ID France and translated at least into English and Chinese. It constitutes the heart of the monitoring of the emission reductions. In Guizhou province, a person of ID China will be in charge of the monitoring of the emission reductions. His work will consist in the following main tasks:

- Train the local coordinators. As they have good knowledge of the situation on the field, they will be in charge of the collection of most of the data.

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

- Formalize the necessary documents for the monitoring (records sheet, questionnaires, monitoring reports) in collaboration with the local coordinators.
- Contact people with competences required for the assessment of the renewable/non-renewable character of the biomass consumed by beneficiaries in new project areas.
- Ensure the encoding of the data, which can be done by ID members or external trained people.

**D.5 Name of person/entity determining the monitoring methodology:**

**The Gold Standard**

c/o BASE

22 Bäumleingasse, CH-4051

Basel, Switzerland

Phone: +41 (0)61 283-0916

Fax: +41 (0)61 271-1010

## SECTION E. Estimation of GHG emissions by sources

### E.1. Estimate of GHG emissions by sources:

In March 2008, ID carried out two surveys in Danzhai and Weining (two different climate regions) in order to assess the annual baseline and project emissions.

Climate region	Place targeted by the project	Project emissions (PE) per household (tCO <sub>2</sub> e/year)		
		PE due to traditional fuel consumption	PE due to biogas leakage	Total PE
Weining District	Dong Shan Municipality	5.89	0.51	6.40
Danzhai District	Jiao Gui village	7.03	0.60	7.63

Therefore, the average project emissions are: 7.02 tCO<sub>2</sub>e/year.

Place	Key Data	Mean <sup>1</sup>
Dong Shan	Daily coal consumption during winter (for cooking, boiling water, boiling animal food and space heating activities). Unit: Kg.	13.72
Dong Shan	Daily coal consumption during summer (for cooking activities). Unit: Kg.	0.76
Dong Shan	Duration of summer period (months)	7
Dong Shan	Duration of winter period (months)	5
Dong Shan	Number of pigs owned by the respondents	3.51
Dong Shan	Number of piglets owned by the respondents	4.07
Dong Shan	Number of buffalos owned by the respondents	0.38
Dong Shan	Number of horses owned by the respondents	0.09
Dong Shan	Average share of manure put into the biogas tank	59%
Jiao Gui	Average daily firewood consumption during a year (for cooking, boiling water, boiling animal food and space heating activities). Unit: Kg, dry matter.	13.03
Jiao Gui	Non-renewability rate of the biomass consumed	85%
Jiao Gui	Number of pigs owned by the respondents	2.42
Jiao Gui	Number of piglets owned by the respondents	0.76
Jiao Gui	Number of buffalos owned by the respondents	1.14
Jiao Gui	Number of horses owned by the respondents	0.26
Jiao Gui	Share of manure put into the biogas tank	100%

1. The mean values concerning fuel consumption are adjusted with the standard deviation of the distribution. The mean values of the other data are not adjusted. Then, this data only give a rough idea of the situation. For more details concerning the assessment of the project emissions, please refer to the documents "Emission Reductions Assessment in Weining" and "Baseline Situation & Emission Reductions Assessment in Jiaogui" at the following website address: <http://ftp.web.free.fr/odd/docs/docsfc/acces.php> (login = carbonfin & password = ctx56m).

For the factors coming from IPCC guidelines, see Annex 2.

### E.2. Estimated leakage:

No significant sources of leakage are identified.

**E.3. The sum of E.1 and E.2 representing the project activity emissions:**

See E.1.

**E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:**

Climate region	Places targeted by the project	Baseline emissions (BE) per household (tCO <sub>2</sub> e/year)		
		BE due to traditional fuel consumption	BE due to biogas leakage	Total BE
Weining District	Dong Shan Municipality	11.16	0.04	11.20
Danzhai District	Jiao Gui village	12.40	0.10	12.50

Therefore, the average baseline emissions are: 11.85 tCO<sub>2</sub>e/year.

Place	Key Data	Mean <sup>1</sup>
Dong Shan	Daily coal consumption during winter (for cooking, boiling water, boiling animal food and space heating activities). Unit: Kg.	18.53
Dong Shan	Daily coal consumption during summer (for cooking activities). Unit: Kg.	6.76
Jiao Gui	Average daily firewood consumption during a year (for cooking, oiling water, boiling animal food and space heating activities). Unit: Kg, dry matter.	22.97

1. The mean values are adjusted with the standard deviation of the distribution.

For the number of animals, the duration of the periods in Dong Shan, the non-renewability rate of biomass used in Jiao Gui and the share of manure put into the tank, see E.1. For the factors coming from IPCC guidelines, see Annex 2.

**E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:**

Climate region	Place targeted by the project	Emission reductions (ER) per household (tCO <sub>2</sub> e/year)		
		ER due to traditional fuel consumption	ER due to biogas leakage	Total ER
Weining District	Dong Shan Municipality	5.27	-0.47	4.80
Danzhai District	Jiao Gui village	5.37	-0.50	4.87

The above assessment of the ERs doesn't take into account the failures of the biogas system. To be conservative, it is estimated that 17.2 % of the biogas systems will to be out of order per year. Therefore, a break down rate of 17.2 % will be taken into account. Then, the average emission reductions achieved by each household participating in the project are about  $4.83 * (1-17.2\%) = 4$  tons per year.

**E.6. Table providing values obtained when applying formulae above:**

In 2007, 250 biogas tanks were built. In 2008 and 2009, 600 and 400 tanks will be built respectively. The future biogas tanks will be implemented in an area very similar to Dong Shan or Jiao Gui. Then, for the total ER assessment, 4 ERs/year are assumed for each of all the tanks. In the Monitoring Reports, the distinction between the different climatic areas (hence sensibly different baseline emissions) will be made.

In a year, half of the new tanks are supposed to be operational at the end of June and the others at the end of December. In 2007, the construction of the first tanks has been delayed and the emission reductions will only be claimed from summer 2008, period which is assumed to start in April. Emission reductions are counted for households using biogas for one month.

Period	Number of biodigesters used	Estimation of baseline emission reduction (tCO <sub>2</sub> e)	Estimation of project activity emissions (tCO <sub>2</sub> e)	Estimation of emission reductions (tCO <sub>2</sub> e) considering a break down rate of 17.2 %
1 <sup>st</sup> April to 1 <sup>st</sup> August 2008	250	988	585	333
1 <sup>st</sup> August 2008 to 1 <sup>st</sup> February 2009	550	3259	1931	1100
1 <sup>st</sup> February to 1 <sup>st</sup> August 2009	850	5036	2984	1700
1 <sup>st</sup> August 2009 to 1 <sup>st</sup> February 2010	1250	7406	4388	2500
1 <sup>st</sup> February 2010 to 1 <sup>st</sup> January 2011	1250	13578	8044	4582
Year 2011	1250	14813	8775	4999
Year 2012	1250	14813	8775	4999
Year 2013	1250	14813	8775	4999
Year 2014	1250	14813	8775	4999
Year 2015	1250	14813	8775	4999
Year 2016	1250	14813	8775	4999
Year 2017	1250	14813	8775	4999
1 <sup>st</sup> of January 2018 to 1 <sup>st</sup> of April 2018	1250	3703	2081	1343
<b>Total</b>	-	<b>137658</b>	<b>81437</b>	<b>46551</b>

Note: 11.85 tCO<sub>2</sub>e for baseline emissions and 7,02 tCO<sub>2</sub>e for project emissions are assumed per biodigester used per year. A break down rate of 17.2 % is estimated as a conservative approach.

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## **SECTION F. Environmental impacts**

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**F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

The host country legislation does not require an EIA to be performed. The initial stakeholder consultation has not identified any significant negative environmental impacts and no indicators were scored -1 in the Sustainable Development Matrix. Hence, no EIA was required for the project.

For a brief description of the impacts of the project on environment, see section A.2.

**F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

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## **SECTION G. Stakeholders' comments**

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<b>G.1. Brief description how comments by local stakeholders have been invited and compiled:</b>
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### **Initial Stakeholder Consultation (ISC)**

A meeting with stakeholders of the project took place on the 28<sup>th</sup> of February 2008 in the village of Jiao Gui in Danzhai where 100 biogas tanks were built in 2007. Another meeting was scheduled in Weining with local stakeholders but it was cancelled. Therefore, the stakeholders in Weining will be consulted afterwards.

In Danzhai, the following stakeholders were identified:

- The beneficiaries of the project
- The chief of Jiao Gui village
- The Agriculture Offices of Danzhai and Weining which finance a percentage of the project and provide technicians to build the tanks.
- Members of Initiative Développement
- Members of the local government of Danzhai and Weining
- ActionCarbone, which is a French program of voluntary offsetting interested in the carbon credits of the project. This organization financed a percentage of the project in 2007.
- French volunteers, members of the French organization Objectif Développement Durable, who helped ID in the writing of the PDD and the implementation of the monitoring plan of the project.

These stakeholders met before the meeting in Danzhai and were informed about it. The Designated National Authority of China, the Gold Standard foundation and two NGOs supporters of this foundation present in China (Greenpeace and WWF) were also informed about the whole process of consultation by email. As the villages of the beneficiaries (as well in Danzhai as in Weining) are of difficult access and are quite far from the headquarters of the previously mentioned organizations, they were not expected to assist to the meeting but only give their general comments on the project.

For the meeting consultation, two documents were written:

- A summary of the environmental impacts of the project
- A non-technical summary of the draft version of the PDD

These documents as well as the report of the meeting are available at the following web address:

<http://ftp.web.free.fr/odd/docs/docsfc/acces.php> (login = carbonfin & password = ctx56m)

<b>G.2. Summary of the comments received:</b>
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### **Initial Stakeholders Consultation**

In Danzhai, some beneficiaries mentioned many advantages concerning the use of biogas (see section A.2 and the report of the ISC) and this is really positive for the project. Their main questions were about the solution of technical problems and about security. In each project area (one or several groups of villagers), a committee of biogas is set

up in order to facilitate the implementation of the project. The director of the energy office of the agriculture bureau of Danzhai suggested changing the committee of biogas into an association of biogas beneficiaries, which would be a non-profit organization managed by trained beneficiaries of the village. This new association would help villagers with the maintenance of the biogas system and make people more sensitive to security.

*Air quality* and *Livelihood of the poor* were the two most important indicators of sustainable development for the participants. *Water quality* and *Soil conditions* were also important indicators for beneficiaries. No negative environmental impact was identified as significant.

No comment was received from the organizations contacted by internet.

<b>G.3. Report on how due account was taken of any comments received:</b>
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**Initial Stakeholder Consultation**

The comments received in Danzhai constituted the basis on which the monitoring of significant sustainable indicators was elaborated (see section D.2). ID will be involved in the setting up of the association of biogas beneficiaries, which was officially suggested to the beneficiaries during the meeting. Finally, as water quality and soil conditions were also relevant indicators for beneficiaries, ID will strengthen links with the Agriculture Office of Guizhou, which is currently undertaking in-depth studies on the advantages linked to the use of residual waste.

Annex 1

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Initiative Développement
Street/P.O.Box:	29 rue LADMIRALT
Building:	
City:	POITIERS
State/Region:	
Postfix/ZIP:	86000
Country:	FRANCE
Telephone:	00 33 5 49 60 89 66
FAX:	00 33 5 49 60 89 01
E-Mail:	<a href="mailto:id@id-ong.org">id@id-ong.org</a>
URL:	<a href="http://www.id-ong.org">www.id-ong.org</a>
Represented by:	Christophe BARRON
Title:	Head of China Programs
Salutation:	Mr
Last Name:	BARRON
Middle Name:	
First Name:	Christophe
Department:	China Programs Department
Mobile:	00 33 6 21 04 06 40
Direct FAX:	
Direct tel:	
Personal E-Mail:	<a href="mailto:c.barron@id-ong.org">c.barron@id-ong.org</a>

Annex 2

BASELINE INFORMATION

Data	Description	Value	Unit	Source
EF <sub>firewood</sub>	CO <sub>2</sub> emission factor for combustion of firewood	112	Kg/GJ	IPCC 2006 Guidelines, Table 1.4
EF <sub>charcoal</sub>	CO <sub>2</sub> emission factor for combustion of charcoal	112	Kg/GJ	IPCC 2006 Guidelines, Table 1.4
EF <sub>coal</sub>	CO <sub>2</sub> emission factor for combustion of anthracite	98.3	Kg/GJ	IPCC 2006 Guidelines, Table 1.4
NCV <sub>firewood</sub>	Net Calorific Value of firewood	15.6	TJ/Gg	IPCC 2006 Guidelines, Table 1.2
NCV <sub>charcoal</sub>	Net Calorific Value of charcoal	29.5	TJ/Gg	IPCC 2006 Guidelines, Table 1.2
NCV <sub>coal</sub>	Net Calorific Value of anthracite	26.7	TJ/Gg	IPCC 2006 Guidelines, Table 1.2
Bo <sub>pig</sub>	Maximum methane producing capacity for manure produced by pig <sup>1</sup>	0.29	M <sup>3</sup> methane/Kg of VS excreted	IPCC 2006 Guidelines, Table 10A-5
Bo <sub>piglet</sub>	Maximum methane producing capacity for manure produced by piglet <sup>1</sup>	0.29	M <sup>3</sup> methane/Kg of VS excreted	IPCC 2006 Guidelines, Table 10A-8
Bo <sub>Buffalo</sub>	Maximum methane producing capacity for manure produced by buffalo	0.1	M <sup>3</sup> methane/Kg of VS excreted	IPCC 2006 Guidelines, Table 10A-6
Bo <sub>Horse</sub>	Maximum methane producing capacity for manure produced by horse	0.26	M <sup>3</sup> methane/Kg of VS excreted	IPCC 2006 Guidelines, Table 10A-9
Bo <sub>Sheep</sub>	Maximum methane producing capacity for manure produced by sheep	0.13	M <sup>3</sup> methane/Kg of VS excreted	IPCC 2006 Guidelines, Table 10A-9
Bo <sub>Goat</sub>	Maximum methane producing capacity for manure produced by goat	0.13	M <sup>3</sup> methane/Kg of VS excreted	IPCC 2006 Guidelines, Table 10A-9
VS <sub>pig</sub>	Daily volatile solid excreted for pig <sup>1</sup>	0.3	Kg dry matter/animal/day	IPCC 2006 Guidelines, Table 10A-5
VS <sub>piglet</sub>	Daily volatile solid excreted for piglet <sup>1</sup>	0.3	Kg dry matter/animal/day	IPCC 2006 Guidelines, Table 10A-8
VS <sub>Buffalo</sub>	Daily volatile solid excreted for buffalo	3.9	Kg dry matter/animal/day	IPCC 2006 Guidelines, Table 10A-6
VS <sub>Horse</sub>	Daily volatile solid excreted for horse	1.72	Kg dry matter/animal/day	IPCC 2006 Guidelines, Table 10A-9
VS <sub>Sheep</sub>	Daily volatile solid excreted for sheep	0.32	Kg dry matter/animal/day	IPCC 2006 Guidelines, Table 10A-9
VS <sub>Goat</sub>	Daily volatile solid excreted for goat	0.35	Kg dry matter/animal/day	IPCC 2006 Guidelines, Table 10A-9
MCF <sub>Solid Storage</sub>	Methane conversion factor for manure managed as Solid storage <sup>2</sup>	0.02	-	IPCC 2006 Guidelines, Table 10.17
MCF <sub>Biodigester</sub>	Methane conversion factor for manure managed in an anaerobic digester	1	-	IPCC 2006 Guidelines, Table 10.17
GWP <sub>Methane</sub>	Global Warming Potential of methane	25	-	IPCC 2007, Table 2.14

1. Pig refers to *Mature Swine* and *Piglet* to *Growing Swine* (See IPCC 2006 Guidelines for National Inventory, Volume 4, Table 10.1). In IPCC Guidelines, Mature Swine and Growing Swine in Asia have the same methane default emissions factors for manure management.

2. This value corresponds to cool temperature. As methane project emissions are higher than baseline ones, it's conservative. In Jiao Gui and Dong Shan villages, manure is managed as solid storage when it's not introduced in the tank.

### Annex 3

## **MONITORING PLAN**

The objective of this monitoring plan is to describe how the data needed for the assessment of the emission reductions resulting from the project as well as the key sustainable indicators will be collected and archived. It has to be implemented for each of the climate areas of the project.

### **METHOD OF COLLECTION OF THE DATA**

There are three methods for the collection of data: Surveys based on questionnaires, Collection of record sheets regularly filled in and Field investigation.

#### **Surveys based on questionnaires**

The surveys concern the assessment of the baseline and project emissions as well as the key sustainable indicators. They're carried out on a representative sample of beneficiaries. The interviews have to be conducted by especially trained personnel who has extensive knowledge about:

- Country or regional customs;
- Local farming practices;
- The technical design of the biodigester system;
- The amount and type of fuel used for each household; and
- How households handle their animal waste.

A team of at least two persons will perform the surveys. The local coordinators will be in charge of the surveys and will be trained by the person of ID in charge of all the monitoring of the project.

#### Selection of beneficiaries to interview

Households will be selected randomly from the project boundary.

The project area is divided in climatic areas. In a climatic area, the fuel types used by the beneficiaries for their energy needs are identified. The fuel mix is also identified. A survey concerns one climatic area and its sample of beneficiaries should be geographically representative of this global area, so that the geographical repartition of the beneficiaries is needed. Once the repartition is known, the selection of respondents should be locally random.

A survey should be made on a sample of around 100 respondents, and at least 60 respondents.

#### Questionnaires

Experienced people on fuel consumption patterns in the different climatic areas designed the questionnaires. During the elaboration of the questionnaires, tests are carried out on several beneficiaries to ensure its relevance.

#### **Record sheets**

The record sheets are used for the identification of all the beneficiaries, the assessment of the construction stage as well as the beginning date of use of the biogas. These are documents filled in by local coordinators, which are the

ones in charge of the implementation of the biogas system for some villages or group of villagers. In each group, the project is coordinated by one of them. Then, the records concern all the beneficiaries of the project.

### **Field investigation**

The field investigation concerns the assessment of the non-renewable rate of the biomass used as a fuel for cooking by beneficiaries.

### **DATA STORAGE**

All the questionnaires, record sheets and reports are archived in the offices of ID in China. They are all available for verification. All the data monitored is also stored in the electronic database (php / mysql). A complete extract is available for verification. ID is in charge of the regular encoding of the data in the electronic database. The data will be kept for two years after the end of the crediting period of the last issuance of the project's VERs.

### **BASELINE AND PROJECT EMISSIONS SURVEYS**

In a year, two periods are considered for the assessment of the emission reductions: winter and summer. Therefore, baseline and project emissions depend on these periods.

#### **Period characterizations and activities monitored**

The baseline and project emissions are assessed by asking beneficiaries for their daily traditional fuel consumption for specific activities (including at least cooking activities). In a year, this daily consumption mainly depends on the outside temperature and the activities performed. In order to simplify the assessment of the emission reductions, two periods have been identified in a year, corresponding to specific pattern of energy consumption. They are basically the winter and summer periods.

#### Winter period

In Guizhou province, winter lasts from about November-December to February-March. The temperatures could vary from 0°C to 15°C. During this period, people use traditional fuels for cooking, boiling water, boiling animal food and space heating. Their eating habits could also vary from season to season. The duration of the winter period is determined with the beginning and ending dates of space heating. These dates are controlled by the person in charge of the monitoring of the project by taking into account the advices of the local coordinators.

#### Summer period

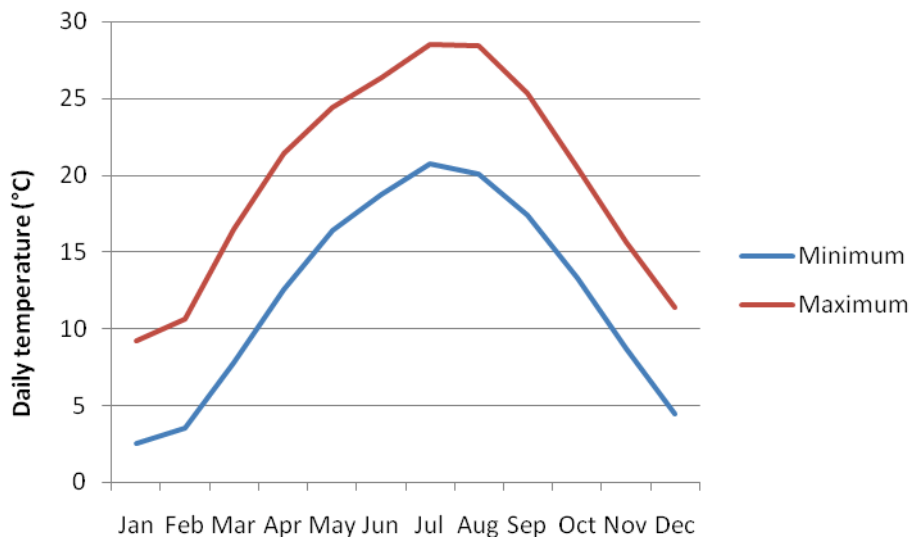
The summer period lasts from about March-April to October-November. The temperatures could vary from 15°C to 30°C. During this period, people do not heat their houses anymore. In some villages, they do not even boil animal food because grass is available for animals. The duration of this period is also determined by the beginning and ending dates of space heating.

#### Activities monitored

The biogas stove is used for cooking and boiling water purposes. It's possible to monitor the daily consumption of traditional fuel for these specific activities only if there is no leakage. As a matter of fact, there could be a leakage from an activity to another when they're done at the same time. For example, during winter period, people could take advantage of the energy produced when they heat themselves for cooking purposes. Even if they stopped cooking with traditional fuel, it would not mean that all the traditional fuel consumption used for cooking purposes would be reduced. Then, for each period, the daily consumption should concern all the activities from which there is a leakage to the cooking and boiling water ones.

An average daily consumption

In a same period, the daily consumption of traditional fuel could vary due to the variation of the outside temperature. The lower the outside temperature is, the higher the daily fuel consumption will be. Moreover, the production of biogas varies also. The higher the outside temperature is, the more biogas will be produced. In winter, there is clearly less biogas produced than in summer. Then, for the assessment of the baseline and project emissions, the answers given by the beneficiaries should not concern the coldest or the warmest days of a period. They should concern "average" days. The surveyors have to ensure beneficiaries are aware of this specificity.



**Daily temperature variations in Guiyang (capital of Guizhou Province)**  
 Source: World Weather Institute, 2007

**Baseline emissions surveys**

Each year, ID may install biogas systems in new villages. Since the baseline surveys have to be geographically representative of the population of the beneficiaries, the original baseline surveys have to be updated. In case the new beneficiaries are in a new climatic area, a whole new baseline survey should be conducted.

In case a new survey is needed, 100 respondents (at least 60) have to be interviewed.

In case an update of an old baseline survey is needed, less than 100 respondents may be interviewed. X old interviews can be recycled from an old survey and Y new interviews conducted in the new area, with  $X + Y = 100$ , and X and Y geographically representative of the new global population of beneficiaries.

The survey should be held before the implementation of the biodigester or within 3 months after the implementation of the biodigester. The main data asked to the beneficiaries is the quantity of traditional fuels daily consumed for specific activities during winter and summer periods before they get the biogas system (surveyors should be able to weigh this quantity). In the case of biomass consumption, the percentage of biomass residues used is asked to the beneficiaries. This data is necessary for the determination of the non-renewability rate of biomass used by the beneficiaries.

During the survey, the type of management of the animal waste is also identified for each beneficiary.

An example of the baseline questionnaire is given on:

<http://ftp.web.free.fr/odd/docs/docsfc/acces.php> (login = carbonfin & password = ctx56m)

### **Project emissions surveys (monitoring surveys)**

Monitoring surveys are conducted twice a year, during summer and winter periods. They concern people who started using biogas for at least three months (in this way, respondents are able to give relevant answers about their consumptions). A monitoring survey is conducted on beneficiaries from one climatic area. The sample should be geographically representative of the climatic area concerned and should contain around 100 respondents (at least 60).

The followings data is asked to the beneficiaries:

- Quantity of traditional fuel consumed in the period during which the survey is conducted
- Number of animals owned and share of manure put into the biogas tank (this data is also useful for the assessment of the baseline emissions)
- Socio and environmental impacts of the project, from the point of view of the beneficiaries.

An example of the monitoring questionnaire is given on:

<http://ftp.web.free.fr/odd/docs/docsfc/acces.php> (login = carbonfin & password = ctx56m)

### **DATA COLLECTED WITH RECORD SHEETS**

The data collected with record sheets is the following:

- Total number of beneficiaries in each group
- State of the tanks' construction for each beneficiary
- Beginning date of use of biogas for each beneficiary

The total number of beneficiaries and its geographical repartition (in different municipalities) is needed to select the samples for the baseline and project surveys. In the electronic database, each beneficiary will be identified by name, identity number and the name of the village and climatic area he/she belongs to. The data should be encoded in the electronic database before conducting the baseline and monitoring surveys.

The beginning date of use of the biogas is needed for each beneficiary before carrying on with the monitoring survey. Therefore, the data should be encoded regularly (at least monthly) in the electronic database between the end of the construction stage and the start of the next monitoring survey.

## **FIELD INVESTIGATION**

A field investigation is necessary to determine the rate of non-renewable biomass consumed by beneficiaries for their energy needs. The methodology proposed by the Gold Standard is followed. A report should be delivered for each new field investigation done. In the electronic database, a non-renewability rate is associated to a forest, including one or several groups of beneficiaries.

### **Assessment of the key sustainable indicators**

The savings of the beneficiaries as well as the share of the biogas in the whole energy mix consumed by the households are the two sustainable indicators monitored. For this, the following data will be asked to the beneficiaries during the monitoring surveys to assess the project emissions:

- Use of the biogas lamp
- Daily traditional fuels consumption for all their energy needs

The monitoring surveys also ask for the benefits of the project viewed by the beneficiaries.

With the previous data and the one specifically needed for the assessment of the project emissions, it's possible to evaluate the sustainable indicators mentioned above.

### Evaluation of the improvement of hygiene conditions

During the first monitoring survey, the improvement of the hygiene conditions will be evaluated qualitatively. It will mainly consist in the evaluation of the quality of the toilets and pigsties built and their utilization.

## **ASSESSMENT OF THE EMISSION REDUCTIONS**

### **Emission reductions by period and by climatic area**

The emission reductions are assessed by subtracting the project emissions from the baseline emissions. They're assessed using a computer with the electronic database.

To a climatic area corresponds at least one baseline survey (there could be more than one if during the project activity a new survey was conducted in order to keep a representative sample). Then, it's possible to calculate the baseline emissions for each climatic area.

A monitoring survey encompasses one or climatic area and a specific period. Then, it's possible to calculate the project emissions for every climatic area.

As a consequence, the emission reductions of a specific period can be assessed for every climatic area and from which more than 60 people were interviewed during one or more baseline surveys. Then, the emission reductions are calculated at the frequency of the monitoring survey (twice a year).

Note: The emission reductions depend on the exact duration of the periods and on the number of beneficiaries who started using biogas. This data could be updated in the electronic database after the monitoring survey, correcting the emission reductions calculation.

### **Monitoring of the IPCC default values**

For the assessment of the baseline and project emissions, several default values from IPCC guidelines are used. Only the Global Warming Potential of methane ( $GWP_{CH_4}$ ) will be updated with the most recent IPCC guidelines.

### **MAINTENANCE**

In each climatic area, a committee of biogas formed by some beneficiaries is set up in order to facilitate the building of the infrastructures and manage the usual failures of the biogas system. For the unusual failures, which cannot be solved by the beneficiaries themselves, a technician of the local Agriculture Bureau will intervene. The phone numbers of the technicians are written on each biogas tank built.

Note: The failures are first taken into account thanks to a 17,2 % correction factor of the ER; second, during a monitoring survey the respondents will answer depending on they had or hadn't a failure, and will give their consumption taking into account that their biodigester might have been deficient. Since the sample is representative, the failures are also taking into account this way. Failures are taken into account twice, which is conservative.