



EIE-06-256 REEPRO

Intelligent Energy  Europe

Promotion of the Efficient Use of Renewable Energies in Developing Countries

Survey of possible Pilot Project Sites

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Shortlist of possible Pilot Project Sites:

Please short list here the surveyed communities and make a first suggestion on a possible renewable energy technology, which could be applied in each community.

Rank	Short Name	Province	Distance to Phnom Penh in km in car hours	Technology
1	OKJAY Village, CBO	Battam Bang	300 Km, 5 hours	Biomass gasification
2	ANLONG TAMEY Village	Battam Bang	300 Km, 5 hours	Biomass gasification
3	OMAL Village	Battam Bang	300 Km, 5 hours	Solar Home System
4	OMANI 1 Village	Battam Bang	300 Km, 5 hours	Solar Home System
5	Kompong Thom Orphanage Centre	Kompong Thom	170 km, 2 hours	Solar Home System





1 OKJAY Village, CBO

Short name of Site:	OKJAY Village, CBO (Capacity Building Organisation)
Official name of Site:	OKJAY Village, O DOMBONG 1 Commune, SANGKAE District
Province:	Battam Bang Province
Country:	Cambodia
GPS position (for Google Earth):	---
Description of the project site (including travel description):	OKJAY Village is located at around 10 Km from the Battam Bang Provincial Town. This Village can be divided into two different zones where the population are densely gathered. There are around 100 households in the first zone and around 170 households in the second zone. The first zone is separated from the second one by a distance of about 3 km. It should be noted that there is another village of the other commune from the above described commune where gathered the population of about 200 households.
Natural Resources available:	<ul style="list-style-type: none"> • Rice milling which is located at about 2 Km from the village (CBO) can provide rice husk at a price of 0.025 US\$ par sack. • There is also corncob, peanut shell available in the village. Unfortunately, they are not abundant. • Almost all families in this village raise two cows for the agriculture purpose. Pigs are also raised but there are not too many. • The Leuceana farm is located at nearly about 15 Km from the village.
Current electricity access:	<ul style="list-style-type: none"> • Currently, people in KJAY Village can not access to electricity from the grid. In the past there was one non licensed REE who produce and sell the electricity to the villagers. Unfortunately, his business was down due to high increase of fuel oil price. • Electricity supply in each household comes from battery which is used mainly for lighting and TV. Depending on the consumption, a 50 Ah battery can be used up to 10 to 15 days. The fee for charging the battery is 0.4 US\$ for a 50 Ah.
Current fuel consumption (kind and prices of fuels):	<ul style="list-style-type: none"> • People still depend on the kerosene for lighting application. Also, depending on the consumption, each household uses kerosene up to 2 or 3 litres per month. One litre of kerosene costs around 0.9 US\$. • For cooking application, people in the village depend on the fuel wood which can be collected easily from rice field and farm.
Current economic basis of the village:	People in the village generate income mainly from rice field and plantation.
Heights of income in the village (estimate):	Depending on the families, the height of income can be varied from 750 US\$ to 2500 US\$ per year.
Future plans for economic development:	There are several future plans for economic development such as: improvement of irrigation system; distribution of seed for plantation like corn and vegetable etc.
Level of community support to such a project (political, financial, labour):	<ul style="list-style-type: none"> • A piece of land with the area of 3200 m² in the premise of CBO is available for the installation of pilot community. • Labour force will be available for the installation of the pilot community • Financial support from the commune for this kind of project seems to be a new aspect for the local community. No promise can be made by chief village alone. Nevertheless it should be noted that there was once a road construction project which costs 12000 US\$ and the commune contribute 3% of the total cost. • Local community are happy and welcomed the idea of the project.

<p>Amount of power needed (in Watt):</p>	<ul style="list-style-type: none"> • In average, there are two lamps and one TV in each household. Thus, $2 \times 9W + 40W \sim 60 W$ • For CBO alone, the power demand is estimated around 1 KW (Lamp, computer, fan, printer) 	
<p>Time frame in which power is to be provided (daily, project timeline):</p>	<p>Daily electricity access with peak demand during the evening time</p>	
<p>Possible Technologies or combinations to be applied:</p>	<ul style="list-style-type: none"> • Option 1: Biomass using rich husk gasification • Option 2: Solar home system • Option 3: Family size biogas system 	
<p>Estimated project costs:</p>	<ul style="list-style-type: none"> • Option 1: Following the past experience from the Community Based Renewable Energy Project (See the appropriate technology scan for more detail), the installation of a 9 KW system cost around 24000 US\$. This could provide electricity to around 100 households plus the consumption of CBO. • Option 2: A solar home system with the capacity of 40 Wp is appropriate. This could cost around 300 US\$ per solar home system. • Option 3: A biogas plant with the volume of 4 m³ is suitable for one family since nearly all families have cows. This biogas plant could provide 3.5 to 4 hours for biogas stove and 8 to 10 hours for biogas lamp. The total investment cost for this biogas plant is around 320 US\$ (See the appropriate technology scan for more detail) 	
<p>Fotos (Site, main street, area, landmarks, resources like river, etc.):</p>	 <p>Figure 1: CBO office</p>	 <p>Figure 2: Premise for the project installation</p>
	 <p>Figure 3: road access to CBO</p>	 <p>Figure 4: inside CBO</p>

2 ANLONG TAMEY Village, CEC

Short name of Site:	ANLONG TAMEY Village, CEC (Community Energy Cooperative)
Official name of Site:	Anlong Tamey Village, Banan District
Province:	Battam Bang Province
Country:	Cambodia
GPS position (for Google Earth):	---
Description of the project site (including travel description):	CEC is located at around 17 Km from the Battam Bang Provincial Town. People in village are densely gathered along the road headed to a tourism resort, Banan Mountain.
Natural Resources available:	The most abundant natural resource is Leucaena trees which can be found freely on the mountain and from the plantation by the member of the community. Besides Leucaena tree there are also rice husk, corncob, and peanut shell. Almost all families in this village raise three cows for the agriculture purpose. Pigs are also raised but there are not too many.
Current electricity access:	<ul style="list-style-type: none"> • Currently, there are around 250 households from three neighbored villages in Banan District who can access to the electricity produced by CEC. The electricity production is kind of biomass gasification using Leucaena and corncob as main fuel. The total installed capacity is 29 KW. • Still, there are some villagers use battery for lighting application and TV.
Current fuel consumption (kind and prices of fuels):	<ul style="list-style-type: none"> • People still depend on the kerosene for lighting application because CEC does not provide electricity 24 hours a day. • For cooking application, people in the village depend on the fuel wood which can be collected easily from rice field and farm.
Current economic basis of the village:	People in the village generate income mainly from rice field and plantation.
Heights of income in the village (estimate):	Depending on the families, the height of income can be varied from 250 US\$ to 2500 US\$ per year.
Future plans for economic development:	<ul style="list-style-type: none"> • Most of the future plans for economic development focus on agriculture. The community also think about the improvement of activities during night time such as creation of the evening class and other activities. • There is a huge demand in electricity from the villagers nearby. CEC plans to expand their customers till 2500 households. • There is also power grid extended in about several kilometres at the beginning of the road leading to this Banan district. No available information on when the grid will be extended till this district.
Level of community support to such a project (political, financial, labour):	For the current project, one household need to pay 17.5 US\$ for a new connection. The power house is located on a premise belonging to the community, but CEC plans to own this piece of land to avoid any confliction in the future.
Amount of power needed (in Watt):	Based on typical consumption: $2 \times 9W + 40W \sim 60W$. The demand would be 60×2500 (households) = 150 KW
Time frame in which power is to be provided (daily, project timeline):	Daily electricity access with peak demand during the evening time.
Possible Technologies or combinations to be applied:	<ul style="list-style-type: none"> • Option 1: Biomass using Leucaena gasification for supplying part of the 2500 households • Option 2: Solar home system • Option 3: Family size biogas system

<p>Estimated project costs:</p>	<ul style="list-style-type: none"> • Option 1: Following the past experience from the Community Based Renewable Energy Project (See the appropriate technology scan for more detail), the installation of a 9 KW system cost around 24000 US\$. This could provide electricity to around 100 households plus the consumption of CBO. • Option 2: A solar home system with the capacity of 40 Wp is appropriate. This could cost around 300 US\$ per solar home system. • Option 3: A biogas plant with the volume of 4 m³ is suitable for one family since nearly all families have cows. This biogas plant could provide 3.5 to 4 hours for biogas stove and 8 to 10 hours for biogas lamp. The total investment cost for this biogas plant is around 320 US\$ (See the appropriate technology scan for more detail) 	
<p>Fotos (Site, main street, area, landmarks, resources like river, etc.):</p>	 <p>Figure 5: grid extension along the road to Banan district</p>	 <p>Figure 6: Leucaena tree used as fuel for gasifier</p>
	 <p>Figure 7: corncob used as fuel for gasifier</p>	 <p>Figure 8: power hours of CEC</p>

3 Omany 1 Village

Short name of Site:	Omany 1 Village
Official name of Site:	Omany 1 Village, Somrong Khnog Commune, Ek Phnom District
Province:	Battam Bang
Country:	Cambodia
GPS position (for Google Earth):	
Description of the project site (including travel description):	Omany 1 Village is located at around 6 Km from the provincial town. There are around 300 households in this village. The villagers do not gather around a centralized place but located along one small road a little bit bumpy. Each house hold is separated from the other by a remarkable distance. There is also one primary school and catholic temple in this village.
Natural Resources available:	Besides cows no abundant natural resource available in the village. Nevertheless there is one big rice milling located 5 Km from this village.
Current electricity access:	There is no electricity access currently and seems to have no future grid plan reaching this village (according to the interview with chef of commune). People living In this village depend on battery for lighting application and TV.
Current fuel consumption (kind and prices of fuels):	<ul style="list-style-type: none"> • Some people still depend on the kerosene for lighting application. • For cooking application, people in the village depend on the fuel wood which can be collected easily from rice field and farm.
Current economic basis of the village:	Around 80% of the villagers are farmers.
Heights of income in the village (estimate):	Depending on the families, the height of income can be varied from 500 US\$ to 2500 US\$ per year.
Future plans for economic development:	There is only development plan for irrigation system, infrastructure, and plantation.
Level of community support to such a project (political, financial, labour):	There used to be once financial support from relevant ministries such as environment, social affair for the construction of infrastructure. Unfortunately, there has never support for energy project before.
Amount of power needed (in Watt):	Based on typical consumption: $2 \times 9W + 40W \sim 60W$. The demand would be 60×300 (households) = 1800 W
Time frame in which power is to be provided (daily, project timeline):	Daily demand with peak demand during the evening time.
Possible Technologies or combinations to be applied:	<p>Only two possible options which are suitable for this village, since there has abundant natural resource available in the village.</p> <ul style="list-style-type: none"> • Option 1: Solar home system • Option 2: Family size biogas system
Estimated project costs:	<ul style="list-style-type: none"> • Option 1: A solar home system with the capacity of 40 Wp is appropriate. This could cost around 300 US\$ per solar home system. • Option 2: A biogas plant with the volume of 4 m³ is suitable for one family since nearly all families have cows. This biogas plant could provide 3.5 to 4 hours for biogas stove and 8 to 10 hours for biogas lamp. The total investment cost for this biogas plant is around 320 US\$ (See the appropriate technology scan for more detail)

Fotos (Site, main street, area, landmarks, resources like river, etc.):



Figure 9: One of the household of the project site



Figure 10: Main road of the project site



Figure 11: Irrigation system

4 Omal Village

Short name of Site:	Omal Village
Official name of Site:	Omal Village, Prey Rokar Commune
Province:	Battam Bang Province
Country:	Cambodia
GPS position (for Google Earth):	
Description of the project site (including travel description):	Omal Village is located at around 6 Km from Battam Bang provincial town.
Natural Resources available:	Only Rice husk which is abundant.
Current electricity access:	There is no electricity access currently and seems to have future grid plan reaching this village. People living in this village depend on battery for lighting application and TV.
Current fuel consumption (kind and prices of fuels):	<ul style="list-style-type: none"> • Some people still depend on the kerosene for lighting application. • For cooking application, people in the village depend on the fuel wood which can be collected easily from rice field and farm.
Current economic basis of the village:	Most of the people are farmers.
Heights of income in the village (estimate):	The average income for farmers can reach 5000 US\$ per year.
Future plans for economic development:	N/A
Level of community support to such a project (political, financial, labour):	Any decision to participate in any project needs to discuss with district governor.
Amount of power needed (in Watt):	Based on typical consumption: $2 \times 9W + 40W \sim 60W$.
Time frame in which power is to be provided (daily, project timeline):	Daily demand with peak demand during the evening time.
Possible Technologies or combinations to be applied:	<ul style="list-style-type: none"> • Option 1: Biomass using rice husk gasification • Option 2: Solar home system • Option 3: Family size biogas system
Estimated project costs:	N/A
Fotos (Site, main street, area, landmarks, resources like river, etc.):	

5 Kompong Thom Orphanage

Short name of Site:	Kompong Thom Orphanage Centre
Official name of Site:	Achar Leak Commune, Stung Sen District
Province:	Kompong Thom
Country:	Cambodia
GPS position (for Google Earth):	
Description of the project site (including travel description):	Kompong Thom Orphanage Centre is located along national road 6 at around 2 Km from the provincial town. The road is in excellent condition and is accessible year round with only 2 minutes by car from the provincial town. The centre consists of 8 dormitories, 1 office, 1 computer room, 1 dining room, 1 health centre and 1 library.
Natural Resources available:	Besides sunlight and organic waste produced by the centre, no other natural resources were reported.
Current electricity access:	The centre is currently connected to the provincial grid. But the stability and reliability of this grid is not ensured. The electricity is often not available during the evening time leading to the absence of the evening class for the students.
Current fuel consumption (kind and prices of fuels):	<ul style="list-style-type: none"> • The centre is electrified by the provincial electricity grid • For cooking application, people in the centre depend on the fuel wood and charcoal
Current economic basis of the village:	The Kompong Thom Orphanage Centre does not carry any activity for income generation. It relies solely on fund and support from the government and donors. It receives the fund from the Royal Government, the assistance from ASPECA and Enfants Angkor Belgium, German Speaking Catholic Community St. Elizabeth in Singapore etc.
Heights of income in the village (estimate):	N/A
Future plans for economic development:	<p>The Khamphong Thom Orphanage is not a typical community but a settlement with an electricity problem which is exemplarily for Cambodia. The orphanage is connected to the electricity grid but the quality and stability is very low. The local energy service company charges 0,45 USD/kWh. In the evening, when the students want to learn and the teachers want to offer further education courses the needed electricity is mostly not available.</p> <p>To overcome this problem, the German-speaking Catholic Community St. Elisabeth in Singapore, already supporting this orphanage in different ways, developed a 3 step concept (summary of the project can be found here):</p> <ul style="list-style-type: none"> • Short term: Using a special environmental educational concept: Train the trainer, conduct workshops with the children/students in Singapore and in Cambodia • Medium term: First installations of solar plants at the orphanage together with the students to enable them for further installations and maintenance • Long term: Extending the project in collaboration with larger institutions to ensure future activities and professional support <p>After step 1 was finalized successfully a contact to the REEPRO project could be established. This enabled the project team to run step 3 concurrently with step 2:</p>

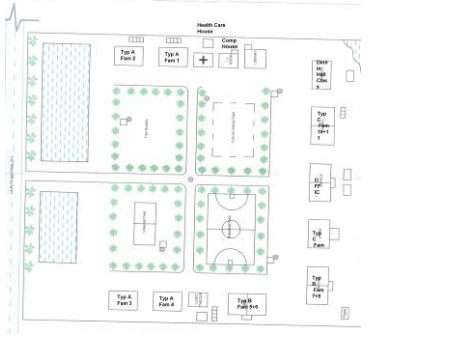

	<ul style="list-style-type: none"> • 2 members of the orphanage are joining the REEPRO level 1 train the trainer programme in Cambodia • The orphanage will be considered to become a pilot community within the REEPRO project • Than the installation of the houses will be done together in order to train the orphans and the trainees of the REEPRO project. <p>The goal is to electrify the 11 student houses and 1 office with photo voltaic bases island systems. Currently we can afford to install 2-3 houses.</p> <p>The centre is seeking for more fund and support from various donors. Especially, the centre is currently working with German Speaking Catholic Community St. Elizabeth in Singapore and the REEPRO Project to search for more fund and collaboration for installing more solar power for the dormitories and offices in the centre.</p>
<p>Level of community support to such a project (political, financial, labour):</p>	<p>Politically, there is a strong support from the local government regarding the installation of the renewable energy project in the centre. Furthermore, people living the orphanage area can offer a strong labour support for any installation of the renewable energy project.</p>
<p>Amount of power needed (in Watt):</p>	<p>Depend on the type of building and nature of consumption, we can summarize as follow:</p> <ul style="list-style-type: none"> • Dormitory : 1,410 Wh/day • Office building : 4,741 Wh/day • Health care building : 1,448 Wh/day • Computer house : 7,941 Wh/day • Library : 1,388 Wh/day • Dinning hall/classroom : 1,338 Wh/day
<p>Time frame in which power is to be provided (daily, project timeline):</p>	<p>Daily demand with peak demand during the evening time.</p>
<p>Possible Technologies or combinations to be applied:</p>	<p>Only two possible options which are suitable for this village, since there has abundant natural resource available in the village.</p> <ul style="list-style-type: none"> • Option 1: Solar home system to replace the current electricity supply • Option 2: Family size biogas system to replace the current fuel wood and charcoal consumption for cooking
<p>Estimated project costs:</p>	<ul style="list-style-type: none"> • Option 1: depend on the dormitory and office size and also its associated activities. • Option 2: A biogas plant with the volume of 4 m³ is suitable for one family. The total investment cost for this biogas plant is around 320 US\$ (See the appropriate technology scan for more detail)
<p>Fotos (Site, main street, area, landmarks, resources like river, etc.):</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Figure 12: Layout of the orphanage centre</p> </div> <div style="text-align: center;">  <p>Figure 13: dormitory of the orphanage centre</p> </div> </div>



Figure 14: office building of the centre



Figure 15: Lighting in the dormitory of the centre