

Rapid Social and Environmental Impact Assessment

On

Introduction of PV Systems

For

Implementation of Corporate Social Responsibility in Rural
Energy Systems in Isolated Areas in Guyana



Organización Latinoamericana de Energía
Latin American Energy Organization
Organisation Latino-américaine d'Énergie
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Abbreviations and Acronyms

OLADE	Organization for Energy Development in Latin America and the Caribbean
GEA	Guyana Energy Agency
OPM	Office of The Prime Minister
RE	Renewable energy
CIDA	Canadian International Development Agency
GoG	Government of Guyana
CSR	Corporate Social Responsibility

Executive Summary

The Village of Powaikoru was used as the study community to assess the social and environmental impacts of introducing Photo Voltaic (PV) technology to power development items (night lighting, educational tools and accessories, refrigeration, computers and different businesses) at three pilot locations.

There was much enthusiasm from the residents about the project and some seventy (70) persons took part in the consultation which lasted some ten hours over a two day period. The primary interest was for opportunities that could generate cash to purchase additional amenities – food and housing infrastructure. The social benefits to be derived from the project are great. There are limited and manageable negative environmental impacts.

The whole village is expected to benefit. However, traditional governance and decision making structures need to drive the implementation and use of solar driven development, to prevent conflict which may arise from more aggressive and capable individuals 'owning' the commercial benefits and advancing disproportionately to others.

With regards environmental impacts, the small saw-mill will require oil, the laundry will require detergent and will generate effluent. The chicken farm will also generate wastes. Reuse of effluent and wastes on farms should be promoted. The introduction of a centralized water supply will result in the concentration of waste waters and should be located where the effluent can be captured and treated to a quality suitable for discharge.

Solar panels and batteries have a 20 year plus lifespan. However, specific means to recover and return faulty and used equipment should be developed so that they are not discarded in and or around the village.

A cross-section of the community should be trained and empowered to install, operate and maintain any new equipment to ensure that the new capacities built remain in the Village and do not migrate elsewhere in search of new opportunities with the knowledge gained.

Finally, the Powaikoru Village is currently intact socially and living at a subsistence level. The benefits derived from the introduction of new development infrastructure need to be managed through traditional decision making.

Background

The communities of Powaikoru, Kangaruma and Shulinab were selected for the installation of three (3) Solar Photo Voltaic systems to meet the communities' needs for energy. All three communities required basic electricity to assist in the development of micro businesses and provide communal services to the individuals and families that comprise them.

Because the needs are quite similar the same installation is proposed. As a result, the use of this PV technology in rural Guyana was examined to identify the potential impacts on the environment. Since the required equipment was manufactured outside of Guyana, the manufacturing process was not considered in assessing impacts. The installation and maintenance of these systems into the community was examined to determine the impact.

The Powaikoru community in Region 1 was used as the case study and the results are applicable to any similar PV implementation.

1.0 Introduction

This Rural Energy Project is being executed by the Latin American Energy Organization (OLADE) and University of Calgary with funding from the Canadian Government, in collaboration with the Guyana Energy Agency (GEA). The Project is seeking to engage and direct Corporate Social Responsibility towards the renewable energy powered electrification effort in hinterland communities. After a careful selection process, three (3) pilot projects, targeting specific beneficiary communities have been selected as well as the respective sponsoring companies and implementation partners. These communities are:

Beneficiary Community	Region
Powaikoru	1
Kangaruma	7
Shulinab	9

Table 1 – Selected Communities

The needs of the final three (3) selected communities were examined in three (3) categories; residential, public and commercial. Residential needs range from the access to computers to other electrical appliances such as TVs, washing machines, radios and other small devices. Public needs include multi-purpose buildings, guest houses to host visitors to the community, library, health and centralized services such as water and washing facilities. Properly equipped schools and vocational training facilities are also required. From a business perspective there is the need to develop sawmills, bakeries, craft, farming and other agriculture (Needs Assessment, Atom, March 2014)

1.1 Purpose

The purpose of this report is to present the results of the environmental impact assessment on the placement of PV technology into the rural communities in Guyana. The adopted approach considers the guidelines for such studies in Guyana and the guidelines given by the Canadian Government.

1.2 Audience

The primary audience for this document will be OLADE and the Key Stakeholders.

1.3 Description of Communities

Since the same PV technology will be deployed in all three communities, the Village of Powaikaru was selected for the study. A brief description is provided for each community but the main focus will be on the Village of Powaikaru in Region 1. This village was visited for three days. The consultant spent this time in the community having discussions with the members and examining the surroundings to collect all relevant information.

1.3.1 Kangaruma

This community was settled in Late 1800s and has a population of 284 persons. 57% of these are female. The primary economic activities in this community are farming, fishing and mining.

Below is a Table of Age Groupings

Age Group (years)	Number of Persons
> 65	12
< 5	45
> 5 and < 14	86
> 14 and < 30	65
> 30 and < 65	76

Table 2: Age Distribution in Kangaruma

1.3.2 Shulinab

This community was settled in 1902 and has a population of 486 persons. 56% of these are female. The primary economic activities in this community are fishing, tourism, livestock and craft.

Below is a Table of Age Groupings

Age Group (years)	Number of Persons
> 65	25
< 5	75
> 5 and < 14	156
> 14 and < 30	101
> 30 and < 65	129

Table 3: Age Distribution in Shulinab

1.3.3 Powaikaru (Selected Community)

This community was settled in 1976 by the indigenous Warao People some thirty-eight years ago. It is located in the north of Region 1, which borders Venezuela on the western side of Guyana. It is about a two-and-a-half hour boat ride from the town of Mabaruma, where the Regional Administrative centre is located. Powaikaru is at the end of a three mile tidal creek which flows into the Kaituma River. Timing is important when visiting Powaikaru. The creek can be traversed at all times in the shallow light weight canoes (bongos) used by villagers. However, even small boats with engines have to wait on the rising tide to have full access to the village.

At the time of our visit the village comprised twenty-nine (29) households occupied by 161 people. Some fifty (50) persons had left the village within the last year in search of social and economic opportunities elsewhere. The dwellings are mostly open sided, made of wood with thatched palm roofs. There is a primary school built last year and a resident teacher. The teacher has his own quarters. The village has a community centre, a church under construction (Full Truth Tabernacle) and a guest house. These are located near to the creek. The village is spread over five (5) acres and is surrounded by subsistence farm lands. Some eight (8) years ago, a Health Centre was constructed about half-way up the creek but has never been used. Four houses are constructed on an island in the creek just before the village.



Figure 1: Entry level Primary School Powaikoru, June 2014

Since a common technology will be deployed into all three communities, the Village of Powaikaru was selected for the study.

1.4 Powaikoru Living Conditions

Water is obtained from five shallow wells constructed out of concrete with support from the Red Cross. Pit latrines are used for basic sanitation. Cooking is performed at a household level. Women are responsible for all domestic activity including child rearing, washing, cleaning and cooking. They also work on the farms. Clothes are washed in the river with crude soap.

The men hunt and carry out primary farming activity. Crops grown include yam, eddoes, cassava, banana, sweet potato, ginger, peas and peppers. 'Greens' are generally not cultivated. Cassava bread is the main staple. A number of mature trees have been planted including avocado, coconut and mango. Fish and all

forms of wild meat are hunted. There are no guns in the village. Hunting is done with spears, bow and arrow and traps.



Figure 2: Typical dwelling Powaikoru, June 2014

The female to male population is just over 50%. Below is a Table of Age Groupings

Age Group (years)	Number of Persons
> 65	9
< 5	16
> 5 and < 14	48
> 14 and < 30	29
> 30 and < 65	59

Table 4: Age Distribution in Powaikaru

The age distribution shows that some 40% of the village is less than 14 years old and close to 60% of the village is less than 30 years old. Children over fourteen

do not attend the school. There are presently no educational opportunities for them. Child bearing can begin any time after puberty.

The village is governed by a Council made up of six persons headed by a Tushao. Decisions are made largely by consensus. When this is not possible the Tushao makes the final decision.

There are eleven families that make up the village population: Lewis, Santiago, Martin, Diego, Smith, Poliah, Jeffrey, Williams, Gomes, Toco and Anastasio. Indigenous names are no longer used. Warao, the language is still used and English. The current group of children attending school will be the first literate generation of Warao at Powaikaru. Traditional social practices are generally intact. However, evangelical Christianity has been established. Villagers are generally willing to be converted keeping the new religion alongside their traditional beliefs and practices.

Common illnesses include gastrointestinal disorders and hay fever, during dry season.

The Warao do not have title to their land which they occupy and hunt on. The Village Council has applied for title. This covers the village and farm area and not the wider area which they use.



Figure 3: Primary School and Teacher's Quarters (Powaikoru, June 2014)

Some of the men have cell phones including the Tushao. Reception is generally poor and limited to certain 'spots'. Solar cookers were made available to all households in the village. These have been widely discarded as people preferred open fires which provide warmth and the smoke chases mosquitos. Several diesel generators (4) are used on special occasions for night lighting in the Community Centre. One was used while we were there. It is noisy and made it hard to hear. These are portable generators which were 'cubes' about 16 inches diameter with pull chords to start. The scope of this project does not include doing anything to or with these generators.



Figure 4: Abandoned solar cookers (Powaikoru, 2014)

Very little cash money is earned by villagers. Some crops and hunted meat is sold at Port Kaituma.

2.0 Impact Assessment

2.1 Methodology

The contact time with residents of Powaikoru was limited to ten hours over a two day period. The approach was to:-

- 1) Gain an understanding of existing living conditions
- 2) Explain the proposed activity
- 3) Document responses
- 4) Summarize the key social and environmental impacts of the intended activity.

Because of the nature of the project environmental impacts were not expected to be negative and certainly manageable if they were.

Social changes were expected to be both positive and significant.

This document can be considered a 'rapid social and environmental impact statement' arising from the introduction of renewable energy systems into rural communities in Guyana.

2.2 Consultation

The author visited Maburama and met with the Region's Community Liaison Officer (John Antonio) and the Regional Deputy Chairman (Fermin Ultise-Singh). The purpose of the visit was explained and the Deputy Chairman offered to accompany the author to the village. This turned out to be essential since access and communication was difficult. Also, the Deputy Chair had a good and

longstanding relation with villagers and we were very well received. We were also accompanied by a boat driver.

We spent two nights in the village on the 9th and 10th of June, 2014. We were met in the creek and transferred to two canoes. We arrived after dark. The following day and evening was spent in discussions with villagers. Attempts were made to have separate meetings with the men and the women and with older and younger age grouping. This was not possible. Some seventy (70) persons attended meetings throughout the day, including men women and children. The purpose of the visit was explained along with its objectives. This was presented directly from the project documents. The Deputy Chair assisted in explaining what the project was about. During the day we toured the village and surrounding farms. Key features such as water wells, pit latrines and the river bathing pool were pointed out.

While there were some communication challenges, there was much enthusiasm and overall we spent ten (10) hours of formal contact time (breaking for lunch and dinner) discussing the project and related issues. These mainly centred on types of development, the meaning of sustainability, types of energy, pollution, sanitation and the advantage of renewable energy (solar) over fossil based energy systems. This was slow going but in the end most of the people who attended understood what was being proposed. Every effort was made to encourage participation. There were recorded contributions from at least twenty (20) persons. The term 'corporate social responsibility' took some effort to communicate. It was explained as a group of successful business persons (people with surplus money earned from offering goods and services) who are responsible and willing to share their profits with others to improve the overall well-being of Guyanese.



Figure 5: Region 1 Deputy Chairman introducing EIA Consultant in Powaikoru Community Centre (June 2014)

2.3 Project Elements Presented

The March 2014 Report on 'Community Needs for Implementation of CSR in Rural Energy Systems in Isolated Areas in Guyana' was directly referenced. The Residential, Public and Commercial Requirements were presented as well as the prioritization and focus on commercial and public energy services. Excerpts from this Report are summarized below.

<u>Public Requirements</u>	Multi-purpose Building with nursery for infants, Guest House, Public Lighting, Centralized Water Supply, Access to Computers, TV and/or radio, Washing Machine, Refrigeration and a Primary School with proper equipment, kitchen and dining facilities
<u>Commercial Requirements</u>	Bakery, Small Saw Mill, Medium-scale Chicken Farm
<u>Prioritized Requirements</u>	Shared Area for access to computers, radio and other small device and a Bakery
<u>Project Power Delivery</u>	11,000 kw-h/year with peak demand of 10KW of power using solar PV technology and battery support

Table 5 : Summary Community needs

2.4 Community Consultation Highlights

The “needs assessment” criteria were discussed. These are:

- Benefits to individuals
- Benefit to Community as a whole
- Female Impact/benefits
- Productivity Potential

Because the meeting took place with 'mixed stakeholders' together (old, young, male and female) and the older and then younger males dominated the discussion it was not possible to determine the extent to which needs that benefited specifically females were to be ranked. However, there appeared to be consensus that "productivity" – the ability to earn cash money was the most important. This was followed by benefits to the whole community, targeted female benefits and lastly individual benefits. This triggered a discussion on the fact that some family farms were better off than others, some houses better equipped than others, and some individuals more capable than others. There appeared to be open willingness to share skills.

Hunting, farming and cooking is done at a household/family level. Produce and bounty is shared within households first, depending on who caught the animal/fish or whose farm it is. Since there is no existing refrigeration meats are consumed fresh or salted for preservation. When large animals are caught these are shared communally as the meat would spoil quickly.

Of all the 'Requirements' presented, the small saw mill was the most favoured, followed by improved school facilities, communal night lighting and the nursery. It was noted that education was limited to under-fourteen year olds. It was suggested that night lighting could support literacy training for older children and adults since they were busy during the day.

The concept of a washing machine was not clearly understood and the idea of a communal bakery did not appear to generate major enthusiasm. However, in discussion it was agreed that if the cassava bread was communally cooked it could save cooking time at the household level.

The concept of the internet access through computers was much discussed. There was genuine concern that "very good" and "very bad" things could be accessed using a computer (on the internet, particularly pornography, violence and "false realities"). It was explained that computers could be used for literacy and general education, including a projector, without the need for the internet.

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The centralized water supply generated great interest. This is because the existing wells are not being properly maintained and were 'uncovered' at the time of our visit (they should be covered to prevent sunlight, contamination, frog and insect access, accidents with small children and growth of algae). Poor water quality consumed could well explain common diarrhoea.

Refrigeration was widely supported for the purpose of storing meats and creating commercial sale opportunities. The chicken farm was also considered favourably.



Figure 6: Guest House and Church under construction (foreground) Powaikoru, June 2014

2.5 Assessment

#	Proposed Activity	Benefits				Impacts		Mitigation
		Individual	Communi	Women	Productiv	Social	Environme ntal	
1	Night Lighting (MPB)	x	x	x		+ve: increased opportunity for social contact time, literacy, general education	none	NA
2	MPB/with Infant nursery		x	x	x	+ve: early childhood development, increased productivity time for mothers	none	NA
3	Guest House		x			+ve: increased contact time with external educators/ service providers	none	NA
4	Public night lighting		x			+ve: improved visibility, safety for access	none	NA
5	Centralized Water Supply	x	x	x		+ve: greater control over water quality, improved health, improved sanitary conditions possible	Generation of increase point source discharge of wastewater	Wastewater management required
6	Access to Computer	x		x		+ve: increased awareness of outside world, education opportunities,	none	Strict controls over internet access.

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	s, TV and/or radio					communication. Caveat on internet access. -ve: contact with negative attitudes, behaviour, cultural practice		Final solid waste disposal/ materials recovery plan required after lifespan expires
7	Washing Machine		x	x	x	+ve: increased time available to women for productive activity. Need for cash money to purchase washing powder	Wastewater generated	Wastewater management required. Disposal/ materials recovery plan required after lifespan expires
8	Refrigeration		x	x	x	+ve: will allow meats, medicines and perishable goods to be stored for long periods. Possible commercial benefits from selling frozen items	none	Disposal/ materials recovery plan required after lifespan expires
9	Equip Primary School	x	x			+ve: presently school has very limited equipment - common chalkboard and crude seats and desks. Implements include pencil and paper. Additional equipment and teaching aids would have dramatic positive impact and increase knowledge transfer	none	NA
10	Bakery		x	x	x	+ve: currently cooking/baking done at household level. A communal bakery could have commercial	none	NA

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						benefits if breads sold outside community. If used for baking for local consumption it would reduce time baking at household level		
11	Small Saw Mill		x		x	+ve: excellent commercial opportunity. Saw could be used to upgrade village houses and general infrastructure and generate income for village from sale of cut and finished timber. Oil would need to be purchased. Spare blades required. Secure building for storage.	Solid wastes generated from disposal of oil cans. Increased cutting of trees	Sustainable harvesting of trees required and limits set on harvesting. Need management plan for this activity
12	Medium-scale Chicken Farm		x			+ve: meat and eggs could be used to increase village protein intake and overall health of community. Opportunity for commercial sales	+ve: Chicken manures could be used as source of nitrogen on farms	
13	PV Panels & Battery	x	x	x	x	+ve: supply of renewable energy/electricity for number of socially beneficial activities	PV Panels have life expectancy of 20 to 25 years. Faulty	Final long-term disposal plan required for material pollutants which include silicon, copper,

Environmental Impact assessment

								panels will require disposal	semi-conductors, Alu-Zinc
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Table 6: Community Impacts Assessment

3.0 Discussion on Impacts

Introduction of proposed renewable energy powered appliances, educational tools and night lighting can have a dramatic positive social impact on the villages. The environmental impacts are limited but important to mitigate. Electricity will completely change the lifestyle of the community after dark, where activities are limited to households or to hunting. A lighted multi-purpose building would allow for greater social interaction, the opportunity for greater learning, study and access to information, particularly for those above the age of going to primary school. Children attending school could also do homework. Children hungry to learn would have an opportunity that presently does not exist.

The fact that these amenities are being powered by renewable energy while ‘modernizing’ the lifestyles of the inhabitants, is a uniquely and interesting proposition. Knowledge and understanding of installation, operation and servicing requirements for PV panels and battery should be taught and the full capacity to trouble shoot and operate all systems and equipment should be transferred to appropriate residents. Caution should be paid to training only younger people who might be prone to leave with the new knowledge gained.

The project provides the opportunity to transform the existing ‘means of subsistence’ to ‘means of production’. It is essential however, that it does not cause conflict and divisions to enter into what appears to be a vulnerable yet ‘intact community’. Traditional governance structures need to be used to make decisions and allocate responsibility. It also provides an opportunity for women to advance and have a greater say in decision making. If such individuals exist they should be encouraged to come forward and be trained in installation, use and operation of any new equipment.

Existing production centres on families. A bakery, small saw-mill and chicken farm would alter the means of production making them strictly for communal or shared benefits accruing to the whole village. The introduction of any new opportunities for commerce should not be controlled by individuals and all decisions should be made in keeping with existing governance structures to avoid conflict. Change should be incremental and monitored. Income generated from any of the new equipment should be equitably shared. The pending introduction of the Rural Enterprise with its financial scheme is to be agreed to by the local community should address these issues.

New development and opportunity will expose differences in ability among villagers. More ambitious and hard-working individuals will rise first to claim any possible opportunities. Care must be exercised on assigning responsibility and opportunity, to ensure that they are spread widely to the extent this is feasible.

Children exposed to greater knowledge and information about the outside world will have different expectations and ambitions. Some may wish to leave to seek a future. Others will remain. In any event, this pristine and sheltered community will be transformed by the project. All social impacts should be carefully considered and support given to avoid conflict, manage disputes and resolve problems, by empowering young, old, male and female individuals within traditional governance practices.