1.0 IDENTIFYING INFORMATION

1.1 Project Name:	**Watershed Resource Management and Micro Hydro Power Development for the Maducayan Tribe of Mt. Province**
1.2 Project Type	Community – based resource management (watershed protection, biodiversity conservation) and development and installation of a 30-kW microhydro power facility for household electrification and rice mill operation.
1.3 Project Site:	Bgy. Maducayan, Natonin, Mountain Province
1.4 Proponent:	Episcopal Diocese of Santiago Santiago City, Isabela
Co-Proponent:	Sibol ng Agham at Teknolohiya 4th and 5th, # 40 Matulungin St. Bgy. Central, Diliman, Quezon City Telefax: (632) 928-8316 Tel No.: (632) 926-8971
1.5. Contact Person/s:	1. Fr. Clarence Olat Project Development Officer, EDS 2. Victoria M. Lopez Executive Director, SIBAT
1.6 Resource Base:	Forest, upland area

2 RATIONALE

2.1. Brief Area Description

Location of target sites. Barangays Maducayan and Saliok, home to the Maducayan Tribe, are sites for the community-based efforts to utilize the Maducayan River for a microhydro power plant, and the development and management of its vital water catchment resource area in the watershed. Maducayan is a barangay of Natonin municipality of Mt. Province in the Cordillera Administrative Region, and is situated at 121° 16.5' East longitude and 17° 6.6' North latitude. It is located about 96 kilometers east of Bontoc, the capital town of Mt. Province, and about 67 kilometers from Santiago City, Isabela Province, which serves as the center of trade and commerce for these Bontoc villages.

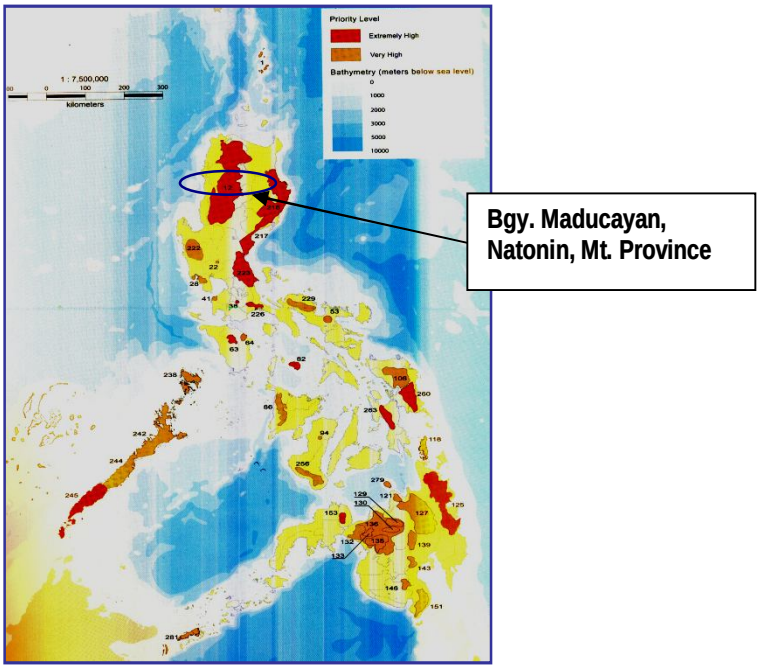
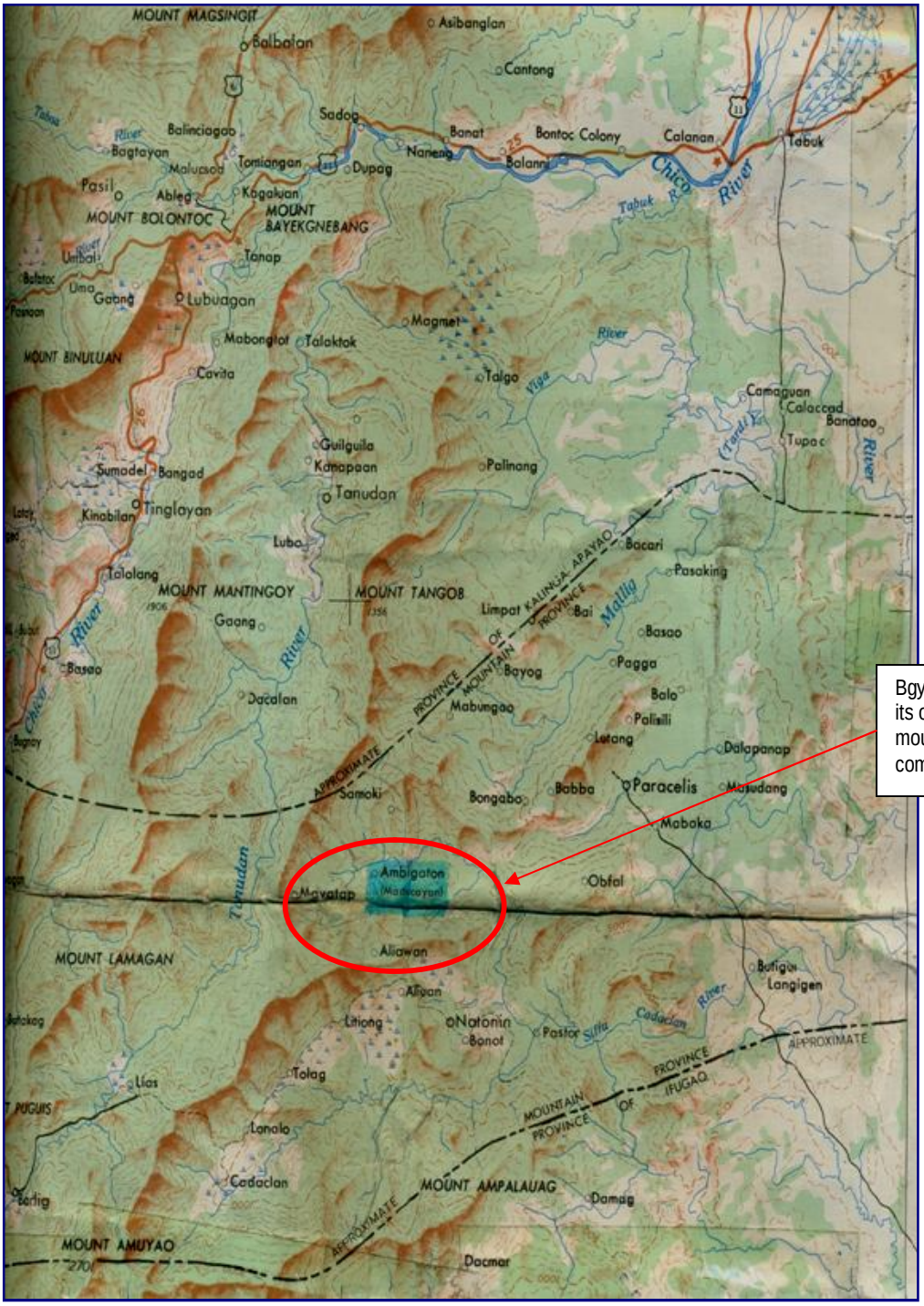


Figure 1: Location Map of Bgy. Maducayan,Natonin, Mt. Province

Accessibility. Maducayan and Saliok are remote barangays accessed mainly via 1 and ½ hour ride in public vehicles plying daily between Santiago City, Isabela and Paracelis. Maducayan is reached from Saliok in 2-3 hour walk through foot trails and river crossing. If weather permits, an alternate 6-kilometer trek is taken along the provincial road in Natonin after a 5-hour ride from Bontoc. Informants say that only two public vehicle units alternate the provincial route.

The Maducayan Indigenous People. Members of the Maducayan tribe (one of the major ethnic groups of the Cordillera) numbering 75 households comprise the main inhabitants of the target communities. It has been noted that the



Bgy. Madukayan (or Ambigaton, its old name) and the mountainous surroundings comprising its watershed area

Figure 2: Topographic Map of Bgy. Maducayan, Natonin, Mt. Province

Maducayans have preserved most of their cultural practices. They continue to display great respect for their elders. The Maducayans promote peace pacts or *bodong* with neighboring and distant tribes and communities. The local dialect spoken is Maducayan, which bears strong similarities with the Kalinga dialect.

Majority, i.e., 90% of the population is affiliated to the Anglican Church (EDS) and the rest are Roman Catholic (9%) and Baptist (1%).

These upland communities survive with little social services. There is no hospital in the community, health services are provided by resident barangay health worker and midwife – assigned not only in Maducayan, but also to the neighboring Sitios of Macottor and Apatan in Saliok. Respiratory illnesses remain as the leading cause of morbidity (3 out of 10) and mortality in these areas.

Picture 1 & 2: [left] and [below] show the Maducayan community

Description of the watershed area. Barangay Maducayan and Barangay Saliok are upland barangays bounded in the north by the high mountains of Tanudan, Kalinga. The overall topography is mountainous and hilly with thick forest cover of dipterocarp type. Woodland or forest areas occupy almost one-third of the total land area (4,184.25 hectares). General elevation ranges from 500 to 600 meters above sea level. Terraced fields for rice production are located along mountain slopes and low-lying grounds. Swidden farms are slowly being established in the upland areas.

Water resources. The Maducayan River is the main river in these communities. It is supported by several creeks and tributaries (Maranas, Karao and Ma-arway) that serve as source of irrigation to some payew. The river and creeks are the year-round sources of fish and other edible freshwater species. There are springs also which serve as the source of potable water for the households

The water flow and discharge are found to be consistent throughout the year. Occurrences of higher water level are observed during typhoon months. Hence, generally, water supply in the Maducayan area is highly abundant and suitable for agriculture and energy development.

Catchment area of the Karao River. Generally, vegetation surrounding the Karao River (the source to supply the proposed microhydro power plant) is lush with primary and secondary dipterocarp forests. Various species of hardwood trees, vines and other plants were noted in abundance within the catch basin of the target water source and surrounding uphill. It was found that the side slopes have been utilized for *kaingin* and are planted with coffee, bananas and other fruit trees.

Terraced farming and *kaingin* or *uma* as sources of food. Residents of Maducayan and Saliok rely on farming as their major source (75%) of livelihood or occupation. Rice is the main staple and a major crop in this upland area. Farmers grow rice twice annually in more than 200 hectares of communal irrigated rice fields and terraces. Average farm size per household is 0.75 to 1 hectare yielding 60 cavans/hectare on average.

Other subsistence crops are grown mostly in the *uma or kaingin*. Sugarcane, corn, root crops (yam, taro and sweet potato), banana and few vegetables (squash, pechay, cucumber, papaya) are planted as secondary crops. Some households domesticate pigs, chickens solely for consumption.

Coconut, coffee and fruit trees are also grown and are a source of cash.

The traditional watershed resource protection. . The forest of Maducayan is a dipterocarp type forest that bears *many* species of hardwoods, the survey showed. A barangay ordinance covers the protection of the forest. Logging is prohibited except for personal use. The farmers avoid the spread of fires when burning their swidden farms.

The traditional leaders and local barangays unit hold official jurisdiction over Karao River and nearby tributaries. Community projects tapping the same and surrounding water sources (e.g., Maranas and Bucalan Creeks) for either potable water system, irrigation and microhydro development are at present, officially coordinated and supervised by the local barangay unit.

2.2. Problem Statement

2.2.1 Low Food and Income and the Pressures on the Maducayan Forests

Lean or Food Scarce Months. Rice production during the first cropping (June to November) is higher than in the second (December to May). Rice produced every cropping period is normally consumed for three months hence the production from the *uma* supports the lean or scarce period during the first cropping. Thus, more lean months occur after the second harvest, lasting from March to May. This is the time when farmers would incur debts from others with more cash -- neighbors, relatives and at times from local cooperatives. From the survey conducted, the lean period is a result of: the limited ricefields or *payew* to support the family's staple needs, and the lack of irrigation in some *payew* especially during the dry months.

To augment food and cash source, residents rely on coffee and coconut production in the uma. The survey yielded a fallow period after 7 to ten years of *kaingin* cultivation, an indication of over-cultivation. Eroded mountainsides are also observed to increase due to opening up of new *kaingin* sites.

The lack of sufficient food and cash drive the residents to look for food outside the communities. The few who have attained some education, often the young population, tend to migrate to other places. Only the adults and those who cannot afford to migrate till the *payew* and keep their *uma*.

The economic pressures on the forest. Hunting and forest gathering are traditional practices by the Maducayan people. However, the low crop productivity and lean months force them to more intensively utilize the forest for food and cash, which is observed to be leading to the depletion of the populations of some wild animals, and in some instances, the informants say, to localized extinction.

The following are the main species derived from the Maducayan forest for food, cash and other uses.

Table 1. Species derived from Maducayan Forest

Local Name	Common Name	Uses
Ugsa	Brown deer	For food, cash and decoration
Alingo	Wild boar/pig	For food and cash
Beklat	Snake	For food and cash
Fuwot	Cloud rat	For food and cash
Ka-ag/bakes	Monkey	For food and cash
Mutit	Wild cat	For food
Billit and itlog	Species of birds/including eggs	For food, pet and cash
Sabag	Wild chicken	For food
Panaklong	Grasshopper	For food
Abuhos	Ant eggs	For food
Uyukan	Honey	For food and cash
O-ong	Species of mushrooms	For food
Piit	Rattan shoot	For food
Rafong	Bamboo shoot	For food
Kawayan	Bamboo	For fence, irrigation, fuel, basketry and house construction
Kayo	Lumber (Lawaan, Narra, etc.)	House construction, furniture, handle for tools, post fuel wood, foot bridge
Uwey	Rattan stem	For weaving
Rono	Wild tiger grass	For plant poles, fence and others

2.2.2 Lack of Electricity

The following are finding from the Energy Demand Study conducted by SIBAT in the community.

Despite proposals by the local power distributor, electricity has not reached the barangay. Grid is six (6) kilometers away in Natonin Poblacion proper. It is powered by a generator set distributed locally by the Mt. Province Electric Cooperative (MOPRECO).

Energy consumption of residents is primarily directed for household use. This involves the operation of small appliances (such as flashlight and transistor radios), generator/s for rice milling, carpentry tools and other post harvest facilities. Kerosene is the primary source of fuel for lighting; diesel gasoline for small machines; firewood for cooking and batteries for flashlight/radios.

Majority of the local population rely on kerosene for lighting where a liter costs P24.00 in the local stores. Apart from kerosene; lamps, Petromax are also used only on specified occasions (i.e., weddings, etc.) but generally limited because of the greater volume of kerosene needed than wick lamps. Similarly, batteries are often used to power small household appliances such as transistor radios and flashlights. From the latest survey, kerosene and battery consumption among households is detailed as follows:

Table 2. Household Energy Consumption and Expenditure

Sources	Uses	Unit/Day or Week	Cost/Unit	Monthly Average
1. Kerosene				
• Gasera (2-3 units/hh)	- Overnight household lighting	1 350-ml bottle/day	P 6.50/bottle	P 182.00
• Petromax	- Overnight household lighting	2 bottles/day		
2. Dry cell Batteries	- Emergency lighting and security	1 pair/week	P 25.00/pair	P100.00
• Flashlight (2 batteries)	- Communication	3 pairs/week	P 25.00/pair	P 300.00
• Transistor radio (6-8 batteries)				
TOTAL				P 582.00

Meanwhile, agricultural activities from land preparation to post harvest-related activities are done manually with the modest of farm tools (e.g., plow, wooden harrow, traditional mortar and pestle, etc.) Neither rice mill nor coffee grinder exists within the community. Most of these facilities are availed expensively and quite remotely in either Natonin Poblacion proper (6 km) or in Paracelis (12 km).

Low crop productivity and cash are the basic problems that confront the daily lives of the Maducayan people that have also wrought pressures on their environment. They have recognized, in the consultations held in the community that affording them energy to be derived from the Karao River, will help increase the opportunities to produce food and cash. Thus, the proposed MHP project not only will address the electrification need of the community but will also help address crop production through the provision of additional irrigation water to enable *payew* expansion. The expansion of rice paddies and other food production activities are thus expected to reduce the *kaingin* practice in the area and ease the forest gathering and hunting practices in the forest. The necessity to sustain the water in the watershed catchment area (for the microhydro supply) will also help improve the state of the watershed.

2.3. Previous Efforts of NGO/PO Proponent

The information on Episcopal Diocese of Santiago (EDS) is found in *Attachment* 1. The EDS is a partner by the community in addressing such needs as food availability, health services, literacy and others.

3 PROJECT PURPOSES

The proposed project aims to assist the indigenous communities of Maducayan and Saliok in Mt. Province in biodiversity conservation and sustainable use of natural resources. Specifically, the project aims to:

1. Promote the conservation and protection of the communal watershed resources and forest biodiversity in the Maducayan communities;

2. Develop a community-based microhydro power plant with a capacity of 30 kW (30 kW MHP) for electrification of 102 households in Maducayan and 33 households in Saliok and operation of rice mill utilizing the community's water resource; and

3. Develop the community's local capacity for managing community-based MHP and watershed conservation projects.

The third objective is crucial as this will spell out the success and sustainability of the resource base that directly affects food production and energy generation. The watershed conservation activities shall directly contribute to the long-term sustainability of the renewable energy and irrigation infrastructure where water is the required resource. Pressure on the forest resources can also be minimized with increased food production.

4.0 PROJECT DESCRIPTION

Project Components

The proposed project will involve the development and establishment of a community-based resource management plan (biodiversity conservation, watershed protection and microhydro power development).

Component 1: Watershed Conservation and Protection, and Biodiversity Conservation

This component shall focus on awareness building and the mobilization of the community to strengthen the indigenous knowledge and practices in watershed pr forest conservation and protection and biodiversity conservation. The local communities will further work out the details of this plan. Activities, as expressed by the community during the initial consultation may include; (1) diversification in the present swidden

lands (agroforestry); (2) strengthening traditional laws and local policies in protecting the forest and wildlife; and (3) tree planting activities using endemic tree species, rattan and other non-timber trees to support livelihood.

Component 2: Community-based Microhydro Power (MHP) Development

This component shall consist the development and installation of a 30 kW microhydro power system for the two communities. The power to be generated shall provide the energy requirement of the community for electrification and operation of a 5 kW rice mill. The MHP system's headrace canal is designed to carry additional volume of water for irrigation. The water source for the MHP shall be sustained through the watershed conservation component of the project.

SIBAT completed the feasibility study of the proposed project and though the project requires a huge amount, the community expresses their willingness to provide counterpart in the form of locally sourced materials and labor. This shows the real interest of the people and their belief on the possible contributions of MHP to community advancement.

(a) Energy Needs and Priority

Energy to be generated by the proposed microhydro project will be intended for the following according to expressed priority of the community:

1. Household lighting for barangay residents;
2. Operation of small household appliances;
3. Operation of rice mill;
4. Operation of coffee grinder; and
5. Operation of woodworking tools.

The prohibited cost of kerosene in the locality, pollutants (black soot or residue) from kerosene, poor quality of illumination; and possibly creating additional opportunities to augment household income are the main reasons cited for household lighting.

While electrification is the topmost priority identified by the residents, it should be clear that the power available from the proposed design of the MHP project will not be sufficient for high-powered electrical appliances except low consumption devices (e.g., transistor radio or cassette recorder). Using the present actual energy consumption, the recommended power available per household should not only be limited but uniform. This will also suggest a fixed tariff for every household. To serve as a guide, the recommended amount should not be more than the current costs spent by the local residents for energy using kerosene.

(b) Demand for Electricity

- Lighting

Current energy use of households, i.e. 3 lamps, could be replaced by three to five 10-W compact fluorescent lamps (CFL) or fluorescent lamps and the dry cell batteries for the their radios by the electricity to be supplied by the MHP system. Shown below are the current energy demands of the 135 households of Barangay Maducayan and Saliok.

Table3. Current Energy Demand of Bgys. Maducayan and Saliok

Load	Wattage	No of Units	Quantity		Total Wattage
			Maducayan	Saliok	
Household electrification					
a. Lighting	10 W	5/hh	102 hh	33 hh	4.1 kW
b. Radio Cassette	14 W	1/hh	102 hh	33 hh	1.9 kW
Other Building					
c. School	20 W	4/classroom	4		
d. Church	20 W	10	2		
Rice milling	5 kW	1	1		5 kW
Total Demand					14.4 kW

With a population growth rate of 5.13% it is expected that the number of potential beneficiaries of the proposed microhydro project in Maducayan will reach 286 households by the year 2015. With this expected increase in the household population, the energy demand of the community will also increase to 24.3 kW. Shown below is the projected load of the proposed MHP system by the year 2015.

Table 4. Projected Energy Demand of Bgy Maducayan and Saliok

Load	Wattage	No of Units	Quantity		Total Wattage
			Maducayan	Saliok	
Household electrification					
a. Lighting	10 W	5/hh	216 hh	70 hh	14.3
b. Radio Cassette	14 W	1/hh	216 hh	70 hh	4.0
Other Building					
c. School	20 W	4/classroom	8		0.64
d. Church	20 W	10	2		0.4
Post harvest/ rice milling	5 kW	1	1		5
Total Demand					24.3 kW

From these projections the designed MHP capacity can still provide for the electrification requirement of the community 15 years after its installation.

Technical Feasibility

a. Water Source and Potential

The proposed site is located in the vicinities of Sitio Amolok and Tinaro in Bgy. Maducayan. The strong water currents of Karao River situated 800 meters northwest of the barangay proper has been identified by the local community and SIBAT's Technical Team as potential for microhydro power (MHP) development. The main criterion for the selection of water system is the presence of water year-round (i.e., the water system does not run dry at any point of the year).

There were no available stream flow and rainfall data at the proposed site. The design discharge used in the determination of plant capacity was derived from actual flow measurement conducted during the technical survey. Flow data was taken upstream of the proposed weir-intake site at elevation of 540 m.a.s.l. Using the current meter for discharge measurement, evaluation of the data gave the following results.

Picture 3: Proposed Intake Site

Table5. Generating Capacity of Karao River

• Distance of water source from barangay proper (km)	1.8 km
• Measured discharge Q_{min} (dry season)	0.50 m^3/s
• Design flow	0.150 m^3/s
• Head (m)	35 m
• Length of transmission line (km)	
- Primary (power house to barangay proper)	800 m
- Secondary (barangay proper to outside sitios)	2 km
• Estimated generated power (kW)	30 kW (min)

The plant capacity was estimated utilizing only 60% plant efficiency and 90% availability.

Geology at the proposed diversion site is composed of igneous rock outcrops that exhibit fractures. The waterway bed appeared to be composed of bedrock and boulders. The immediate downstream of the river is characterized by deposition of rocks and boulders with loose fragments of gravel, silt and coarse sand.

The geological characteristics at the proposed powerhouse site, at about 200 meters below the intake site, consist of clay loam and gravel. At this point, the creek bed is also composed of bedrock. Several springs are present in the vicinity that are being utilized for irrigation and domestic use.

Table 6. General Technical Details

Electrical Data	
Potential power output	30 kW
Rated Voltage	440 V
Primary voltage	1.5kV
Secondary voltage	230 V
Output current	49.26 A
Load power factor	0.6

Civil Works	
Weir length (reinforced concrete weir)	14 m
Weir height	1.0 m
Intake (width x height)	0.30 x 0.37 m
Headrace canal	690 m
Earth (length, width x height)	380 m, 0.60 x 0.60 m
Lined / concrete (length, width x height)	310 m, 0.40 x 0.60 m
Slope of canal	0.007 m/m
Fore bay volume capacity	6 m^3
Penstock length	152 m
Penstock size	
Upper 102 m portion	12” dia SDR 24 HDPE
Lower 150 m portion	12” dia SDR 17 HDPE
Powerhouse (floor area)	5 x 6 m

b. Applications and Operation Phase

Comparing the power available from the Karao River, and the demand study conducted, it is clear that the proposed source could provide for the electrification requirement of the entire population of the target barangays. The potential power that could be generated form from the proposed source could also provide for the operation of a 5 kW rice mill and the lighting requirement of the school and churches.

There will be a uniform allocation of 100 W per household for lighting and operation of small household appliances throughout the year. This allocation could also provide for the energy requirement of a 14" television set but all the lighting fixtures should be turned OFF. Rice mill operation should be done during off-peak lighting hours.

4.1 PLANNED ACTIONS AND ACTIVITIES

Objectives	Target / Expected Output	Critical Activities	Performance Indicator	Organization / Group Responsible	Schedule
Organize community-based people's organization in regard to the MHP structure around community development direction	Organized community with developmental orientation MHP structure in the community	Organizing and formation of MHP structure Community consultations		Community, project partners	3 mos
Develop community and technical workplans	Synchronized schedules, activity plans relating to project implementation	Conduct leveling - off, synchronization of activities and work plans in regard to project	Community-wide stakeholders workplan	SIBAT, project partners, community	2 mos. Starting from the first mo of project period
Establishment of MHP technical, and project management structure	Defined MHP technical and management systems and procedures Appointment of project management and technical committee	Identification of MHP technical and management functions Identification of key persons in the technical and management committee	MHP technical and management structure Oath taking of appointed officers	SIBAT, project partners, community	1 mo starting from the 2nd mo
Draft local policies and guidelines for MHP energy utilization, operation and maintenance	Community-based policy draft for MHP utilization, operation, maintenance and other related concerns	Assembly, community consultations and workshops and policy discussion	90 - 100 % assembly participation at the community level ratified project policy guidelines for implementation	SIBAT, project partners, community	1 mo starting from the 2nd mo
		Phase 1-b: Material Preparation			
Canvassing, procurement, handling and hauling of hardware component for the MHP	Gathering of all required MHP project materials Completed fabrication of turbines	Canvass, purchase and hauling of materials from source to project site Generation of materials as counterpart	All construction materials are on site before civil works begins Fabrication ongoing or completed	SIBAT, project partners, community	2 mos. Starting from the 3rd mo

Objectives	Target / Expected Output	Critical Activities	Performance Indicator	Organization / Group Responsible	Schedule
		Turbine fabrication			5th mo
		Phase 2: Construction / Installation Phase			
Civil Works for MHP	All civil works component of the MHP completed	Construction of weir, wing wall, intake, power canal, silt basin, and forebay. Laying out of penstock Construction of the powerhouse	Functional power canal system, carrying the designed volume capacity (from weir to forebay) Functional penstock Completed powerhouse	SIBAT, project partners, community	1 year starting from the 4th mo
Electro-mechanical works	Turbine and generator installed and ready for testing	Installation and testing of turbine and generator	Operational turbine and generator producing the designed power output	SIBAT, project partners, community	1 mo. After completion of civil works
Transmission Line Laying	Transmission system installed	Installation of transmission posts and laying of transmission lines	Functional and safe transmission system	SIBAT, project partners, community	1 mo after completion of electro-mechanical works
Testing and commissioning	Operational microhydro power system	Testing and commissioning	Functional MHP system with the target beneficiaries' expected load requirement satisfied	SIBAT, project partners	1 mo after completion of the previous row
Technical and Management trainings	Pool of community - based operators and management technicians Manual of technical and management operations	Series of skills training for hardware operation Production of a Manual of hardware operation	Capable local technicians to operate, manage and maintain the system Unvarying hardware systems' operation	SIBAT, project partners, community, TESDA	Parallel w/ installation of Elctro-mechanical

Objectives	Target / Expected Output	Critical Activities	Performance Indicator	Organization / Group Responsible	Schedule
		Series of management capability trainings	Local populace capable of system trouble shooting		
Designing of project M&E system	Community-generated monitoring and evaluation system	Participatory designing / conceptualization of community-based M&E tools and system	M&E plan, systems and procedures	SIBAT, project partners and community	6 mos starting from 1st mo. Of project period
		Watershed Conservation and Management			
Formulating and implementation of a comprehensive watershed management plan	Long-term watershed conservation and management design Tactical watershed management workplan	Actual profiling of key resources / Data gathering / resource assessment Community-wide discussion and planning for watershed conservation and management (in all barangays within the Alibanua Range) Formation of the Task Force Alibanua as a local management structure for the Alibanua Range that would coordinate efforts on watershed protection and management. Workshop planning of a doable activity towards watershed conservation	Implemented community generated watershed conservation and management plan.	SIBAT, project partners and community	6 mos starting from 7th mo of project period

Objectives	Target / Expected Output	Critical Activities	Performance Indicator	Organization / Group Responsible	Schedule
	Implemented watershed management and conservation workplan	Nursery establishment Procurement of wildling species and commercial seedlings Tree planting Trainings			3 mos starting from the end of 1st year of project period 3 mos after completion of previous activity

4.3 Project Management

4.3.1 Management Structures

1. The implementation and management of the project at the installation phase will be a joint effort of the Episcopal Diocese of Santiago City (EDS), the community and SIBAT. EDS, Community and SIBAT will form the Project Team. In particular, SIBAT will serve as the project manager (during installation phase only) and supervisor to provide technical support and facilitate the timely purchase of the required materials for the MHP. Decision-making will be through a consultation with the project owner (Maducayan Community) and the proponents (SIBAT and EDS)

2. The team will make an overall project plan including the detailed technical implementation plans while EDS will look into the organization, i.e., project management formation and mobilization. The project team shall go by a detailed schedule and shall meet regularly or as required in order to check on the progress and immediately act on problems.

3. SIBAT will accomplish detailed designing, equipment selection and purchase, installation and trainings of para-technicians. SIBAT has the trained and qualified staff for the project to provide the over-all backstop for the technical management of the system.

4. Technical management skills for the MHP: (1) overseeing maintenance of the system (regular clearing/cleaning of power canal, silt basin and forebay); (2) regular check-up of generator for the correct power output and turbine bearings; and (3) monitoring of load controller if functioning properly.
   Financial management includes, tariff collection, bookkeeping and record keeping.

4.3.2. Phase-out Mechanism

The community organization will operate and manage the project right after installation, and wholly and solely upon completion of the trainings.

- SIBAT shall continue to monitor development and assists in project management until the system is fully operational. The definite phase out of SIBAT will be determined by the organizational plan to be developed together with the project owner and proponent.

- There will be quarterly monitoring to be conducted for one year after project completion to check on the system's operation and management. After this, the community will be solely responsible for any technical troubleshooting and repair.

- On the management aspect of the project, the organizational capacity will be developed through trainings within the project installation period. This is to ensure that the PO is capable and equipped when SIBAT phases out.

5.0 EXPECTED OUTPUTS AND EFFECTS

The overall expected outputs of the project are:

Development and installation of a community-based biodiversity conservation and watershed protection project that will both address increasing food production and protection of the existing natural resources. This project will be implemented with recognition of indigenous communities' rights and practices.

Promotion and development of a clean and renewable energy source through microhydro power development for household electrification and rice milling operation; and

Building awareness on biodiversity conservation and use of renewable energy sources.