

**DEUTSCHE GESELLSCHAFT FÜR  
TECHNISCHE ZUSAMMENARBEIT (GTZ)**

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**PROMOTION OF THE USE OF RENEWABLE ENERGIES (PURE)**

**IDENTIFICATION & ASSESSMENT OF THE APPLICATION POTENTIAL OF  
SOLAR PHOTOVOLTAIC WATER PUMPING INITIATIVE (PVP)  
IN BANGLADESH  
(STAGE-I A)**

***EXECUTIVE SUMMARY REPORT ON FIELD VISITS - III***

BANDARBAN, CHITTAGONG HILL TRACTS (CHT)



10 AUGUST 2006  
VISIONS

***“Plug your Drinking Water Supply to the Sun”***  
***“Green Pumping for a Greener Bangladesh”***

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## **ACKNOWLEDGEMENT**

The Consultant acknowledges with thanks the cooperation extended by Mr. KYA HLA KHOIN, Assistant Engineer, LGED Office at Bandardban. Mr. KHOIN's keen interest in Renewable Energy based systems, including Micro-Hydro - an area, in which he also seeks GTZ-PURE's cooperation, is deeply appreciated.

Organizing the local visit of a remote village through cooperation of Mr. KYA CHAN is also highly acknowledged. The cooperation extended by the local member of the Rajbila remote area village and the hearty reception and guest-friendliness of the indigenous people is also hereby acknowledged and remembered.

The Consultant takes this opportunity to thank GTZ-PURE for its support, which made this field visit possible in connection with assessment and evaluation of the PVP Initiative - Stage 1A activities.

## 1.0 BACKGROUND

This Field Report (III), concludes the Field Visits of the Consultant and has reference to GTZ-PURE's assignment under Contract No. 83001737 and Project No. 022129100100 - Promotion of the Use of Renewable Energies, whereby the **Stage-1A Works** (Inception/Study Phase) are required to be performed, as per the Terms of Reference (TOR), to identify and assess the potential of **Solar Photovoltaic Pumping (PVP) Initiative in Bangladesh**.

To perform the said Stage 1A tasks, the Approach Methodology of the Proposal on PVP Initiative (Section 7.0 - A and B of the Proposal) included both primary and secondary data/information collection/feedback for situation analysis of both the **Piped Safe Drinking Water Supply and Irrigation for Agriculture** in rural areas through field visits and interactions with appropriate institutions/individuals/ engaged in application-oriented 'pilot projects' and also large scale sustainable/commercial operation.

A series of Field Visits were first performed in areas of North Bengal, especially areas covering Bogra, Natore, Rajshahi and other 'Barind' areas of Bangladesh - a 'semi-arid' zone in Bangladesh where rainfall is minimum and the agricultural outputs are highly dependent on **Irrigation**. The programme philosophy and the highlights of outcome of the first major field visits, vide a more comprehensive report entitled: "*Executive Summary Report on Field Visits*" dated 20 July, 2006, submitted to GTZ-PURE by the Consultant.

**This Field Visit Report (III)**, which concludes the planned field visits for practical situation analysis related to the assessment and evaluation of the potential of PV Pumping **for irrigation and rural water supply management**, presents the findings/data/information in off-grid areas with a relatively undeveloped infrastructure - **the Bandarban and its surrounding areas in the Chittagong Hill Tracts (CHT) region**.

## 2.0 RATIONALE BEHIND SELECTION OF BANDARBAN (CHT) FOR THE FIELD VISIT IN CONNECTION WITH THE PVP INITIATIVE OF GTZ-PURE - STAGE-I A

The key reasons for selection of Bandarban as the area for a field visit in connection with the PVP Initiative of GTZ-PURE had been the following :

- the Local Government Engineering Department (LGED), under its Sustainable Rural Energy (SRE) Programme, funded by UNDP, had set up, in 2002, a small Solar PV Pump at a Tourist lodge at Prantik lake with the objective to test/demonstrate the function/usefulness of Solar Photovoltaic Pumps in remote/inaccessible off-grid areas
- the present practices used in managing water supplies - both for drinking and irrigation purposes, is generally considered to be a very difficult task in remote hilly regions of the country - both for drinking and irrigation purposes
- identification and assessment of the potential of PVPs or any other RE / hydraulic-powered pumping technologies which could be appropriate for the CHT area, which has a highly undeveloped infrastructure in Bangladesh. Consultant's interest, in connection with the PVP Initiative of GTZ-PURE, has been focused to the following observations in this remote area of CHT:
  - **water management and irrigation practices** and requirement of the area, with special emphasis on the **situation of the safe drinking water supply**, which is scarce in the region
  - **identification of the potential of micro-hydro/pico-hydro RE sources**, which could be used to light homes of the tribal people habitating the off-grid areas of CHT, which, at the same time, could be used to drive small pumps electrically or hydraulically (e.g. hydraulic ram-water pumps) to pump water uphill, where people are experiencing enormous problems to manage water both for irrigation and household use
  - identification and assessment of the practices and potentials, if any, of tapping **Gravity-fed Water Supply (GFS)** from uphill water sources (mountain springs or 'chharas' in local terms) as RE-based water management source - both for drinking water and irrigation in the off-grid areas of Bandarban in the CHT

- finally, to identify and assess, if ground water sources (water 'lenses', caused by geo-hydrological river histories) in the off-grid area of this region, where water wells could be drilled and **Solar PVPs** used for safe community drinking water supply by pumping the water to hill-top water tanks, which could feed nearby communities indigenous people of CHT with safe drinking water.

## 2.1 INTERACTIONS WITH LGED OFFICE AT BANDARBAN

The Consultant visited the LGED Office at Bandarban, headed by **Engr. Kya Hla KHOIN**, Assistant Engineer, LGED, on the morning of the 10<sup>th</sup> August, 2006. The mission of the visit on PVP Initiative of in Bangladesh by GTZ-PURE, supported by the letter of Introduction, issued by Mr. Otto Gomm, Coordinator, GTZ-PURE, was presented and explained. The initiative was appreciated by **Engr. KHOIN, who hails from a local tribe. He was pleased to inform that he had received a formal training on Renewable Energy (Bio-mass) in India** and therefore, would promote any RE based venture which could used to improve the conditions and quality of life in his area. He assured to provide all supports and requested Mr. Khya CHAN, Project Manager of an **CHT based NGO - GRAUS** with whom he/LGED works closely in resolving engineering, agro-input and water related issues, to accompany the Consultant to a remote off-grid marma village, where, under his advise, the local NGO has set up a **gravity fed water supply system (GFS)**, using an uphill mountain spring.

Welcoming the GTZ-PURE's PVP initiative Engr. KHOIN explained that as regards the LGED's Solar PVP, it was a small PVP set up, installed at a tourist lodge for demonstration purposes only and does not exist any more. The grid has reached there. The Solar Panels have unfortunately been stolen in 2004. It was located close to a place called Keranir Hat, about 25 km off from the motorway that connects Bandarban with Chittagong.

### 2.1.1 HIGHLIGHTS OF DISCUSSIONS & FIELD VISITS AT BANDARBAN WITH LGED, A LOCAL NGO (GRAUS) AND LOCAL TRIBAL PEOPLE

Engr. KHOIN, LGED being a local tribal, expressed his keen interest in seeking cooperation from GTZ-PURE for evaluation and setting up of **two very potential Micro-Hydro Projects**, close to Bandarban - one at Monjaipara and another at Rajbila Union (Site #1) and the other (Site # 2), is situated about 1.5 km from Monjaipara village (see Base Map of Banarban, enclosed in Annexure). Following efforts by a local **tribal mechanic - Mr. KHOY**, a crude **water wheel-driven generator** was installed at one of the three sites. About 40 tribal homes could be lighted and all the local inhabitants, including Engr. KHOI are very optimistic about the potentiality of Micro-hydro based electricity generation in this area, being inspired by KHOY's initiative, which after much efforts had received a recognition from the Ministry of CHT on 30<sup>th</sup> July'06 (ref.: public news enclosed in Annexure under heading : "Khoy's dream comes true").

**A Feasibility Study Report** has been prepared by Engr. KHOI, which was submitted to LGED, with preliminary estimates to generate **10 kW and 20 kW** respectively at these two sites, the copy of which was handed over by Engr. Khoin to the Consultant. But since SRE project is no more, he would be interested in implementing the project with GTZ-PURE's support. When requested about the possibility of visiting the 2 sites, Engr. Khoin suggested that one should come with a schedule of at least 2 - 3 days to visit these potential sites, as the access by normal vehicles is not possible and will take time. These Micro-Hydro sites, if and when implemented, could **light about 300 homes** of the rural tribal people at night and could be used to run pumps for the drinking water supply to an uphill storage. The people who live in the hills are suffering greatly have to come down from the hills to fetch water for drinking and other purposes, Engr. Khoin explained. During the dry season, when the nearby Sangu river dries up, the irrigation of the fields for agriculture also becomes very difficult.

Engr. KHOIN suggested to visit the said gravity-fed piped drinking water supply (GFS) project, which was set up under his advise by the **local NGO - GRAUS** (Gram Unnayan Sangathon) and requested Mr. CHAN, the Project Manager of GRAUS to accompany the Consultant. The place could accessed only by a Motorbike and is a remote off-grid area.

The following are the highlights of the findings of this trip to the off-grid habitation, which is located about 20 km away from Bandarban. The journey took about two hours ( 2 x 20 km each way of hilly tract). The remote marma village has an elevation of about 1200 ft from mean sea-level (Bandarban about 1000 ft from m.s.l). The following are the highlights of the findings of this trip to the Gravity fed piped Water Supply (**GFS**) Project of GRAUS, under advise by Engr. KHOIN, of LGED:

- the piped community water supply has a **5000 litre capacity RCC (underground) water tank** where the water is piped under flow of gravity from a nearby “Chhara”, (the local term for a mountain spring/water source). While during summer/rainy seasons there is sufficient water and the uphill catchment reservoir overflows, there is scarcity of water in the dry seasons and/or rainless summers.
- water is distributed through a single **Community Standpipe**. All households are instructed to use/collect water within a narrow time span of **four (4) hours** (6 A.M. to 10 A.M. every day) from the Standpipe
- **the locality has already got access to and familiarity with Solar PV Electricity**, it was found by the Consultant. Two nos. of SHS - 50 Wp Systems, each with a 100 Ah Battery, were installed by Grameen Shakti were - one at a Marma household and the other at the Community Buddhist Temple. The Temple was visited by the author, where two Tube lamps installed by GS were seen to provide quite sufficient illumination (see Photographs in Annexure). The Consultant was greeted very warmly by the local tribes, with whom discussions were held on their water crisis and irrigation problem in dry season.

They requested for a solution for more sustainable drinking and irrigation water.

- **SOME PRELIMINARY THOUGHTS ON WATER MANAGEMENT AT THE MARMA VILLAGE IN RAJVILLA UNION, BANDARBAN**

AT 1200 ft elevation, the chances of finding Groundwater Resources (‘hydro-geological water ‘lenses’) is grim, although a Hand Tube-well was located on the way, any detailed information on the workability of this Hand tube-well could not be obtained, except that it was set up by the NGO - World Vision. The local people informed that several efforts to drill for water failed in the area, either due to lack of ground water layer or the difficulty to penetrate hard underground rock strata.

Hence, to resolve the water management and irrigation problem at such an off-grid remote location at such high altitudes, one should exploit all surface water options. Some inspirations were discussed by the Consultant with the Project Manager of GRAUS - Mr. Kya CHANG, who is an agriculturist and Project Manager for Homestead Food Production Project :

- one should look into the possibility of putting up **additional tankage** to increase the water volume which flows abundantly in summer and rainy season.
- arrangement for **rainwater harvesting** could also relieve the indigenous people to some extent, which could be stored in an additional tank
- UNDP is currently supporting the marma village with **agricultural crops like “Olkochu” (a special variety of Cassava)** which grows quite well there. The soil is quite fertile, but the British American Tobacco (known as BTC in Bangladesh) used to grow Tobacco in many of these areas, which destroys the soil for other crops, Mr. CHAN informed, who had worked with BTC for some time.
- the local NGO - GRAUS has managed to introduce the **concept of valley-based (or flatland) agriculture** to the local Marma tribes, who traditionally knew no other form of agro-practices, excepting their traditional **“Jum Cultivation”** on the hilly slopes
- **special ponds could be excavated in the area** (and the local tribal inhabitants are willing to put their labours for such ponds. This they also did for the GFS Project. If lined with appropriate ‘geo-textiles’ throughout the year, such ponds could serve as additional water storages, fed by rain and also by GFS from uphill, which they are already using, which overflows during seasons.

- for water conservation, the **used water could be channeled to the nearby agricultural fields for irrigation**, which lie at an elevation lower than the village.
- the nearby **Sangu river** where water level also goes very low during winter is a good **surface water source**. Along the flatland sides of this river, many **vegetable crops are being grown**, but during only one season. This is due to lack of mechanized irrigation and water reservoir facilities.
- **As only low head pumps are be needed** to lift water from the river to the agricultural fields on both sides of the river, **PVPs could be used** from pure technical considerations, the area being off-grid. To make the use of PVPs commercially possible and sustainable, however, the LGED/NGO/Ministry of CHT could provide financial (e.g buy-down) supports for PVPs in the frame-work of their social development/poverty reduction through income generation/increase by use of PVP-based year-round irrigation systems, for which special pond reservoirs would also be required as part of the system.

**For water conservation, the low-cost drip irrigation system developed by BARI** may also be replicated with NGO support, with buy-back arrangements of the agro-produces. It may be mentioned that the GFS Community Water Supply project was set up with Danish assistance at a cost close to about Tk 20 lacs, for which about 25% was evaluated as contribution by the indigenous people in the form of their labour inputs and also some 'token' cash contributions to create a sense of ownership of the project.

The Bandarban visit was concluded on the same day (9<sup>th</sup> October'06) with a wrap-up meeting, held between 19-00 - 20-00 hrs. at the LGED office (on return from the field), when Mr. KHOIN handed over his **Feasibility Study on the Micro-Hydro Project**, repeating his special interest for implementing the Micro-hydro projects if GTZ-PURE is willing to support the same, if possible, through the local NGOs, like GRAUS, who are proven in the area for their development works in various fields.

The Consultant thanked Engr. KHOIN of LGED and also Mr. CHAN for their kind cooperation in organizing visits to such remote places and appreciated Engr. KHOIN's interests to work with GTZ-PURE in related RE issues, like the two Micro-Hydro sites, on which he has already prepared a Feasibility Study.

## **ANNEXURE**

Some selected Photographs of  
Consultant's visit to Bandarban  
Chittagong Hill Tracts (CHT)

## MEETING AT LGED OFFICE, BANDARBAN, SADAR, CHT



Engr. KYA HLA KHOIN, Assistant Engineer, LGED (middle) with his Sub-assistant Engineer (right) Mr. KYA CHAN, Agriculturist (left), Project Manager of the local NGO, GRAUS.



The Consultant (right) with the same team as above, discussing critical issues on water supply and irrigation in remote off-grid areas like Bandarban with the above team of LGED, when the local NGO representative of GRAUS, informed of their initiative with the gravity-fed supply system (GFS) Implemented at a remote (off-grid) tribal village located at Rajbila, Kohalong Union.



Engr.. KHOIN (right), LGED, is seen with his Feasibility Study (on the table, at right), to implement which he showed keen interest to receive any form of support from GTZ-PURE.

#### **THE EXECUTIVE DIRECTOR OF THE LOCAL NGO GRAUS**



Mr. CHAN (right) introduced the Consultant with the Executive Director Mr. Chaing Seing Moung (right), who explained the financing and working mode of the GFS, before Mr. CHANG accompanied the Consultant to the GFS Project

**THE KEY MEMBERS OF THE MARMA VILLAGE  
RAJBILA - THE GFS PROJECT AREA**



**COMMUNITY BASED WATER SUPPLY STANDPIPE  
FOR 130 HOUSEHOLDS**



The GFS based Water Supply is strictly time-controlled **for conserving water** (water supply is put on from the Village Storage tank (located uphill) **during 6-00 to 10-00 A.M. every day**

**THE 'PRECIOUS' DRINKING WATER RESERVOIR OF THE VILLAGE**  
**5000 LITRE CAPACITY WATER TANK AT THE VILLAGEE**  
**INSTALLED BY THE NGO - GRAUS WITH LABOUR INPUT FORM THE VILLAGERS**

THIS TANK RECEIVES & STORES GRAVITY-FED WATER SUPPLY (GFS)  
FROM AN UPHILL MOUNTAIN SPRING ("CHHARA")



The proud villagers look on, explaining the need for more water and some kind of water management during the dry season (Note : the uphill Mountain Spring overflows during summer and rainy season, but runs very lean in winter)

**THE REMOTE VILLAGE IN BANDARBAN ALREADY GOT EXPOSURE TO SOLAR PV TECHNOLOGY (SHS)**



**THE SOLAR PV PANEL ON ROOF**

The proud owner looks of the SHS on. When interviewed by the Consultant he informed of the good services he is already receiving from the SHS. He has two lights and runs a Television and till date has faced no problem with the SHS which was installed by Grameen Shakti (GS)



Solar PV also provides lighting to a **Buddhist Temple** at the same village, which also installed by Grameen Shakti (GS).

**INSIDE THE PV LIGHTED TEMPLE AT THE VILLAGE  
GOOD LIGHTING INSIDE FROM SOLAR PV**



The villagers are happy with the good intensity of Solar PV lights. However, their demand now is a Fan which could be run by Solar PV for the Temple visitors to feel comfortable at the humid heat during summer days.

**THE VILLAGERS IN THE REMOTE AREA OF BANDARBANS  
AT THEIR LOCAL TEA HOUSE**

**“LOOKING FORWARD FOR A BETTER FUTURE”**



**WILL THAT BETTER FUTURE BE AS BEAUTIFUL  
AS THEIR VILLAGE IN THE BANDARBAN ??**



Water is there. “Sometimes too much and sometimes too little”. What is required is its appropriate management. Can't we do it applying our knowledge and skills ?

