

Micro-Hydro Power Assessment for Nangarhar Province

Afghanistan Clean Energy Project (ACEP)

February 27 - March 1, 2010

Summary

ACEP evaluated the potential for developing new micro-hydroelectric projects (MHP) in Nangarhar Province. The Nangarhar PRT is interested to develop a number of MHP sites with ACEP. More than 20 MHP potential sites were identified by the PRT in the Kot District east of Jalalabad city. ACEP also received a list of 400 potential MHP in Nangarhar from the Central Asian Development Group (CADG). ACEP identified the Achin District as focus for initial MHP activities in the province.

Nangarhar Province

Nangarhar province has an area of 7,727 km² and is located in eastern Afghanistan bordering the Pakistan Kyhber agency. The provincial boundary is 75 km east of Kabul. The provincial primarily has a Pashtun population of about 1.3 million persons. Jalalabad is the capital and lies at 580 meters elevation with 746,000 people. What is the university in Jbad and how many students?

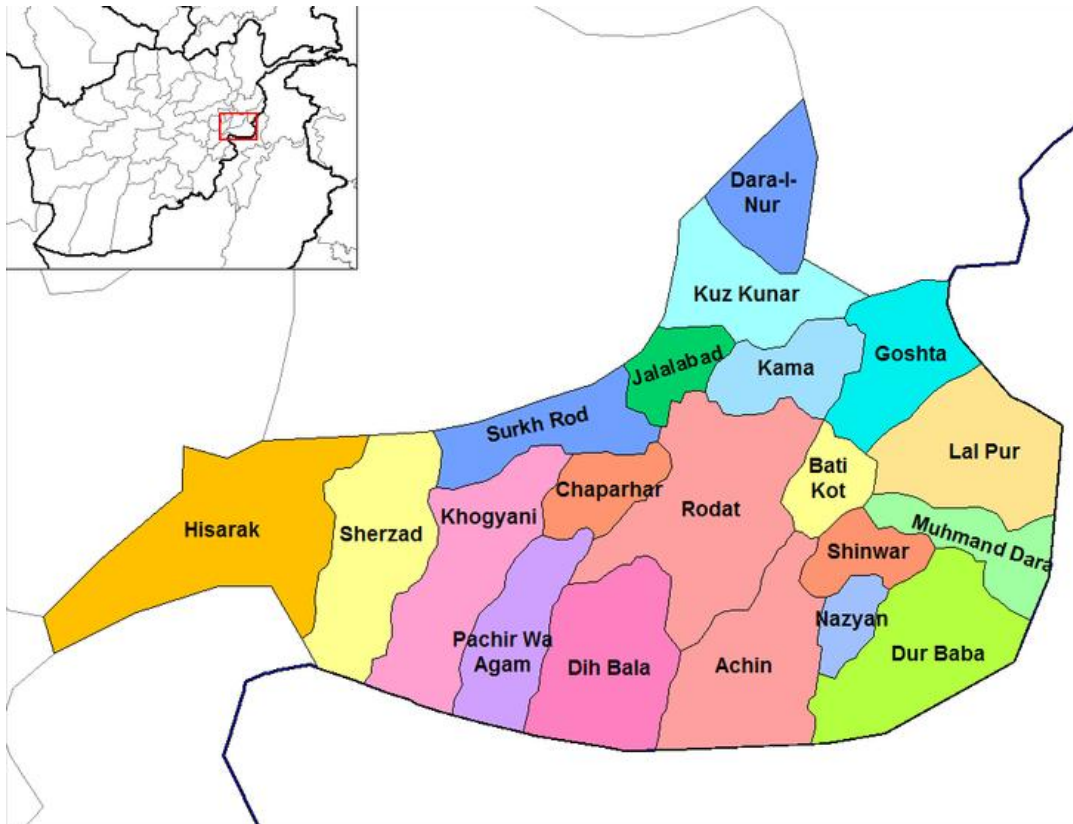


Fig. 1. Nangarhar Province and its political districts

Nangarhar Hydrological Resources

The Nangarhar province hydrological resource is centered on where the Kunar and Kabul rivers meet in the central part of the province. Most of this water is coming from the Panjshir and Kunar watersheds. Nangarhar province receives winter seasonal precipitation and only averages about 20 mm in a year.

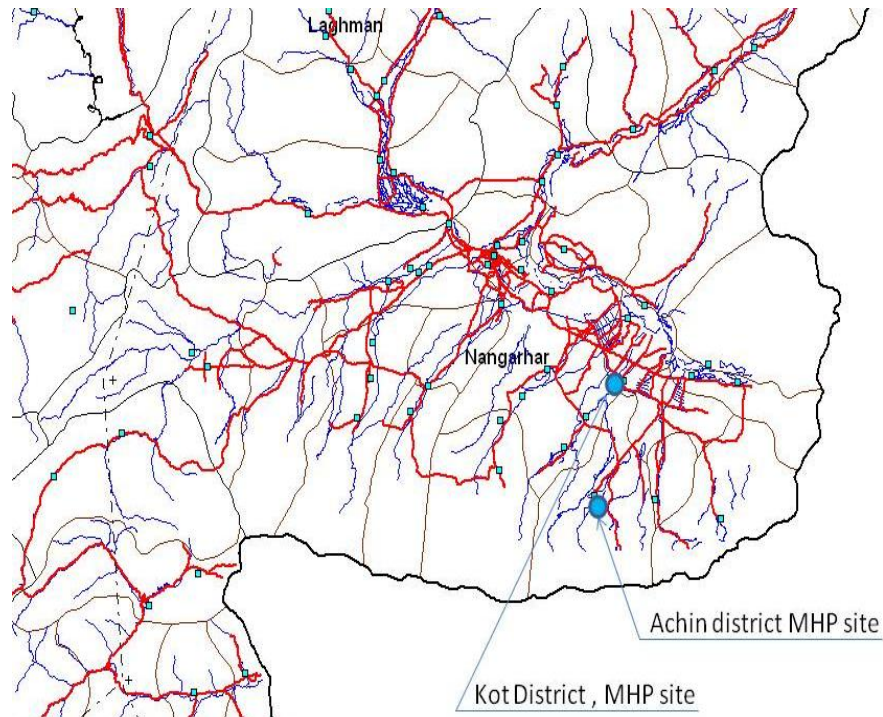


Fig. 2. Jalalabad river systems and location of Achin and Kot.

ACEP MHP Nangarhar Field Assessment Mission

ACEP Field Assessment Team:

Dr. Ali Azimi (ACEP, COP)
Eng. Fazli Fazlullah (ACEP, RE Engineer)
Eng. Owen Schumacher (, MH consultant)
Eng. Rasool Wardak (USAID OIEE, ACEP COTR)

Meeting with PRT

The ACEP team met with Eric Florimon-Reed, the USAID Field Program Officer (FPO) and three members of the PRT team on Feb. 27th of Feb at the PRT compound in Jalalabad City. The PRT explained their scope of works and their activities, providing details on some MHP projects they have completed or are under construction in several districts of Nangarhar province. The Nangarhar PRT has already implemented 44 MHP projects in the province, mostly in the Shenwar district as that area is a key priority. ACEP was initially asked by the PRT to consider to develop a large number of MHP in the Kot district, but later this idea was discarded out of fears that other districts would complain that they were being totally ignored.

The PRT wants to implement new MHP projects where poppy cultivation is still a problem, in that new economic opportunities can be provided with electricity for productive uses. However, they may only continue the MHPs for six more months, and delegate new small village scale MHP in the Nangarhar villages to NSP through the community based development committees (CDC)

Eng Farid from the Central Asia Development Group (CADG) was also introduced to the ACEP team by Mr. Florimon-Reed to go along on the MHP site visit in Kot district. Dr. Ali Azimi also provided some details concerning ACEP scope and future plans, and how USAID was pushing ACEP to focus most projects in southern and eastern regions of Afghanistan. Besides MHP, ACEP will be involved with other technologies including wind, solar hot water, and photovoltaics for electrification and water pumping. Owen Schmacher also discussed his own 2 decades of experiences in Afghanistan on MHP implementation, and that it was important to take into account Afghan culture and villager issues during the implementation and survey period. He also requested to implement small scale HP projects and involve the local CDCs during project construction.

Kot Site visit

On Feb. 28th Eng Farid from CADG (Central Asia Development Group) accompanied the ACEP team to the Kot district to look at construction of a new 13 kW MHP plant. Laborers from the same village were busy constructing the civil works of the MHP plant and stone masonry workmanship looked good.

Later that same day the ACEP team visited Eng Wali the Director of the Nangarhar PRRD, along with Mr Daud Asgher, the NABDP Nangarhar manager. PRRD promised to work with ACEP in Nangarhar and they will provide lists of possible MHP plant locations, including some technical and community background information. Afterwards, the ACEP team met with the Nangarhar PRT in the evening with Mr. Florimon-Reed. Besides security issues, the location and size of potential MHP plant was considered, and it was recommended to meet with Khan Mohammad and Daud Shenwari of IDEA in Jalalabad for further discussion and to collect additional technical information regarding their activities and potential good MHP sites in Nangarhar. The Nangarhar PRT recommended for ACEP to maintain a close collaboration with PRRD and DDA in Nangarhar, and that they will be the best source for information required for implementation of MHP projects.



Fig. 3. USAID/CADG/ MHP in Kot district for 13 KW under construction

DAI meeting

Pm Feb. 29th, the ACEP team met with Daud Senwari who is the IDEA/DAI MHP senior engineer. He explained their activities and procedures, and have installed 3 MHP station in Nangarhar province, summarized as follows:

1. Two 75 kW MHP stations with a 250 KW generator and a 15 Km 20 kV transmission line was installed by IDEA in Shear Zad District has operated for several months now. They have installed a tomato concentration factory and small cotton processing factory with the MHP power. Unfortunately because of poor operation and maintenance plan, the MHP and resource generator's AVR./Automatic voltage regulator failed three weeks ago. Due to current security problems they cannot go to replace the failed electronics board

A tariff system was developed by IDA for this MHP system, and all households are metered and paying \$3 Afg / kWh,, Likewise, all shops are metered and commercial consumption is set at \$5 Afg/kWh. The villagers select new persons to collect for the consumption of electricity every month and plan to change bill collectors every month.

2. A 60 kw MHP was installed by DAI in the Dari Noor district of Nangarhar north of Jalalabad. The station worked for a short time, but again due to poor operation and maintenance plan and inadequate electrical protection system for the plant generator, just like for the Sher zad MHP, the

electronics failed and the system is not operational and is awaiting replacement of the AVR board from Pakistan.

3. Another 20 Kw HP station was recently installed by DAI in the Dahballa District of Nangarhar. The system is still under testing and soon they will hand over to the CDC. ADI will support them to install six small productive cotton processing machines in this district powered by the hydro station

4. There is a fourth proposed 200 kW hydro station for the Kodikhil village of Sherzad district. Due to the current poor security situation in the area, this project is pending until such time that work can be reasonably undertaken.



Fig. 4. Pakistani cross flow Turbine by SK Company for 200 kW system in Kodikhil (pending)

For all these projects, DAI is also following the same procedure as MRRD, working with the village level CDC and DDA submitting their projects request to the district offices. These requests are passed to the provincial government to PRRD. A feasibility study is conducted with the implementing partner organization, and if viable, further survey, design, and implementation steps are carried out.

Nangerhar energy sector organizations have monthly meetings at the TWC (technical working council) and DG(development group) to communicate, share, and exchange information on their activities. There are also some energy projects in unsecured districtus, but the organizations sign contracts with a local district contractor to implement projects in the field.

Tariff

For the Nangarhar MHP systems installed by DAI, tariff, maintenance and operation costs of projects is the responsibility of the owner of the project (CDC). The PRT sub-contractor DAI trains 4

or 5 persons from the local community CDC to be responsible for the maintenance, operation, and fee collection

Nangarhar Turbine Manufacturers

There is already a robust MHP industry in Afghanistan and at least six existing turbine manufacturers in Jalalabad including Afghan Motahid Electric; Nagerhar technical workshop , Shenwari Ltd.; Aria Khoginy Workshop; Noruallah Workshop; Zaib Electric Workshop; and Rana Workshop. While in Jalalabad, the ACEP team visited three of the turbine manufacturers including Shenwari, Rana, and Norualla manufacturers. For instance Shenwari turbine manufacturers are producing cross flow turbines, which are copied from the original IAM MHP program design (low efficiency cross flow units). They do not have trained personnel able to produce improved units from standard technical drawings. They have good machinery and technical opportunities, but they need additional technical capacity building and various training to learn how to use technical drawings for new MHP electro-mechanical components like speed controllers (electrical and hydraulic) , valves, expansions joint and different type of turbine designs useful for different site characteristics that are dependent on flow and head.



Fig. 5. Shenwar Kharadi Workshop / Cross flow turbine manufacturer



Fig. 6. Rana Technical work shop / Cross flow Turbine manufacturers

Conclusions

Nangarhar province has an existing micro-hydro power industry serving eastern Afghanistan with at least six turbine manufacturers located in Jalalabad. Small scale application of MHP has already been widely applied in Nangarhar already by NSP, PRTs, DAI, and other organizations. There is a need for capacity building to improve turbine quality and efficiency through upgraded design and manufacturing capabilities in Jalalabad. ACEP should assist with capacity building for Nangarhar turbine manufacturers and help increase the quality of installed systems to reduce field failures. ACEP has identified one site with SADG in Aichen where it can begin implementation of an exemplary, quality MHP project for village power.