

BUILDING WATER INFRASTRUCTURE AS PART OF KHIMTI I HYDROPOWER PROJECT (KHP-I), NEPAL, CASE # 191

This case study highlights several IWRM lessons from the cooperation between the private sector and the rural communities in sharing of water resources. A case is made that private sector can benefit by assisting in infrastructure development and empowering communities in the project area.

ABSTRACT

Description

Khimti 1 Hydropower Project (KHP-I) is located in Dolakha and Ramechhap districts, Eastern Nepal. The power source for the hydropower plant is the Khimti river, a tributary of Tamakoshi River in the Saptkoshi river basin. The average flow at the intake is 31.5 m³/s. The installed capacity of the power station is 60 MW. KHP-I is the first private sector financed project, promoted by Hima Power Limited (HPL) under a Build Own Operate and Transfer (BOOT) concession in Nepal. The capital cost of the project was US\$140 million with 75% bank financing from Asian Development Bank (ADB), International Finance Corporation (IFC), Eksportfinans AS (Norway), Nordic Development Fund (Finland) and Norwegian Agency for Development Co-operation (NORAD). The shareholders of HPL include both Nepalese and multi-national companies. Construction works of KHP-I started in June 1996 and was commissioned in July 2000. The ownership of the plant will be transferred from HPL to the Nepalese government after 50 years of operation.

The project's development aims are, to develop Nepal's hydropower potential, to generate electricity for Nepal's national energy needs, to execute and operate the project in an environmentally friendly way, to mitigate impacts on the inhabitants in the project area and to provide a mini-hydropower plant for the local community at the end of the construction period.

The main purpose of the project is to generate electricity and supply it to the national grid on a commercial basis. Power Purchase Agreement (PPA) was concluded between the state owned Nepal Electricity Authority (NEA) and HPL at the initiation of the project. As the KHP-I is a run-of-the river project, "water rights" is not an issue downstream of the project area, i.e., the river receives its natural flow downstream of the powerhouse.

Prior to KHP-I, there was only one irrigation canal that used the Khimti river to service a small farmland in Khimti Bensi, about 8 km downstream of the hydropower intake site, mainly for dry season irrigation. As part of the project, HPL has been assisting farmer communities within the project area in constructing and refurbishing irrigation canals that use flows from the tributaries of the Khimti River. In addition, an Environmental Impact Assessment (EIA) was carried out in order to identify promotion of livelihood, economic enhancement and social well being of the project area communities. The project formulated an Environmental Mitigation and Monitoring Plan (EMMP) as well as bio-physical environmental mitigation and monitoring programme. Development activities for local communities were also executed along with the construction of the project:

- Improvement in existing irrigation canals and guaranteed minimum flows.
- Improvement in educational, agricultural and health services and sanitation facilities.
- Conservation of local resources by promoting and empowering users' groups.
- Negotiation with the affected parties regarding project affected matters such as land use.
- Rural electrification and promotion of small-scale cottage industries.

Lessons learned

- Successful planning and Implementation of Environmental Mitigation and Monitoring Plans (EMMP) as part of the project execution is beneficial for local communities.
- Ensuring benefits for local communities in terms of reserved rights to employment in the project and provision of electricity supply as a run-off effect of the project helps generate support for the project.
- Good public relations through out the project life cycle can avoid unnecessary delays (e.g., strikes, non-cooperation from local community and arbitrations) and the costs associated with such delays.

Importance for IWRM

This case sets a pioneering example of sustainable community development resulting from the cooperation between the private sector and rural communities in a water-infrastructure project. The Environmental Mitigation

and Monitoring Plan is a relevant example of the integration of needs for local community development into national electricity supply plans.

Main IWRM Tools

- A2.1 Water rights
- B1.08 Role of the private sector
- C5.3 Consensus building
- C6.4 Land use planning controls and nature protection

Keywords

Khimti Hydropower Project, private sector and community partnership, water resources sharing, Nepal

MAIN TEXT

1. Problems

During the study phase of the project, a detailed Environmental Impact Assessment (EIA) study was carried out covering socio-economic and bio-physical aspects of the Khimti Hydropower Project (KHP -I). A multidisciplinary team of social scientists, economists, biologists, foresters, and fishery experts, civil and environmental engineers undertook this study. The study was in accordance with the requirements set by international donor organisations such as IFC, NORAD, ADB and the Nepalese government.

Along with recording fundamental base line information the EIA study also identified immediate problems that the communities were facing as briefly discussed below:

Low literacy rate: The settlement patterns within the most affected area are clusters of houses in scattered communities. The households in the project area were estimated to be about 2080 with a corresponding total population of 14,110. There was only one higher secondary school and 14 primary schools in the four most affected Village Development Committees (VDC). Primary schools are located at least 30 minutes to 1 hour walking distance whereas the secondary school is more than 2-3 hours' walk. Most of the schools lacked basic physical facilities. The literacy rate for Dolakha district was 37.8% in 1991. The average literacy rate within the most affected area was 43% (male 65.8% and female 20.5%).

Poor health status: A 25-bed hospital is located in Jiri (22 km from the KHP I headworks) and another 12-bed hospital in Charikot, the district headquarters. Both of these hospitals are located at least 6-8 hours walking distance from the project area. A health post is located in Chyamma VDC, which is the only health service centre for the most affected community. Since the health post was recently established and organised under the government rules, the management and facilities were poor and inadequate to serve the local needs.

Inadequate drinking water supply: There were a few gravity water supply schemes in the Sahare VDC, however none were functional. The only functional water supply system in the area was located in Chyamma VDC, which served limited number of households. The villagers normally fetched water directly from nearby springs or wells.

Limited irrigation systems: Khimti river flows through a narrow gorge and has a steep slope in the downstream area of the Intake site. The settlement and agricultural fields area are located above the bed of the river. Therefore, water abstraction from Khimti river for irrigation and water supply was insignificant. However, approximately 40 hectares of agricultural land in Khimti Besi (approximately 8 km downstream of the intake) was irrigated using the Khimti river water. In this area only about 40% of the land was cultivated for winter crops.

No access to electricity: Prior to the initiation of KHP-1 non of the VDCs in the project area had access to electricity. Most households used home made "wicked" kerosene lamps popularly known as "Tuki" to meet their lighting needs.

2. Decisions and Actions Taken

Upon identification of the problems in the area a number of decisions and actions were undertaken as discussed in the following sub-sections:

2.1 Environmental Mitigation and Monitoring Plan

The EIA study recommended the Project Owner (HPL) to undertake monitoring and mitigation measures during both the construction (short term) as well as the operational (long-term) phases. Thus, based on the EIA, it was decided to establish an Environmental Mitigation and Monitoring Plan (EMMP) for the construction phase of the project. The plan was also submitted for review and approval to the national environmental authorities as well as the funding agencies.

2.2 Public Hearing and information dissemination

According to the Electricity Development Act and Water Resources Act of Nepal, any private entrepreneur interested in promoting of an infrastructure project of such magnitude as KHP-I is obliged to performed public hearings in the project area for project licensing. Thus, it was decided to arrange for public hearings in accordance with the legal requirements.

2.3 Land and property Compensation

In order to construct the project, the Project Owner had to acquire adequate land area for permanent and temporary (i.e., during construction) uses. 77 hectares (ha) of land belonging to both the government and individuals was required.

It was decided to adopt the following property/land acquisition procedure:

- a. Initially, the public in the project area would be informed about the commencement of project construction and arrangements for land acquisition would be undertaken in consultation with the concerned landowners. A Public Relations Officer would be appointed for this purpose and made responsible to initiate discussions both individually and in small groups with the landowners.
- b. All the landowners would be invited to participate in such discussions and would be assured of appropriate compensation.
- c. A “Land Rate Fixing Committee” would be established in the District Headquarter of the project area in accordance with the prevailing rules of the government.

2.4 Employment priority for local population:

To ensure increased benefit of the project for the local community these employment priorities were established:

Category I: Directly effected families: Those who lost their land and residential houses were given the first priority for any upcoming suitable employment.

- a. Category II: Project area VDC - People residing within the project area VDC:
- b. Category III: People from Ramechhap and Dolakha Districts.
- c. Category IV: From other parts of Nepal.
- d. Furthermore, the Project Owner decided to hire all technical operators only from Category I, II and III.

2.5 Khimti Community and Environment Unit (KECU)

It was decided to establish **Khimti Community and Environmental Unit (KECU)** to monitor the environmental impacts and implement the EMMP as part of the project activities. The entire operation of the unit was decided to be contracted out by the project owner to a management contractor. KECU was assigned two principal functions, which are distinct and yet related. The first was to conduct community related mitigation measures on behalf of the project (which are not specifically related to the activities of the contractors), while the second was to monitor the project impacts and implementation of the mitigation measures.

2.6 Rural Electrification

A decision was made to undertake a feasibility study of establishing a mini-hydropower plant for the following two reasons:

- As there was no electricity grid in the project area, construction power for KHP-I would have to be supplied by diesel generators. Installing a mini-hydro plant in the vicinity would replace/reduce the use of diesel.
- After the commissioning of KHP-I, the mini-hydropower plant could be used for rural electrification.

3. Outcomes

The Environmental Mitigation and Monitoring Plan (EMMP) for the construction phase of the project was approved by the national authorities as well as the funding agencies. The EMMP served as a basis for the community development activities that were undertaken during the construction phase of KHP-I. Specific outcomes are discussed hereafter.

3.1 Land and property Compensation

Of the 77 ha of land that was acquired by the project, 31% (24 ha) belonged to 154 individual landowners (the remaining 54 ha land was under government ownership). Among them, three families were fully displaced, but they were looking forward for migration towards the Terai (southern plains of Nepal). Another seven families had to partially resettle within the village. All landholders were given prior notice and were compensated by the project for the individual parcel of land that was acquired. The following additional issues regarding land acquisition are worth noting:

- a. Except for a handful of cases, all concerned landowners sold their land to the project within the stipulated time. Some landowners were not available for consultation as they did not reside in the area and could not be contacted (e.g., those who had migrated, employed in India etc.). Their land was acquired according to the prevailing laws of the country.
- b. Several unforeseen impacts on private properties and temporary encroachment on agricultural land and damages to the crops were unavoidable during the construction of the project. Such problems were always mutually discussed with the concerned parties by the project. In such a situation either the project's Public Relations Officer contacted the affected party in advance by proactive public relation approach or the affected parties came and lodged their complaint to the project. In either case, the issues were resolved by discussions and consultation and eventually consensus was reached.

The land that belonged to the government was leased by the project for a 50 year period.

3.2 Employment

During the peak construction period, the total number of work force reached as high as 4000. Employment under various categories (discussed in Section 2.5) during peak construction period were as follows:

- a. Category I - Directly affected families: 6%
- b. Category II - People residing within the project area: 23%
- c. Category III - People from Ramechhap and Dolakha Districts: 43%
- d. Furthermore, 25 personnel were hired from Categories I, II and III, three years prior to the commissioning of the plant and trained in technical schools to become KHP-I plant operators. The operators completed their scheduled training course about a year earlier than the commissioning of the plant. Until the commissioning of the plant they were absorbed by various contractors.

3.3 Khimti Communities and Environment Unit (KECU)

The Khimti Community and Environment Unit (KECU) was established and it became the focal point for community development activities during the KHP-I construction period. KECU also organised public hearings under the presence of the Licensing Authorities (Department of Electricity Development), local authorities, elected bodies (Village and District Development Committees) and the concerned community members. Various

community development activities that KEKU implemented such as non-formal education, improvement in agriculture, health and educational facilities, conservation of forests and skill development trainings are discussed hereafter.

3.3.1 Adult Literacy: Non-formal Education

Non-Formal Education (NFE) was a major component of the programme as well as the foundation for all other programme activities. NFE was aimed towards educating the adults who did not have the opportunity to attend formal education during their childhood. Majority of the NFE participants were housewives (age exceeding 20 years). However, in some cases children who were deprived of schooling were also included in the NFE classes.

The NFE classes served as a forum for awareness raising along with increasing the literacy rate. All other programmes such as agriculture, conservation of forest resources, skill development and income generation, women's right, nutrition, health and sanitation were gradually introduced through these classes. Moreover, the NFE programmes were used for dissemination of project related information. These programmes were designed such that the parents were encouraged to send their children to schools. The parents were also educated to be against child labour through NFE lessons. Similarly, money use and savings programmes (micro-financing) were also organised through the NFE forums.

The NFE programmes were conducted in three phases as follows:

Basic Course: The initial 7 months course was known as the Basic NFE course. By the end of this period the participants were able to read and write in the Nepali language. They were made familiar with basic arithmetic such as addition and subtraction. An NFE facilitator (a teacher) was appointed to run the lessons on a day-to-day basis on small groups (10-20 persons). All necessary stationary such as pencils, papers, notebook, course books, were provided to each participants. Since the programme was run in the rural area where there was no electricity and all the participants were able to attend the lessons only during the evening (after dinner), kerosene lamps were also provided to the groups. A total of 923 participants successfully completed the basic course.

Follow up courses: The second 7 month course was called the "follow up course" which was aimed at enhancing the literacy and mathematical skills of the participants. A facilitator was appointed by the programme for the follow up classes. All necessary stationary, kerosene lamps and required fuel was provided by the programme. A total of 619 participants successfully completed the follow up course.

Trunk Library: A trunk library with educational materials was established for each group by the end of the follow up classes. For the sustainability of the library, the users' group was encouraged to contribute some funds locally, which was matched by the programme. A total of 27 trunk libraries were established.

Non-formal education classes were used as a media for establishing good contacts with the local population by the project. Such classes were the fundamental means for launching other community works under KECU. Through the NFE classes various women's groups were also formed since more than 75% of the NFE participants were women.

3.3.2 Preventative Health Education and Sanitation

Awareness Raising: Various community health awareness-raising programmes were conducted to educate the local population on preventive healthcare. These included several outreach clinics combined with educational programmes which covered topics such as household sanitation, personal health care, nutrition, child-care, family planning, safety against sexually transmitted diseases, HIV and AIDS. The local community was made aware of and encouraged to use the available health services in the area. These topics were also included in the non-formal education curricula.

Latrines/Smokeless stove: None of the households within the project area had toilets/latrines. People used the riverbanks, forest and other open areas. Specialised trainings were organised to educate the locals on the construction, use and maintenance of pit latrines. A concrete toilet pan along with one bag of cement was provided free of charge to each household interested in constructing a toilet. During the construction phase of the project more than 300 households in the community built toilets. Similarly, in order to improve the kitchen environment, smokeless stoves (fire wood is the only fuel used for cooking) were introduced and trainings were given so that they could be constructed locally.

Water supply: In order to provide better access and higher quality drinking water supply, some of the existing water supply systems were maintained and upgraded. Altogether, five small (new) piped water supply systems were constructed in the project area.

3.3.3 Skill development for self-employment

Series of skill development trainings were conducted for the local communities mainly aimed towards the women of the project area. The guiding principle in conducting the skill learning trainings was to enable the local women to generate additional income with nominal investment as well as by utilising locally available resources. The following skill development trainings were conducted by the project during the construction phase:

- Basic tailoring course: 38 female participants
- Advance tailoring course: 4 female participants
- Knitting training: 45 female participants
- Poultry farming: 4 female participants
- Bee-keeping training: 8 female participants
- Pig farming training: 4 female and 12 male participants
- Bamboo furniture making: 3 female and 12 male participants
- Potato chips making training: 10 female participants
- Pickle preparation training: 12 female participants
- Saving/credit training: 24 female and 7 male participants

A women's group called "Janaki Janaprava Mahila Samuha" was established and registered with the local administration as a non-governmental organisation (NGO). This NGO was mainly active in promoting the local women to continue using their training skills. It also raised some funds to facilitate initiating self-employment activities independently.

3.3.4 Conservation of Forest

One of the important local resources in the area is the forest. The forest resources provide fodder for the cattle, firewood, stable hill slopes and a healthy living environment. In order to promote conservation and rational use of the forests, series of educational and awareness raising activities were initially launched in the community. Later on, the community was encouraged to become an active owner of the nearby forest by establishing Community Forest Users' Groups (CFUG). By the end of the programme period a total of 12 CFUGs were established.

Plantation: Besides the promotion of CFUGs, the project implemented plantation in the places where deforestation was a problem. Nurseries were established in different locations in order to supply seedlings of various species to the villagers. These seedlings were sold at a nominal price of NRs 1 (equivalent USD 1/76) per piece to discourage misuse. The CFUGs were actively involved in the plantation works and thus they were able to learn the techniques for selecting the right species based on climatic conditions and topography, raising nursery, and protecting the seedlings. During the programme implementation period, a total of 84,000 seedlings were planted. Initial surveys indicated the survival rate of planted seedlings to be about 65%.

3.3.5 Improvement in Agriculture

The main economic activity of the area was (and is still) agriculture. Therefore, emphasis was given on improving farming practices. There was a very limited culture of kitchen gardening and growing fruits and vegetables. Therefore, advices were given on improving the agricultural patterns depending on the climatic condition. The project had employed full time Agricultural Technicians to provide consultation to the local farmers. The farmers received advice on the improved seeds of various crops that were available, use of fertilisers and farming technique. More than 4,600 farmers received such consultation and services during the construction phase of KHP-I.

One of the important activities was demonstration and training to the local farmers on kitchen gardening. During the programme period a total of 30 farmers received intensive kitchen gardening training. About 30 varieties of vegetables' seeds were introduced and cultivation techniques were demonstrated. Approximately, 29,000

vegetable seedlings were distributed to the interested farmers. Altogether, 10,900 fruit seedlings of various species were distributed to the local farmers by the project nursery.

To encourage best farming practices, kitchen gardening and fruit production, three agricultural-exhibitions were organised in the project area during the four years of the construction period.

The initial survey indicated that this activity has raised vegetable and fruit farming as well as their consumption culture in the area.

3.3.6 Improvement in Educational Facilities

Project School: An English medium Primary school was established and fully subsidised by the project in the Powerhouse Area, the main headquarters of the project. The standard of the education provided in this school was equivalent to an average English medium school in Kathmandu. Earlier opportunity for such standard education in the area was not available. The school was established with the aim to:

- Provide sound education to the children of the project workers as well as the local community members without having to send their children to Kathmandu.
- Reduce the pressure in the existing local schools due to families of workforce and increased immigrants nearby due to project activities.

The capacity of the Primary school was around 300 children per year. One of the objectives of the project was to make this school sustainable so that it could continue even during the operation phase of the hydropower plant when the workforce would be significantly reduced.

Local Schools: Support was provided by the project to seven primary schools and one higher secondary school for improvement of physical facilities such as school building, furniture, teaching materials and management. Teachers were provided by the project to the three of the primary schools situated in the proximity of the project's construction site. Such provisions were made since some of the immigrants and workers send their children to those schools and pressure to accommodate additional children was experienced during the construction period.

3.3.7 Health and Medical Services

Project Clinic: It was obvious that due to the large workforce involved in the development of the project and the nature of the work, health care provision would be essential. Good medical services, capable of handling casualties and accidental case was available only at 4-5 hours driving distance from the main headquarter of the project. Thus, the project established a Clinic in its headquarter, which was staffed by two full time Medical Doctors, Health Assistants, Nurses and a dedicated ambulance service. Furthermore, four more small clinics each staffed by a Community Medical Auxiliary (CMA) were established at other major construction sites. Basic medicines were also sold at the clinics on a non-profit basis. Such facilities were made available for all the community members seeking medical advice and services. At times such facilities provided life saving services to community members, especially in the case of child delivery and severe accidents. Although, the small clinics established at the construction sites were to be closed after the completion of construction activities, the main clinic at the project headquarter was planned to be continued beyond as part of the plant operation.

The project clinics have motivated the local population towards the adoption of modern medical advice and health services. As mentioned in section 1.0, the existing local health posts were poorly managed and staffed. As a result of having access to good services in the project clinics, the local community started giving pressure to their local representatives to improve the existing health posts.

Improvement of Existing Health Posts: During the course of the project implementation phase, the project decided to upgrade the two of the existing health posts, one at Chyama VDC and another at Hanwa VDC. Initially, the physical facilities of the health post buildings were newly constructed to suit the local needs. The Project Clinic personnel under the supervision of a Medical Doctor provided the existing health post staffs "on the job training".

3.4 Guaranteed Minimum Flows and Downstream Water Use

Environmental Discharge: At the downstream of the KHP-I intake weir, provisions were made to release at least 500 l/s during the dry seasons (known as compensation flow or environmental discharge). There is another small perennial stream approximately 200 m downstream of the weir, which also augments the discharge immediately.

Khimti Besi Irrigation: This was the only existing irrigation canal in the project area that used the Khimti river water. It is located on the left bank of the river, about 8 km downstream of the weir. The design flow of the canal was not a problem even during the dry season as there are several tributaries between the intake weir and the irrigation off take. The EIA studies indicated no serious impacts on irrigation.

However, the project owner had a contingency plan (including necessary budget) in the case of insufficient flows for irrigation. It was not possible to monitor the impacts during the construction phase and thus, a full provision was made for monitoring the situation once the project was put into full power generation.

3.5 Rural electrification and handing over a Mini-hydro plant

The feasibility study identified a suitable site for a 500 KW mini-hydropower plant close to Jhankre village of Thulopatal VDC, about two km upstream of the headworks site of KHP-I. The source stream for this plant is called Jhankre, which is one of the tributaries of the Khimti River.

Construction of this mini-hydro plant was completed in the summer of 1996, i.e., when main project construction work was about to commence. A separate contract was awarded to a private company to implement the Jhankre Rural Electrification Programme (JREDP). The main function of the JREDP was to promote electrification and extend electrical supply lines gradually to the project affected areas.

The programme initially established a User's Committee in consultation with the local communities and the elected representatives. The committee based on the available funding and other factors established an electrification programme. Before starting the electrification program, an awareness raising campaign regarding safe and optimum use of electricity was launched in the area. As part of the rural electrification programme, enterprises based on electricity use were encouraged. During the phase I (3 years) of the JREDP, about 300 households were electrified and 7 small-scale electricity based enterprises were established in the area. Household electricity is being mainly used for lighting. Some examples of the enterprises were poultry farming, flower mills, and welding workshops. Currently, JRED has over 2500 consumers and the project owner is in the process of handing over the mini-hydro plant to the communities through users' groups.

4. Lessons learned and replicability

Khimti I Hydropower Project is the first private sector power project in Nepal to implement a dedicated and structured community development program in the project affected areas. As a result of such a program, besides receiving due compensation, the local community has also gained number of direct and indirect benefits. This programme has educated and encouraged the local community to improve their life styles.

A proactive public relations program was established by the project within the local community. Any conflicts created due to the construction activities were resolved by disseminating facts by the projects, discussions with the locals and eventually reaching mutual agreements. This has ensured the cooperation and good will of the local community during both the project construction and the current operational phases. The community members within the project area perceive KHP-I to have contributed in the development of their communities and benefited them.

The main message from this case is that both the private sector and the local communities can work together and mutually benefit by sharing water resources if conscious efforts are made to establish dialogue during the project-planning phase. In KHP-I, good public relations with local communities through out the project life cycle has ensured their support and it was able to avoid unnecessary delays that most hydropower projects in Nepal faced in the past (e.g., strikes, non-cooperation from local community and arbitration). It should be noted that such delays also result in cost escalation.

The cost of establishing a structured community development program need not necessarily be high compared to the total project cost in a large water infrastructure project, but the benefits to both the developer and the community can be immense. For example, the total expense of KECU during the construction period of KHP-I including the cost of the Jhankre Mini-hydropower plant was less than 1% (US\$ 249,100) of the total project cost.

Successful planning and implementation of the Environmental Mitigation and Monitoring Plan as part of project execution has benefited local communities, and as it has also prevented protests and unrest, consequently the hydropower project has also benefited.

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6. Contacts

- i. Mr. Kamal Gautam
Butwal Power Co. Ltd (BPC)
P. O. Box 11728,
Kathmandu,
Nepal
Phone:(977)-01-5538404 / 5535595
E-mail: kamal-gautam@hydroconsult.com.np
kamalprasadgautam@hotmail.com
- ii. Mr. Ajoy Karki
G.P. O. Box 1309,
Kathmandu,
Nepal
Phone: (977) - 01 - 5535537 / 5528704
Email: akarki@mail.com.np