Japanese ODA Loan

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country: The Nepal
Project: Tanahu Hydropower Project
Loan Agreement: March 13, 2013
Loan Amount: 15,137 million Yen
Borrower: The Government of Nepal

2. Background and Necessity of the Project

(1) Current State and Issues of the Electricity Sector in Nepal

Nepal is endowed with abundant water resources and has hydropower potential of an estimated 83,000MW and economically effective hydropower of an estimated 42,000MW. The power-generating capacity in 2011, however, remained a mere 706MW. The country depends on hydroelectricity for 90% of its power generation, but most of the existing hydroelectricity power plants are disproportionately run-of-river type, while there are only two reservoir type hydroelectricity power plants (a total of 92MW) that can seasonally adjust the flow of water used for power generation. The reservoir type hydroelectricity power plants were built with assistance from Japan. Therefore, electricity output falls substantially in dry seasons and the country becomes short of electricity supply of more than 400MW. In such situations, annual electricity sales per capita is 91kWH (2009), which is one of world's lowest levels, and the country needs to perform planned outage for a maximum of 16 hours per day in dry seasons, causing serious problems in people's lives and economic activities. Moreover, according to the Nepal Electricity Authority (NEA), peak demand is expected to continue to increase by around 9% per year: an increase in the capacity of power generation is an urgent issue.

(2) Development Policies for the Electricity Sector in Nepal and the Priority of the Project

In the Three Year Interim Plan (2010-11 to 2012-13), Nepal's topmost national development strategy, the Government of Nepal views development of economic infrastructure, including electricity, as one of the top priority issues. At the end of 2008, it formulated a "National Electricity Crisis Mitigation Action Plan" and a "Ten-Year Hydroelectricity Development Plan", aiming to develop hydroelectric power sources of 10,000MW in the next ten years to ease the power shortage at an early stage. The Plans find it essential to build storage- type hydroelectricity power plants that can stably supply electricity in dry seasons, and include this project. To meet electricity demand in dry seasons, construction of thermal or reservoir type hydroelectricity power plants is considered to be essential, but the Government of Nepal takes a negative stance toward thermal power plants because of the power generation cost

and fluctuations in fuel import prices.

(3) Japan and JICA's Policy and Operations in the Electricity Sector

JICA Country Analytical Work for Nepal analyzes that development of hydroelectricity power plants is a priority issue, and the Country Assistance Policy for Nepal formulated by the Ministry of Foreign Affairs of Japan in April 2012 views the "building of social infrastructures and institutions for a balanced and sustainable economic growth" including electricity, as one of the priority areas, so this project is consistent with the policy of the Japanese government. To date, Japan has given assistance to the electricity sector in Nepal in various ways, which include: construction of power generating plants through ODA loan assistance; formulation of a power sources development plan through development study; construction of distribution plants through Grant Aid; and soft component through dispatches of experts and providing training. Major assistance programs conducted are as listed below:

- Loan assistance: Kulekhani Hydroelectric Project I (FY1976 and FY1978); Kulekhani Hydroelectric Project II (FY1982 and FY1983); and Kali Gandaki A Hydroelectric Power Plant (FY1996. Joint financing with Asian Development Bank (ADB))
- Grant Aid: the Project for Introduction of Clean Energy by Solar Electricity Generation System (FY2009)
- Technical Cooperation: Project for the Nationwide Master Plan Study on Storage-Type hydroelectric Power Development in Nepal (from FY2011)

(4) Other Donors' Activity

The World Bank has given assistance to development of transmitting and transforming facilities; power resources development (including rehabilitation of the existing facilities and construction of small hydropower stations); improvement in business efficiency for the reform of the electricity sector; etc., and ADB to power resources development (including hydropower generators and renewable energy); development of transmitting and transforming facilities; electrification of rural areas; etc. This project is a loan project in collaboration with ADB.

(5) Necessity of the Project

This project deals with tight electricity demand in Nepal by constructing a storage-type hydropower station that can stably supply electricity. It also contributes to the consolidation of peace by improving the foundations for social and economic activities of the citizens after the successful peace process, sustainable economic development and an improvement in the living standards. It also conforms to the development policy of the Government of Nepal and the assistance policies of the Japanese government and JICA. Thus given the above, JICA's assistance for this project is highly necessary and relevant.

3. Project Description

(1) Project Objective(s)

The objective of the Tanahu Hydropower Project (the "Project") is to provide stable power supply and to cope with increasing power demand by constructing a storage-type hydropower plant (140MW) in Tanahu district, thereby contributing to economic development, improvement of civil life, and adaptation to climate change.

(2) Project Site/Target Area

Tanahu District (Upper-stream of Seti River)

(3) Project Components (Including the Procurement Method)

1) Construction of a storage-type hydropower station (intakes, dam, headrace channels, pipelines, power generators (70MW x 2), preparatory work, transmission cable (approx. 37km), transformers, etc.) (international and national competitive bidding)
2) Consulting services (bidding assistance, construction supervision, assistance to operation and maintenance, etc.)

(4) Estimated Project Cost (Loan Amount)

41,596 million Yen (Loan Amount: 15,137 million Yen)

(5) Schedule

March 2013 - October 2021 (104 months). The project will be completed when all the facilities start operation (October 2020).

(6) Project Implementation Structure

1) Borrower: the Government of Nepal
2) Executing Agency: Tanahu Hydropower Limited: THL
3) Operation and Maintenance System: THL

(7) Environmental and Social Consideration/Poverty Reduction/Social Development

1) Environmental and Social Consideration

① Category: A

Reason for Categorization: this project falls into the hydroelectric generation sector and is likely to have significant adverse impact due to its characteristic under the "JBIC Guidelines for Confirmation of Environmental and Social Consideration" (established April 2002).

② Environmental Permit: the detailed Environmental Impact Assessment (EIA) report on dam construction in this project was approved in August 2009, and the Initial Environmental Examination (IEE) on construction of transmission cables in June 2010 by the Government of Nepal.

③ Anti-Pollution Measures: spoil disposal work will be carried out for at least five years after the commencement of services with care for water contamination and any impact on downstream residents with the support of an experienced consultant. Impacts on the environment and society are expected to be minimized if THL gains certain experience, and takes over and continues the

spoil disposal work.

④ Natural Environment: the project site is not designated as sensitive areas near national park. . The dam to be built interferes with migration of anadromous fish, so fish will be cultured at hatcheries and released as an easing step. Trees of approx. 400ha are cut off for the project, so seedbeds will be prepared for alternative tree plantation.

⑤ Social Environment: this project requires acquisition of approximately 112 ha of land and resettlement of 86 households, of whom 37 households reside in the construction site for the power station (scheduled dam site) and 49 households in the sites for access roads and other incidental facilities. The land acquisition and resettlement will be carried out in accordance with the domestic procedures and a resettlement assistance program (RAP). In preparation for the RAP, there have been constant discussions with local residents affected, and no particular objections have been raised.

⑥ Other / Monitoring: THL will monitor the water quality of the reservoir; stability of the reservoir slopes; development and inhabitation of fauna and vegetation; impacts of spoil disposal work on the downstream basin; progress of resettlement; etc.

2) Promotion of Poverty Reduction: none

3) Promotion of Social Development (e.g. Gender Perspective, Measure for Infectious Diseases Including HIV/AIDS, Participatory Development, Consideration for the Handicapped etc.): the project will provide residents in the project area with community development assistance comprising programs for improvement in educational environments, income generation, and assistance for juveniles, women and other socially vulnerable groups.

(8) Collaboration with Other Schemes and Donors: this project will be implemented under the joint financing scheme (parallel method) with ADB, the European Investment Bank and Abu Dhabi Fund for Development.

(9) Other Important Issues: none

4. Targeted Outcomes

(1) Quantitative Effects

1) Operation and Effect Indicators

Indicator	Baseline	Target (2022) [Expected value 2 years after project completion]
Maximum output capacity (MW)	-	140
Plant Load Factor (%) (annual output/annual rated output)	-	47.7

Unplanned Outage Time(hours/year)	-	5
Annual Amount of Net Generation Output (Gwh/year)	-	585

2) Internal Rate of Return

Based on the conditions indicated below, the economic internal rate of return (EIRR) of the project is 18.4% and the financial internal rate of return (FIRR) is 11.4%.

[EIRR]

Cost: project cost (excluding taxes) and operating and maintenance costs

Benefits: an increase in consumer surplus as a result of power generation

Project life: 35 years

[FIRR]

Cost: project cost and operating and maintenance costs

Benefits: earnings from electric power selling

Project life: 35 years

(2) Qualitative Effects

Economic development and an improvement in the living standards in Nepal

5. External Factors and Risk Control

Delay in civil engineering and other work due to floods or other natural disaster

6. Evaluation Results and Lessons Learned from Past Projects

(1) Evaluation results of similar projects

The ex-post evaluation of Sipansihaporas Hydroelectric Power Plant Project in Indonesia has given a lesson for measures for reservoir sedimentation: that is, the volume of sediment should be grasped and appropriately monitored for systematic implementation of dredging and flushing operation. The ex-post evaluation of Ujjani Hydroelectric Project in India has given another lesson: the geological conditions initially unexpected caused delays to the project and affected the internal rate of return and other financial condition of the project. Thus, the geological conditions of project sites should be counted as a key factor that may affect the project cost, schedule and scope. The ex-post evaluation of Kali Gandaki A Hydroelectric Power Project in Nepal has pointed out the necessity of carefully selecting the coating method of water wheel runner to prevent it from wearing out due to sediment.

(2) Lessons for this project

In light of the aforementioned lessons for measures for reservoir sedimentation, confirmation of the geological conditions and consideration of coating for hydropower generator, THL, the executing agency of the project monitors and

manages the volume of sediment as part of sedimentation measures with the support of the consultant. Moreover, detailed geological surveys were carried out in JICA F/S and reviews of the F/S by ADB, so uncertainties related to the geological condition have been eliminated. The project also adopts coating of water wheel runner.

7. Plan for Future Evaluation

(1) Indicators to be Used

1) Maximum output capacity (MW), plant load factor (%), unplanned outage (hours/year) and annual amount of net generation output (Gwh/year)
2) EIRR (%) and FIRR (%)

(2) Timing of Next Evaluation: two years after project completion

END