IEA Hydropower Implementing Agreement Annex VIII Hydropower Good Practices: Environmental Mitigation Measures and Benefits Case Study 07-01: Resettlement - Chiew Larn Multipurpose Project, Thailand

Key Issues:

7-Resettlement

12-Benefits due to Dam Function 13-Improvement of Infrastructure

Climate Zone:

As: Tropical humid

Subjects:

- Restoration of livelihood and Rebuilding of Resettled Communities

Effects:

- Socio- economic conditions of the resettlers
- Suitability of resettlement community plan, public infrastructure, agriculture plan, utilities and services provided

Project Name:	Chiew Larn Multipurpose Project
Country:	Thailand (Asia)

Implementing Party & Period

- Project:	Electricity Generating Authority of Thailand (EGAT) 1981 -
- Good Practice:	Electricity Generating Authority of Thailand (EGAT) 1981 -

Key Words:

Resettlement, Environmental mitigation

Abstract:

The Chiew Larn Multipurpose Project is located in peninsular southern Thailand. This project provided a series of benefits, including generation of electric power, increase of agriculture output because of irrigation, and additional fishery output. An environmental Mitigation Plan (EMP) has been carefully developed and organized by the government agencies. The Chiew Larn resettlement development program which provided adequate land, utilities, and assignment of rubber plantation, is considered to be one of the most successful programs in the region.

1. Outline of the Project

The Chiew Larn multipurpose project, a water resources development scheme, have the dam constructed on Khlong Saeng, at Ban Chiew Larn, Amphoe Ban Ta Khun, Surat Thani province, as shown in Figure 1. Its main purposes comprise power generation, irrigation, flood control, fishery enhancement and environment protection. It consists of a rockfill central clay core dam with the crest elevation at 99.5 m MSL. At its normal high water level of 95.0 m, the reservoir has an active storage of 5 050 million cubic meter and a water surface of 165 sq.km2. The power house, is equipped with 3 generating units with ultimate installed capacity of 240 MW, have the total generation capacity of 554 GWh per year.



After project completion the Chiew Larn Dam was conferred by His majesty the King to be called the *"Rajjaprabha"* Dam which means in English the "Ligth of the Kingdom" Dam.



Figure 1: Location of Chiew Larn multipurpose project

Item		Specification
River		Klong Saeng
Power Plant	Start of Operation	May 1987
	Max. Output	240 MW
	Max. Power Discharge	2,750 CMS
	Max. Effective Head	97.48 m (MSL)
Dam	Name	Rajjaprabha
	Туре	Rockfill with impervious core
	Crest Length	969 m
	Max. Height	94 m
	Volume	6,500,000 cu.m
	Design Flood Discharge	5,300 CMS
Reservoir	Catchment Area	1,435 km ²
	Impounding Area	185 km ²
	Max. Capacity	6,111 MCM
	Max. Water Level	97.48 m (MSL)
	Minimum Water Level	62 m (MSL)

Table 1: Specifications of Rajjaprabha Dam and power plant



Figure 2: Cross section view of power station





Figure 3: Floor plan of power station

2. Features of the Project Area

The reservoir and its vicinity areas are underlain by three main rock units, namely Phuket group, Ratburi limestone and granitic rocks. The most important rock with respect to reservoir leakage is the ratburi limestone which is commonly found in the central part of the area. Solution cavities are significantly developed particularly in the massive limestone, of which the most important one is the formation connecting Khlong Saeng and Khlong Sok, where the previous geological investigations have been mainly concentrated.

The Ta Pi-Phum Duang river basin is under the influence of two monsoons, namely the southwest and northeast monsoons. Rainfall of the basin is markedly influenced by these two monsoons, with the western highlands including the Khlong Saeng subbasin being mainly influenced by the southwest monsoon causing heavy rain during mid-May to November, while the east coastal zone being more influenced by the northeast monsoon. Rain is abundant over the Ta pi-phum Duang region, ranging from 4000 mm on the western highlands to about 1400 mm in the eastern highlands, on the average annual basis. The annual rainfall amounts decend from the west to the east. Generally, the wet years are often followed by two or three dry year. Temperature of the basin is relative constant throughout the year generally ranging from 29 C during the wet season to about 35 C in April. Humidity is high and also relatively constant, ranging from 75 to about 89 % on the monthly average.

3. Major Impacts

There are several causes of socio-economic changes relative to the Chiew Larn multipurpose project and resettlement is among the most important causes. The main objectives of the resettlement study were as follows:

- 1) To evaluate suitability of resettlement community plan and administration; suitability and adequacy of public infrastructure, utilities and services provided, and suitability of agricultural plan and actual practices.
- 2) To evaluate socio-economic conditions of the resettlers and changes of conditions with former villages, and evaluate environmental impacts of each resettlement site
- 3) To assess degree of success of each resettlement site based on the evaluation in (1) and (2) above, and to propose plans for improvement of necessary aspects of each resettlement site.
- 4) To identify future monitoring criteria and programs for necessary aspects of each resettlement site.

4. Mitigation Measures

4.1 Resettlement Development

The resettlement development for evacuees of the Chiew Larn multipurpose project is completed in mid of 1987. The selected resettlement area of approximately 18,000 rai (2,900 ha), is located within Ban Ta Khun district boundary, 4 km east from the dam site. It can accommodate about 400 families that can be divided into 4 groups for political or administrative purposes. The resettlement site is selected taking into consideration soil and land capability, accessibility socio-economic, and preference of the potential resettlers. The land on the selected site is mostly suitable for fruit trees, para rubber and paddy rice in the lower part.

The several major tasks accomplished in resettlement development can be summarized as follows:

 Construction of standard public infrastructures as main access service roads, electricity and water supply systems and government service buildings as primary and secondary schools, public health centre, monastery, police station, etc.



Figure 4: Construction of standard public infrastructures

- Assignment to each family of a rai (0.39 acres) for homelot and 19 rai (7.52 acres) of rubber planting.
- Provision of monthly income of 1,000 Baht for each family to take care of their own rubber trees in the first 2 years
- 4) Establishment of agricultural cooperative unit for resettlers; a credit loan was also organized.
- 5) Arrangement of supplementary occupational extension programs to support the resettlers household income; this included fisheries development, agricultural extension (e.g., poultry farms, mechanical repairing, vegetable growing)

The total compensation and resettlement cost is approximately 176 million baht which comprised compensation cost 45.3 million baht and resettlement cost 130.7 million baht.

- 1) Compensation cost per household is about 160,000 baht.
- 2) Resettlement cost per household is about 435,667 baht.





5. Results of the Mitigation Measures

The group of National Environment Board and EGAT are jointly responsible for the long-term follow-up monitoring. Change in socio-economic conditions of the resettlers in Chiew Larn resettlement communities was observed. The results of survey indicated that, after 6-8 years of resettled in Chiew Larn resettlement area, the resettlers are better off when considering 8 basic requirement such as public health and nutrition, security occupation, community management, public infrastructures, education services, etc.

The collected data by means of interviewing household heads, and secondary data were obtained from the related documents showed that most of the household heads were male between 46-55 years of age. Average number of household members was 5-6 people. Most housing was in the better condition. Rubber plantation was the major occupation of every household. With respect to the capital employment, only 8.2 percent of the settlers use their own capital, and 91.8 percent of the settlers borrow capital from outside.

In term of net income, the settlers who utilize their own capital earned the annual net income of 46,575 baht per household, as compared to 34,301 baht of those who borrow from outside. Before resettlement scheme, the average net annual income of the settler was 27,974 baht per household.

The health survey shows that health conditions of resettlers are better because adequate public health facilities and personnel are provided in the resettlement area. The prevalence rates of malaria were lower compared with those of the whole province

6. Reasons for Success

It is accepted that the Chiew Larn resettlement development is considered as one of the most successful human settlement program in this region.

The key of success resulted from an effective planning of resettlement program, psychological effects on evacuees and resettlers have to be minimized; fair and rapid compensation operation and management; adequate social inputs, infrastructure and utilities in the resettlement areas; adequate land to make living, adequate and efficient demonstration and extension services for the new occupation; and an effective resettlement scheme

A resettlement committee, comprising all representatives from the government agencies concerned, should be expeditiously appointed by the Prime Minister so that the work could be carried out without delay.

7. Further Information

7.1 References

- TEAM Consulting Engineers Coltd: Chiew Larn Project Environment and Ecological Investigation, Final Report, June 6, 1980
- Electricity Generating Authority of Thailand: Chiew Larn Multipurpose Project Unit 1&2, Completion Report, May 1987

7.2 Inquiries

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