

**Secondary Evaluation Report on Dai Ninh Hydropower Project (1)(2)(3)
in the Socialist Republic of Vietnam**

Takako Haraguchi, International Development Associates

Profile of the Project for the Primary Evaluation

Title	Dai Ninh Hydropower Project (1)(2)(3)
Objective	To meet the increasing power demand in the Southern region of Vietnam, to enhance irrigation agriculture in Binh Thuan Province, and to support the improvement of living standard of indigenous people in the project site, through construction of a hydropower plant and related facilities as well as the Indigenous People Development Program (IPDP).
Loan Amount Approved / Disbursed	(1) 4,030 million yen / 2,956 million yen (2) 10,000 million yen / 8,924 million yen (3) 19,142 million yen / 16,691 million yen
Loan Agreement Date	(1) March 1999, (2) March 2001 and (3) March 2004
Completion Date	April 2008
Executing Agency	Electricity of Vietnam (EVN)

Profile of the Primary Evaluation

Type of Evaluation	Ex-post evaluation
Evaluators	Vietnamese Primary Evaluation Team for Dai Ninh Hydropower Project (Ministry of Planning and Investment, Ministry of Industry and Trade, EVN, Project Management Board No.6 of EVN, Dai Ninh Hydropower Company of EVN, and evaluation consultants)
Period of Evaluation	November 2010 – July 2011 (Fieldwork: March 2011)
Evaluation Rating	Highly satisfactory (A) with sub-ratings of relevance=high (3), efficiency=fair (2), effectiveness=high (3), impact=high (3) ¹ , and sustainability=high (3)

1. Framework of Secondary Evaluation

1.1 Background and Purpose of the Secondary Evaluation

This secondary evaluation is part of the Vietnam-Japan Joint Ex-post Evaluation Program, collaboration between Ministry of Planning and Investment (MPI) and Japan International Cooperation Agency (JICA) for evaluation capacity development in Vietnam. Every year since the Program started in 2007, a couple of Japanese ODA loan projects have been evaluated in their ex-post stages by project-wise joint evaluation teams consisting of the Vietnamese and Japanese evaluators. Year by year, the responsibility on the Vietnamese side has become larger. In JFY2010, evaluation ownership was further transferred to the Vietnamese side, which is now expected to plan, manage, implement and use evaluations on their own, by introducing the two-step evaluation as follows:

STEP 1 - Primary evaluation conducted by the Vietnamese evaluation team consisting of project-related organizations and external evaluators (national consultants) with guidance and suggestions by the Japanese secondary evaluator; and

¹ In the JICA project evaluation system, a single rating is given to effectiveness and impact. However, the Joint Evaluation Team decided to give separate ratings to effectiveness and impact.

STEP 2 - Secondary evaluation or evaluation of the primary evaluation. Secondary evaluation is conducted by the Japanese secondary evaluator.

There are two major purposes of the secondary evaluation:

- (1) Evaluation capacity development of the Vietnamese government officials and consultants through verification of their evaluation process and reports; and
- (2) Ensuring JICA's accountability by validating the evaluation judgment made in the primary evaluation from the viewpoint of the JICA's evaluation criteria.

1.2 Scope of the Secondary Evaluation

The object of this secondary evaluation is the ex-post evaluation of Dai Ninh Hydropower Project (1)(2)(3), the primary evaluation.

1.3 Methodology²

To serve the above purposes, the secondary evaluation was designed to answer the two major evaluation questions:

- (1) Is the process and results of the primary evaluation good? (quality control)
- (2) Is the evaluation judgment valid considering the evidence presented? (accountability)

For the quality control, the secondary evaluator reviewed the process and report of the primary evaluation based on a pre-defined checklist. For validation of the evaluation judgment, the secondary evaluator reviewed the findings presented in the primary evaluation report in the light of the JICA's evaluation criteria and sub-criteria for Japanese ODA loan and grant projects. For these purposes, the secondary evaluator joined the primary evaluators on meetings to design and process the primary evaluations as well as the field trip.

The secondary evaluator reviewed the primary evaluation report twice -- the first draft and final draft -- and shared the review results with the primary evaluation team, which then improved the quality of the draft.

Checklist for Quality Control of Evaluation Process and Results

I Evaluation Process	1. Schedule, Budget and TOR (1) Appropriate scheduling, (2) Adherence to schedule, (3) Budget, (4) Adequateness of TOR, (5) Adherence to TOR
	2. Evaluation Design (1) Logic model, (2) Evaluation questions, (3) Data collection, (4) Information and data management
II. Evaluation Report	3. Background (1) Evaluation purpose and methods, (2) Evaluators, (3) Necessity of Project, (4) Output, outcome and impact
	4. Evaluation on Relevance Quality of the report: (1) National development strategy (2) Sector policy, (3) Comparability, (4) Development needs, (5) Japanese ODA policy Comments on Value Judgment
	5. Evaluation on Efficiency Quality of the report: (1) Details of output, project period and project cost, (2) Output, (3) Project period, (4) Project cost Comments on Value Judgment

² References: JICA References on Ex-post Evaluation; Western Michigan University, Evaluation Checklists (<http://www.wmich.edu/evalctr/checklists/>); Secondary Evaluation by the Advisory Committee on Evaluation (http://www.jica.go.jp/english/operations/evaluation/reports/2007/pdf/2007_04_01.pdf).

<p>6. Evaluation on Effectiveness Quality of the report: (1) Evidence, (2) Selection of evidence, (3) Reasons, (4) IRR Comments on Value Judgment</p>
<p>7. Evaluation on Impact Quality of the report: (1) Evidence, (2) Beneficiary, (3) Environment, (4) Land acquisition and resettlement Comments on Value Judgment</p>
<p>8. Evaluation on Sustainability Quality of the report: (1) Institutional arrangement, (2) Staffing, (3) Technological level, (4) Source of O&M budget, (5) Amount of O&M cost and O&M budget, (6) Maintenance activities Comments on Value Judgment</p>
<p>9. Conclusion, Recommendations, and Lessons Learned Quality of the report: (1) Representation, (2) Feasibility of recommendations, (3) Concreteness of recommendations, (4) Relevance of recommendations, (5) Feasibility of lessons learned, (6) Relevance of lessons learned</p>
<p>10. Overall Quality of the report: (1) Consistency across sections, (2) Data table, graph and photos, (3) Data source, (4) Description of social survey, (5) Limitation of the evaluation, (6) Deviation from rating criteria, (7) Protection of personal information</p>

1.4 Constraints and Limitation of this Secondary Evaluation

None.

2. Evaluator

Takako Haraguchi, International Development Associates

3. Summary of the Primary Evaluation Results by Vietnamese Evaluation Team

(1) Relevance. This project has been highly relevant with the country's development plan, development needs as well as Japan's ODA policy, therefore its relevance is high.

(2) Efficiency. Although the project cost was within the plan, the project period exceeded, therefore efficiency of the project is fair.

(3) Effectiveness. This project has largely achieved its objectives, therefore its effectiveness is high. Since it started operation in 2008, the 300MW Dai Ninh Hydropower Plant has generated average 1,183GWh every year, which is slightly higher the target (1,178GWh). After Dai Ninh Plant, water is provided to the 30MW Bach Binh Hydropower Plant, which EVN constructed downstream Dai Ninh Plant by its own investment to generate additional 114GWh per year, and then utilized for agriculture in Bach Binh District, which added approx. 2,000 ha of irrigated land after the project. The project-affected indigenous people benefited from IPDP in terms of better infrastructure, access to public services (school, hospital and market). The financial internal rate of return was re-calculated to be 11.25%, which was almost same as the calculation in the appraisal (11.9%).

(4) Impact. A number of positive impacts were observed while there were some negative impacts. Positive impacts includes the support for rapid economic development of the country by adding power sources, increase in agricultural production in Bach Binh district (20-30% annual increase in paddy rice production after the project). Also, the road and bridges built for construction of this project became a main route to connect Lam Dong and Binh Thuan

provinces and realized better transportation of people and goods. As for negative aspects, the team observed EVN's or local governments' insufficient fulfilment of mitigation measures against environmental impacts, such as improper discharge of water downstream the dam (spillway) during the night time, delays in afforestation programs by the province, and non-regulated discharge of water downstream the hydropower plant during floods..

(5) Sustainability. No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is high.

(6) Conclusion. In the light of the above, this project is evaluated to be (A) highly satisfactory.

(7) Recommendations. (i) To complete all project components, Dai Ninh Hydropower Plant should fix the problem of communication system, and local authorities of Lam Dong Province should solve the problem of non-utilization of irrigation pump systems in the rehabilitation area. (ii) To avoid negative impacts, Dai Ninh Hydrpower Plant should (a) strictly commit to discharge 0.7m³ or more water to downstream to ensure water in Duc Trong district during 24 hours a day, and (b) ask the National Load Dispatch Center of EVN for lower operation of the hydropower plant in case of floods in order not to aggravate damages. For the same purpose, Binh Thuan province should promote afforestation programs.

(8) Lesson learned. (i) Future project involving land acquisition and resettlement can learn from good practices of this project, including (a) good coordination among related parties and support from local authorities, and (b) support to indigenous or affected people in a sustainable way – not only compensate them by land, resettlement site and money but also support them in social development so that they can get on well with the changing life. (ii) Participation of operation agencies in the construction stage can improve sustainability. (iii) Good coordination between the project management unit, the operation agency and the contractor, at the initial stage of operation, can promote smooth operation and commissioning.

4. Summary of the Secondary Evaluation Results and Recommendations

As the primary evaluation satisfied most of the check points with some small concerns, the evaluation process and the quality of the report are evaluated as satisfactory. There are rooms for improvement in some aspects such as schedule control and reader-oriented presentation of the report, such as better editing and spelling out of technical arguments.

The value judgment made in the primary evaluation is valid considering the evidence: relevance is high (3), efficiency is fair (2), effectiveness is high (3), impact is high (3), sustainability is high (3), and thus the overall evaluation is highly satisfactory (A).

5. Analysis of Process and Report of the Primary Evaluation

Verification of the Evaluation Process

5.1 Schedule, Budget and TOR

The brief overall evaluation schedule was drafted by the Japanese secondary evaluator, and the Vietnamese primary evaluation team refined it and prepared a detailed work plan with interim deadlines in each step of evaluation. The overall period of the primary evaluation was approx. eight months from November 2010 to July 2011. Although enough time was allocated for the primary evaluation, interim deadlines were sometimes not kept due to overload of team members. In particular, finalization of the primary evaluation report took very long time as the

team (except members from the project management unit) lost concentration to finish the work after the final feedback workshop (where the team presented the primary evaluation results) in July. Insufficient management structure (mentioned below) also affected this situation.

The cost for the primary evaluation was shared by the Japanese side (remuneration for consultants, cost for trainings, meetings and workshops, vehicles during the field work) and the Vietnamese side (travel expenses for trainings, meetings, workshops and fieldwork). There was no major problem in the amount of the budget for conducting the primary evaluation.

As mentioned above, the Vietnamese evaluation team was supposed to manage, not only implement, the primary evaluation. TORs were prepared separately for the “management team” and the “implementation team”, the newly-introduced sub-division of the Vietnamese evaluation team in response to the increased tasks on the Vietnamese side. The TOR for the implementation team was clear for both the government members and consultants, while the TOR for the management team was not fully understood by some members from the government (i.e. they interpreted that the only task for the management team was to attend a few workshops and acknowledge the draft evaluation report, while there were many other tasks of schedule and quality control had been assumed). This was possibly because evaluation management was still new in Vietnam, though the legal framework (such as No. 131/2006/ND-CP) provides outsourcing of project evaluation to external evaluators.

5.2 Evaluation Design

At the beginning of the evaluation design, the primary evaluation team developed the logic model of the project. Then, they identified evaluation questions and data collection strategy to answer each question in a format of evaluation planning framework.

In the first draft of their evaluation planning framework, there was confusion between outcomes and outputs. Later, the problem was solved and the logic model improved much to a sufficient level. Likewise, the evaluation questions became more to the point as they repeated discussions and with suggestions from the secondary evaluator.

Data sources were very detailed and realistic given the fact the team included the members of the project management unit and the hydropower plant who have been involved in the project or knew well about it. This is an advantage of this kind of (partial) internal evaluation.

Verification of the Evaluation Report

5.3 Background

The format of the primary evaluation report was taken from that of JICA project evaluation, which does not have distinct sections on evaluation purposes and methods in individual reports (instead, JICA includes them in its annual evaluation report as common information to all project evaluations). If the Vietnamese side is to publicize the primary evaluation reports as a stand-alone document, the evaluation purposes and methods should be added to the report.

Other essential background information such as the evaluators as well as the project outlines are all presented in the report.

5.4 Relevance

The relevance section is satisfactory.

In the policy aspect, the report shows relevant sections of the Socio-Economic Development Plans and Power Sector Master Plans at the times of both ex-ante and ex-post evaluations as the development policies that have supported the project.

In the needs aspect, the report shows the rapid GDP growth and accompanying high electricity demand with data before and after the project, which indicates the continuing needs for power source development.

5.5 Efficiency

The efficiency section is partially satisfactory, with rooms for improvement especially with regard to the project outputs.

The description of the outputs is precise as it was drafted by the project management unit of this project. It is observed that they tried hard to summarize the outputs as much as possible, and show details in the attachment. In the first draft, the contents were not very friendly for readers who are not familiar with technical details of power generation and civil works. Later, this aspect was improved with explanations of technical terms.

5.6 Effectiveness

The effectiveness section is satisfactory.

The evidence that the evaluation team selected (i.e. outcome indicators such as electricity generation output as against the target, the amount of water supply from the hydropower plant and irrigated area, and some qualitative information to show the improvement of living standard of the indigenous people using the results of the focus group discussions and surveys) is direct and valid in verifying the intermediate outcomes.

The report also clearly explains reasons for an increase/decrease in each outcome indicators (e.g. fluctuation of rainfall as an influencing factor to plan vs. actual differences in electricity generation).

The re-calculation of financial internal rate of return (FIRR) and economic internal rate of return (EIRR) and comparison of it with the planned value is at a satisfactory level for this kind of ex-post evaluation (i.e. comprehensive; not focusing only on economic and financial analyses), too. The reasons for the plan-actual gaps are analysed and explained.

From a viewpoint of Japanese ODA, a remark could be added that synergy effects are expected from this project and the two more on-going JICA-assisted projects: Phan Ri-Phan Thiet Irrigation Project (ODA Loan agreed in 2008) and the Technical Cooperation Project for Agriculture Development in Phan Ri-Phan Thiet (Technical Cooperation agreed in 2011). Both projects are to make better use of water from Dai Ninh and Bach Binh Hydropower Plants for approx. 10,000ha of additional irrigation land in Bach Binh district. The construction of the irrigation facilities are expected to complete in 2012.

5.7 Impact

The impact section has much improved compared to earlier drafts in terms presentation of both positive and negative findings with evidence, though there is still rooms for improvement by further refining the analysis and presentation of what the team observed. Overall, the impact section is evaluated as partially satisfactory.

The evidence the evaluation team selected (i.e. GDP growth, power demand-supply gap, rice production, income of the poor, and some qualitative information) is direct and valid to assess the intended impact of this project even though the report could only tell the project partially contributed to the observed positive changes (i.e., analysis of attribution is difficult within the framework of this joint evaluation).

The report does not expressly define who benefitted from this project, though beneficiaries are quite clear if reading it through: (1) the whole population benefiting from power supply, (2) farmers in Bac Binh district, Binh Thuan province benefiting from irrigation water supply, and (3) indigenous people in Duc Trong district benefiting from IPDP. It would be better if the approximate size of each beneficiary group is provided, and if clarification is made on whether the whole population of Duc Trong district benefitted from IPDP or only the people directly affected by the project.

Regarding environmental impact, which is one of the major concerns of many audiences, the report mentions some negative findings (i.e. those related to water discharge downstream and decrease in forest area). As those issues are relatively small compared to huge positive

impacts, the report maintains a high evaluation of impact. Also, data are lacking to determine causal relationship between this project and the problems. Being fully aware of this, the evaluation team decided to mention them after repeated discussions to draw attention of the executing agency and local governments for further improvement of the situation of the project-affected areas. The team's serious commitment in this evaluation not to score a finished project but to use this opportunity to enhance project impacts is highly appreciated.

Another biggest concern, impact of the land acquisition and resettlement, is handled as the direct outcomes of the project in the effectiveness section. The secondary evaluator agrees that the support to people affected by the land acquisition and resettlement is one of the points that are noteworthy about this project.

5.8 Sustainability

The sustainability section is partly satisfactory, with some missing information.

The report clearly states the organizational setting for operation and maintenance of the facilities built by the project. The evaluation of technical levels of operation and maintenance staff is good, too. However, weaknesses are observed in the evaluation of financial aspects for operation and maintenance and current situation of operation and maintenance.

The financial aspects could be improved if the report shows, in addition to the current indication of the summary income statements of the hydropower company, the required and actual operation and maintenance cost that it says is covered by the operation revenue.

The evaluation of operation and maintenance situation could be better supported if the report briefly describes types and frequency of maintenance activities.

5.9 Conclusion, Recommendations and Lessons Learned

The recommendations and lessons are generally agreeable, but there are some concerns.

The recommendations are mostly concrete enough to follow. It is also well supported by the evaluation findings presented in the main body. However, the recommendation to Lam Dong province to utilize irrigation pumps that have never been used is questionable: according to the ex-watchman of the pump house, measures such as organization of users groups with fee collection had been tried but not worked because the specification of the pumps had not matched their needs. Under such circumstances and after the long years of abandonment of the pumps, it would be very difficult to come up with a feasible solution.

As for the lessons learned (significance of IPDP), it is not clear whether all projects that accompany involuntary resettlement should have this kind of development program, and how deep the project should be involved in it. Normally it is difficult to generalize the findings from only one case and determine the conditions and situations where the lesson is applicable. Nevertheless, the lessons presented in this report show a concrete good practice, which future project planners can refer as one case study.

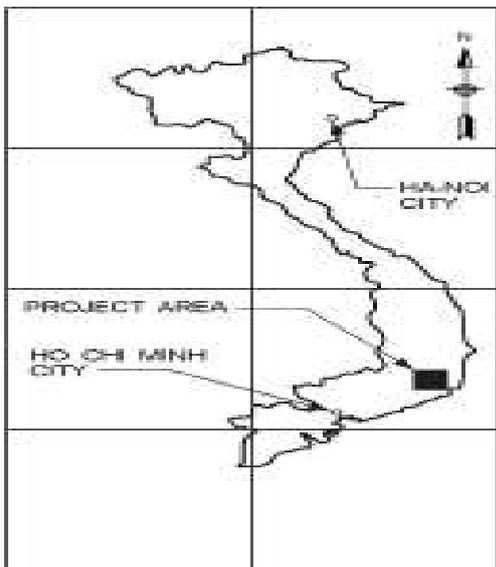
5.10 Overall

The information in background, body sections and the comparison table (attached to the end of the report) are consistent. Data tables, graphs and photos clearly support the argument. Further editing in terms of notation, grammar and layout could have improved the quality of the report more.

6. Attachment

Primary Evaluation Report on Dai Ninh Hydropower Project (1)(2)(3)

1. Project Profile



Project Site



Dai Ninh Power house

Dai Ninh Hydropower Project has the capacity of 300MW with the average output annually of 1.2 billion kWh, after more than two years of operation it has been made 2.9 billion kWh.

The project was constructed under fund of the ODA Loan from Japan (75%) and Vietnam Government’s portion (25%).

The Employer of the Project was Electricity of Viet Nam (EVN) who representative by Hydropower Project Management No.6 (HPMB6).

1.1 Background

In Vietnam, demands for electricity have been increasing rapidly along with economic development since the instruction of the “*Doi moi*” Policy in 1986. At the time of the project appraisal power shortages had already become a serious problem in Viet Nam, especially in Southern Vietnam. It was projected that during period till 2005, the power demand would increase by 11.7-14.1% p.a. in the entire country which was a very high rate requiring more installed capacity of power plants..

The installed generation capacity as of 1998 was 5,233MW (2,390MW thermal, 2,834MW hydro and 9MW other) as a whole. To meet the demand mentioned above, a minimum output of 12,357MW in Vietnam was required in 2006.

In 1994, a 500kV transmission line to connect the north and south was commissioned so that power shortage in the South could be alleviated by supply from the north. Nevertheless, it was projected that northern Vietnam would also run short of power in the near future due to rapid economic development. In sum, even with power supply from other areas, the development of large-scale power resources was necessary in the South.

In addition, about 40,000 cultivated hectares in Binh Thuan Province are in danger of becoming desert as a shortage of irrigated water. Hydropower plant located in Lam Dong and Binh Thuan on the one hand can supply additional power to ease the shortage of electricity, on the other hand, to rescue a huge land for agriculture.

1.2 Project Outline

The objective of this project is to meet the increasing power demand in the Southern region of Vietnam. Dai Ninh Hydropower Project (HPP) is power generation and provision of water for irrigation for forest, agriculture development in downstream areas, and at the same time help improvement of environment, ecology creating ideal tourist resorts. What is special here is that after commissioning, water discharged from power generation will be further utilized for Bac Binh Hydropower Plant of 33 MW in capacity, and then water being discharged to Song Luy Reservoir of Phan Ri-Phan Thiet Irrigation Project. It helps reclamation of 40,000 hectares of agricultural land that is under serious water problem and in danger of a desert in North Phan Thiet, Bac Binh District and part of Tuy Phong District, Binh Thuan Province. In addition, support the improvement of living standard of indigenous people in the project site by implementing environmental preservation; the indigenous people development plan (IPDP) and resettlement and rehabilitation action plan (RRAP).

Logical Framework

Goal	Support socio-economic development of Vietnam in general and of Southern region in particular.
Purpose	<ol style="list-style-type: none"> 1. To meet the increasing power demand in the Southern region of Vietnam 2. To enhance irrigation agriculture in Binh Thuan Province 3. To support the improvement of living standard of indigenous people in the project site
Outcomes	<ol style="list-style-type: none"> 1. Increase in power supply to the Southern region 2. Supply irrigation water to Binh Thuan province 3. Better living condition and livelihood of indigenous people in the project site
Outputs	<ol style="list-style-type: none"> 1. Dai Ninh hydropower plant (300MW) 2. Transmission lines (from Dai Ninh HP to Di Linh and Phan Ri substation) 3. Substations (110kV and 550 kV) 4. Consulting services 5. Indigenous People Development Program (IPDP) 6. Development of Resettlement and Rehabilitation Action Plan (RRAP)
Inputs	<ol style="list-style-type: none"> 1. Total cost: 49,270.989 million Yen (JICA loan: 33,171.814 million Yen; Gov't portion: 16,099.175 million Yen)

Outline of Loan Agreement

	L/A 1	L/A 2	L/A 3
Approved Amount/ Disbursed Amount	4,030 million Yen / 2,956 Million Yen	10,000 million Yen / 8,924 Million Yen	19,142 million Yen / 16,691 Million Yen
Exchange of Notes Date/ Loan Agreement Signing Date	03 29, 99 / 03 30, 99	03 30, 01/ 03 30, 01	03 31, 04/ 03 31, 04
Terms and Conditions - Interest rate - Repayment period - Grace period - Procurement	0.75% p.a. 30 years 10 years General Untied	0.75% p.a. 30 years 10 years General Untied	0.75% p.a. 30 years 10 years General Untied
Borrower / Executing Agency	The Government of the Socialist Republic of Vietnam (GOVN)/Electricity of Vietnam (EVN)	GOVN/ EVN	GOVN/EVN
Final Disbursement Date	MM DD, YY 07/18/2006	MM DD, YY 07/18/2006	MM DD, YY 08/11/2010
Main Contractor (Over 1 billion yen)	Kajima-Kumagai-Song Da Joint Venture (KKS), Hazama Corporation, IHI-Sakai Joint Venture, Consortium Toshiba-Sojitz, Consortium Sumitomo-Japan AE Power		
Main Consultant (Over 100 million yen)	JV of SOGREAH Ingenierie & SNC Lavalin International Inc JV of NIPPON KOEI Co, Ltd & EPDC Ltd		
Feasibility Studies, etc.	EVN, feasibility studies, 1994.		
Related Projects	Resettlement and rehabilitation action plan (RRAP) Indigenous People Development Plan (IPDP)		

2. Outline of the Evaluation Study

2.1 External Evaluator

The primary evaluation was solely done by Vietnamese Evaluator, Dai Ninh Hydropower Joint-evaluation Group with suggestions by Japanese secondary evaluator.

The Vietnam-Japan Joint Evaluation Team 2010 consisted of the two Working Groups each of which evaluated different projects. This project was evaluated by the Dai Ninh Hydropower Joint-evaluation Group joined by the following members:

1. Luong Lan Dung, National Power Transmission Corporation (National adviser)
2. Bui Duc Tho, National Economics University (National consultant)
3. Mai The Cuong, National Economics University (National consultant)
4. Banh Thi Bich Ngoc, Hydropower Project Management Board No 6 (core team member)
5. Nguyen Thi Lan Dai, Hydropower Project Management Board No 6 (core team member)
6. Nguyen Thi Hong Thuy, Hydropower Project Management Board No 6 (core team member)
7. Nguyen Hong Hai, Hydropower Project Management Board No 6 (core team member)
8. Nguyen Dinh Vinh, Dai Ninh Hydropower Plant (core team member)
9. Do Phuoc Dung, Ministry of Industry & Trade (core team member)

10. Cao Thanh Phu, Ministry of Planning & Investment (core team member)
11. Pham Minh Hung, Ministry of Planning & Investment (core team member)
12. Nguyen Minh Hai, EVN (core team member)

Management team includes:

1. Le Huu Phuc, Ministry of Industry & Trade
2. Luong Thi An, EVN
3. Luong Van Ket, Ministry of Planning & Investment
4. Cao Manh Cuong, Ministry of Planning & Investment

2.2 Duration of Evaluation Study

Duration of the Study: November 22, 2010 – July 14, 2011

Duration of the Field Study: December 13, 2010 – March 19, 2011

2.3 Constraints during the Evaluation Study

Nether Binh Thuan nor Lam Dong Natural Resource and Environment Department can provide any information on the types and number of wild animals in the project area, the study has no evidence to evaluate this aspect.

3. Results of the Evaluation (Overall Rating: A)

3.1 Relevance (Rating: 3)

3.1.1 Relevance with the Development Plan of Vietnam

A high priority on power sector development is continuously seen in the Socio-Economic Development Plan (SEDP) of both before and after the project. SEDP 1996-2000 (at the appraisal or ex-ante evaluation stage) emphasized adding to and upgrading power resources and networks in the Industrial Development Program and the Infrastructure Development Program. SEDP 2006-2010 (at the ex-post evaluation stage) gives an even higher priority to power sector development. A priority on hydropower development, which can utilize Vietnam's natural resources and save generation costs, is also stressed.

At the lower level of development plan of EVN, the Master Plan IV 1996-2000 Perspective up to 2010 plans to increase generation capacity from 4,435MW to 19,000MW in 1994-2010. Increasing power generation capacity is again mentioned in the current Master Plan VII 2010-2020, which plans to increase generation capacity up to 54,294 MW, and to construct 50 hydropower plants.

3.1.2 Relevance with the Development Needs of Vietnam

In the period of 1996-2000, Vietnam experienced a high GDP growth rate, an average of 7%¹. This fast economic development required a rapid increase in electricity demand with an average 14.4% p.a. consumption growth (countrywide) in 1998-2005, higher than estimated at the time of appraisal -- 11.7-14.1% p.a. consumption growth forecast till 2005. GDP of Vietnam continues to grow at a high rate in the period of 2001-2010, an average of 7.2%. This development leads to a high demand forecast, an average of 13.1% p.a. consumption growth forecast till 2020.

Table 1 shows basic indicators of power demand and supply at the ex-ante and ex-post evaluation stage. High demand for power both before and after the project completion can justify the necessity for the development of power resources in the South.

¹ Calculate from Statistical year books 1997-2009, GSO.

Table 1: Basic power indicators

Indicator	Ex-ante evaluation stage	Ex-post evaluation stage
Power consumption and growth rate		
Vietnam	Average 18.1% p.a. consumption growth in 1995-1997	Average 14.4% p.a. consumption growth in 1998-2005 and an average of 13.5% p.a in the period of 2006-2010.
Southern of Vietnam	Average 18.27% p.a. consumption growth in 1995-1997	Average 14.74% p.a. consumption growth in 1998-2010 and an average of 12.73% p.a in the period of 2006-2010.
Installed generation capacity		
Vietnam	20,854 million kWh (1998)	59,088 million kWh (2010)
Demand forecasts		
Vietnam	11.7-14.1% p.a. consumption growth forecast till 2005	Average of 13.1% p.a. consumption growth forecast till 2020
Southern of Vietnam		Average of 13.97% p.a. consumption growth forecast till 2020

Source: EVN and A2

3.1.3 Relevance with Japan's ODA Policy

The ODA Charter of Japan (1992), which defined the overall aid framework at the time of the appraisal of this project, gave priority to assistance in infrastructure development as a prerequisite to socio-economic development. Based on such framework, the Japan's Country Aid Principles for Vietnam (1994-1999) identified five major priority sectors for the implementation of ODA, namely, (i) human resource development/ institutional building, (ii) rehabilitation/ construction of economic infrastructures in the areas of electricity and transport, (iii) agricultural development, (iv) improvement in social services and education, public health and medicine, and (v) environmental protection. The objectives of this project serve (ii) and (iii) above. Also, the Indigenous People Development Program (IPDP) integrated in this project was to serve (iv) and (v) as well.

This project has been highly relevant with the Vietnam development plan, development needs, as well as Japan's ODA policy; therefore its relevance is high.

3.2 Efficiency (Rating: 2)

3.2.1 Project Outputs

The project output was produced mostly as planned (see "Comparison of Original and Actual Scope" on the last page of this report). This consisted of six main components: (1) Construction of the Dai Ninh Hydropower Plant with two reservoir and dams; (2) Construction of 500kV substation and expansion of 110kV substation; (3) Construction of 220kV and 110kV transmission lines; (4) Consulting services; (5) Development of resettlement sites and Indigenous People Development Program (IPDP); and (6) Development of Resettlement and Rehabilitation Action Plan (RRAP). The summary of the output produced is as follows:

Specification of major project outputs:

- Hydropower plants with 300MW (150MW x 2 units)
- Two reservoirs with total volume of 251 million m³: Da Nhim reservoir with 66 million m³; Da Queyon reservoir with 185 million m³ and a connecting channel.
- Two main dams (earth-fill dams): Da Nhim main dam with height of 56m; Da Queyon main dam with height of 58m.

- Transmission lines: total 90km (44km of 220kV lines and 46km of 110kV lines)
- Substations: New construction of 220/500kV Di Linh Substation (3 x 150MVA) and Extension 110kV Phan Ri Substation 1x16MVA² Scope of transmission lines (T/L) and substations (S/S) of the Project are changed due to the adjustment of electric connecting system by the revised Master Power Plan No.V. The new 500kV Di Linh S/S was replaced with extension 2 S/S (Bao Loc, Long Binh) and 2 x 220kV Transmission lines (Dai Ninh-Bao Loc 70.3km and Bao Loc-Long Binh 136.5km)

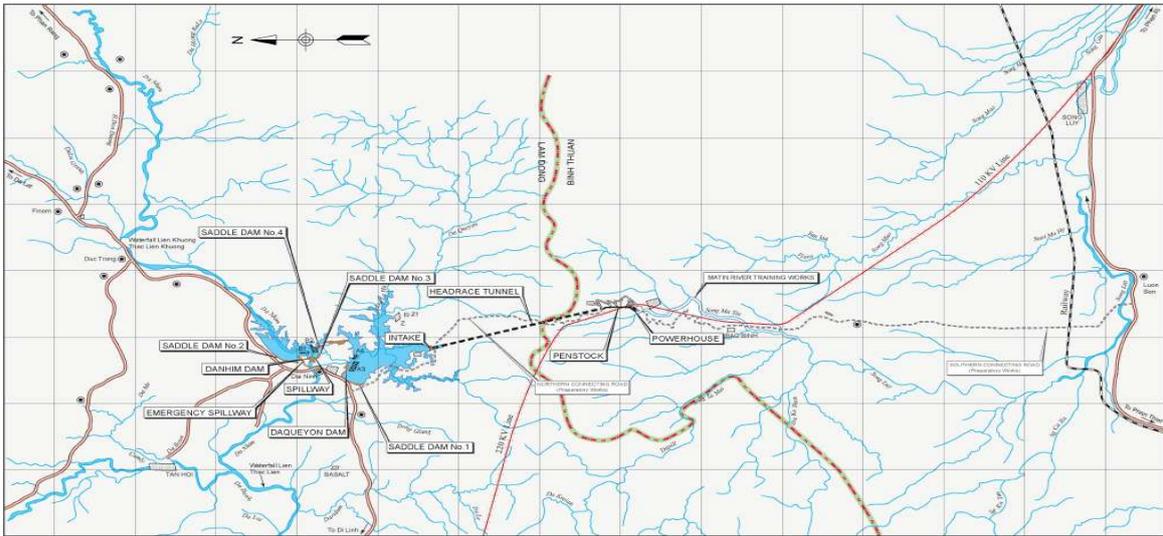


Figure 1: Project general layout



Photo 1: Di Linh Substation



Photo 2: Hydropower plants with 300MW (150MW x 2)

² The 16 MVA transformer installed by the Dai Ninh hydropower project is not in use until April 2011. It is in use after experts from Siemen came and fixed the problem of compatibility between the transformer and the circus breaker in March 2011.

After the completion of the facilities and equipment of the power plants (as of April 2008), there were some minor problems found (i) Over heating and cracking of cap insulators of generators unit 1&2 (The temperature of cap insulator had been increased to 150-160⁰C, so the cover of caps have been cracked). (ii) Loose-spacer; (generator's spacers have been loose when the generators operating) (iii) Turbine shaft Coupling (Coupling bolts of turbine shaft and generator shaft has been designed by the Contractor was not compatible with technical requirements); (iv) The communication system between Spillway, intake and Powerhouse (This system had not been yet made commissioning since completed of installation work due to interface between equipment of Hydro-mechanical Equipment (ME1) and Electrical Equipment (ME2) contractor and one Ultra- high frequency (UHF) radio equipment on belong to ME2 contractor was damaged). The Contractor has carried out the repairing works and the deduction of contract price. Up to now, the above captioned outstanding works have been settled by the relative parties as follows:

(i) and (ii): Overheating and cracking of cap insulators of generators Unit 1&2 and loose-spacers have been repaired by the Operation Unit, Dai Ninh Hydropower Company in occasion of yearly overhaul. The Contractor has been agreed to make the compensation fee for this works. Up to now, the Generators Unit 1&2 have been being in the good condition of operation.

(iii): Turbine shaft coupling: EVN hired an Independence Organization named National Research Institute of Mechanical Engineering (Narime), to evaluate the impact of the turbine shaft coupling problems. The existing design of the turbine shaft coupling is sufficient to ensure for endurance and shaft coupling's straight for long-term operation as Narime's review. Besides, 2 set of bolts (20 bolts) for standby were supplied by the Contractor and the Contract price was deducted for this. Up to the stage of this Ex-post evaluation, the turbine has been being in the smooth operation condition.

(iv): The UHF (Ultra high frequency) equipment was repaired by the Contractor however the installation works for this equipment have been not carried out yet by the Contractor until now. The consulting services were provided mostly as planned. The major tasks were review the detailed designs; assistance in tender and construction supervision. No big problem is reported about the performance of the consultants. The whole actual Man-month (M/M) of the Consultants was 415 M/M for foreigners and 560 M/M for local staff while the planned ones were 336 M/M for foreigners and 554 M/M for local staff.

The IPDP is carried out mostly as planned with 5 development programs namely: Forestry program; Agriculture program; Education Program; Medical program; and Culture program. Detail figures on the output of the IPDP are described in the table "Comparison of the Original and Actual Scope of the Project" at the end of the report.

Development of resettlement sites included 48 houses in Ninh Gia commune, 7 houses in Ta In Commune and 1 house in Phu Hoi commute. Each household has a 400 m² parcel with a 56m² house, a well and a rest-room. The resettlement site is well designed with accessing roads, a public welfare house and a local clinic.

Rehabilitation (Agriculture resettlement) areas at Ninh Gia, Ta In and Phu Hoi communes included 220 hectares of reclaiming area with its 3 pump systems (pumps, operation control houses, tanks (100 and 200m³) and connection pipes) and road in production section.



Photo 3: Resettlement site



Photo 4: Phan Ri substation



Photo 5: Pump for irrigation

3.2.2 Project Inputs

3.2.2.1 Project Period

Using LA1 as the baseline for evaluation, the overall project period was delayed by 39 months (57% of the planned period)³ in which the period of each packages is such as 40months of Consulting service, 13 months of preparatory works, 8 months of Civil works for waterway and powerhouse (CW1) package, 8 months of Civil works for Head-works (CW2) package, 13 months of Hydro-mechanical Equipment (ME1) package, 21 months of Electrical Equipment (ME2) package, 28 months of Supply of Equipment and Material for Transmission Lines (TL1) package, 39 months of Erection for Equipment and Material for Transmission Lines (TL2) package and 28 months of Supply and Erection for Substations and Communication system (TL3) package. The reasons of the delay are as followings:

- The approval procedure and duration by Ministry of Industry (MOI) and relative organizations for results of bidding of consultancy service package, detailed design and additional design, bidding documents and results of negotiation of contracts were long and complicated. As a result these, the subsequence activities for project such as detailed review, additional design, bidding and construction... were shift accordingly.
- Revision of master plan such as adjustment of electric network system due to revision of Power Master Plan V, the scope of works of the project was changed accordingly.

³ Total project period stated in LA 1 was 70 months, from March 1999 to December 2004. The starting date is the signing LA1 date and the completion date is the starting of the operation of the power plant. However, according to LA 3, the completion date is expected in December 2008.

- The planning schedule in the appraisal stage (time of discussion for Loan Agreement) was based on the Basic detail Design such as the planned schedule for packages of civil works was 47 months in the appraisal stage (L/A) but in the actual these schedules were adjusted to 51 months after detailed design reviewed and bidding document issued.
- During the construction stage, the performance of the Contractor such as ME2, TL3 and TL2 Contractor was not good as expected due to weak of ability in technical and organizational.

3.2.2.2 Project cost

The total actual cost of the project was 38,215 million Yen, which was 23,358 million Yen lower than estimated cost of the project (save 38% of the estimated cost). In which, 19,839 million Yen from JICA portion was saved.

Table 2: Project estimated and actual cost

Unit: Japanese Yen

	Total Estimated Project Cost (LA VN XI-1)	Total Actual Project Cost	Balance
Total	61,573 million	38,215 million*	23,358 million
JICA Portion	48,439 million	28,600 million	19,839 million
Gov. Portion	13,134 million	9,615 million	3,519 million

Source: HPMB No.6

Note: (*): This amount included the estimated costs for some remaining issues such as Contractor's claim

Reasons of differences:

- Due to international and local competition bidding helps reducing project costs of some packages such as in the L/A estimated amount for the packages of civil works was 29,552 million JPY and equipments was 12,591 million JPY...but decreased to 17,550 million JPY and 7,378 million JPY, respectively after bidding.
- Fluctuation of exchange rate between JPY and VND in which JPY rate was increased remarkably. While some Contract Prices were calculated by VND so the actual disbursement amounts were lower much than the planned one. The exchange rate in the appraisal stage was 1JPY= 100VND, but in the construction stage was about 1JPY=130VND, that mean the JPY rate increased 30%.
- The cancellation of the first International Competition bidding (IBC) for TL1 package to change to the Local Competition bidding (LBC) and direct appointment and purchase helped to decrease the cost for this package (the first IBC bidding price was 1,123 million JPY but the actual cost was 591 million JPY after this package was divided into 8 small packages and carried out the re-bidding by method of LBC and direct appointment and purchase).

Although the project period extended by 157% as comparison with plan stated in LA1, project cost was saved by 38%, therefore efficiency of the project is fair.

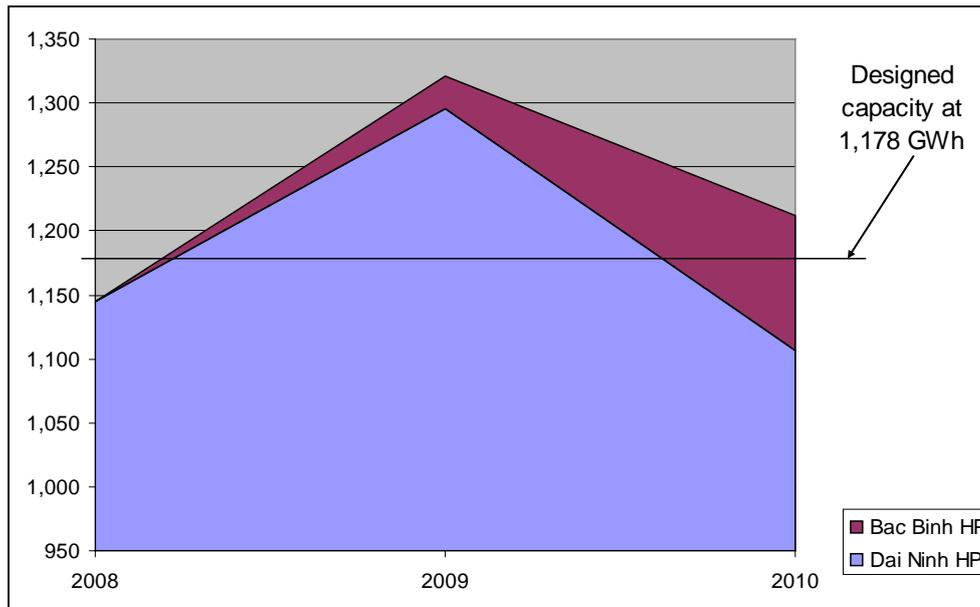
3.3 Effectiveness (Rating: 3)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

+ Increase power supply

Dai Ninh HP achieves its full capacity as planned, 300MW, with two 150 MW generators. After three years of operation, the average annual energy output of Dai Ninh HP is 1,183 GWh/year which is slightly higher than targeted 1,178 GWh/year. The water used at Dai Ninh HP is sent to Bac Binh HP, which EVN constructed on its own resources after this project, for additional power generation (see 3.4 Impact).



Source: Dai Ninh HP

Figure 2: Annual energy output of Dai Ninh and Bac Binh HP as comparison with target

Table 3 shows that even there is a fluctuation of energy output of Dai Ninh HP, the three year average output is higher than targeted. The fluctuation of energy output is mostly due to the amount of rainfall. The two generators of Dai Ninh HP are now in a good condition and expected to work as planned for stable energy output.

Table 3: Target and actual annual energy output of Dai Ninh HP (GWh)

GWh/year	Target annual average as guarantee	Target annual average as design	Actual			Actual average
			2008	2009	2010	
Dai Ninh HP	862.9	1,178	1,145	1,296	1,107	1,183

Source: Dai Ninh report to the questionnaire

+ Enhancing irrigation agriculture in Binh Thuan Province mainly in Bac Binh district

The water used for generation at the Dai Ninh HP was flowed to Bac Binh HP reservoir and then was supplied for irrigation to Binh Thuan province. On average from 2008 to 2010, Dai Ninh supplied 768 million m³/year for irrigation in Binh Thuan which is slightly higher than designed, 766 million m³/year.⁴ According to the report from Bac Binh Division for Agriculture

⁴ As designed, quantity of irrigation water supply = 0.65 m³/kWh * 862.9 GWh.

and Rural Development, using water from Dai Ninh HP, the number of irrigated hectares increased from the baseline of 7,576 ha in 2007 to 9,372 ha in 2010. The number of irrigated hectares may increase more as the district has planned to develop the channel system to utilize the best of the water resources.

Table 4: Water flow from Dai Ninh to Bac Binh and irrigated hectares in Bac Binh district

	2007	2008	2009	2010
Water supplying from Dai Ninh HPP (mil m ³)	0	746,25	830,21	727,25
Irrigated hectares for agriculture (ha)	7,576	8,032	8,733	9,372

Source: Report of Dai Ninh HP and report of Bac Binh Department for Agriculture and Rural Development

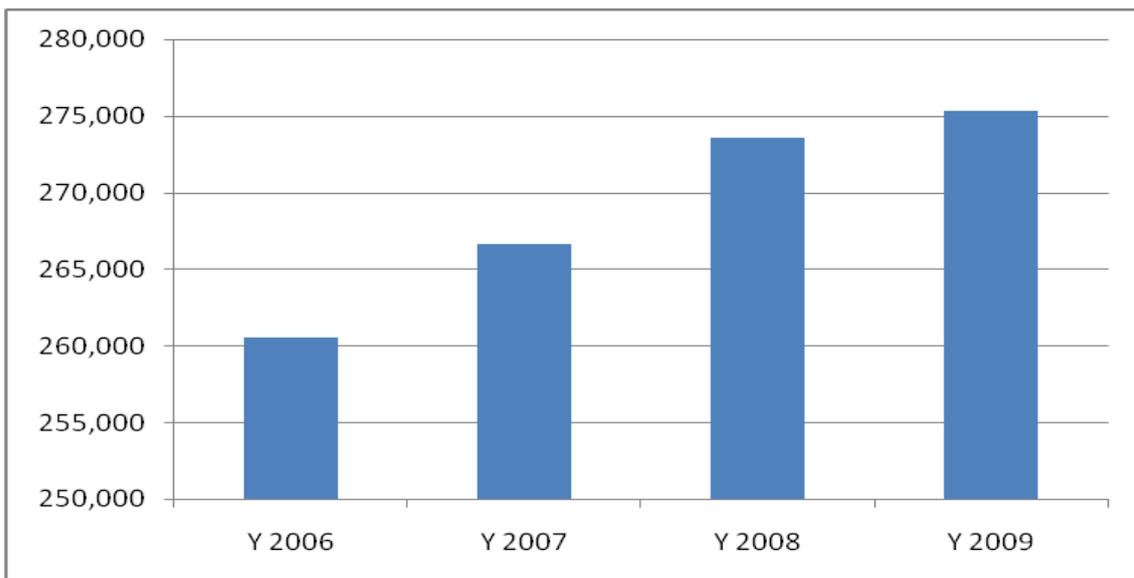
In addition to the amount of water supplying, Dai Ninh HP can help to control the flow of water for not only electric generation but also for irrigation in Binh Thuan. That is the reason why after the project completion, Bac Binh can switch from 1 or 2 crops/year (before the project completion) to 3 crops/year.

The above statistical figures imply that the project has successfully enhance irrigation agriculture in Binh Thuan Province

+ Reclaimed land for agriculture

Using water from Dai Ninh HP, Binh Thuan has been rehabilitated its unused land for agriculture. In Bac Binh district, according to the report of Bac Binh Department for Agriculture and Rural Development, there are 360 ha of rehabilitated land using water from Dai Ninh HP. And according to Binh Thuan Department for Agriculture and Rural Development, they are developing more canals to rehabilitate more land not only for agriculture but also for tourist development. In this aspect, the project achieved its primary purpose and even gets more benefit from the use of water.

Figure 3 shows that the planted area of Binh Thuan has increase sharply right after the project completion in the end of 2007. With a supply of about 768 million m³ water annually to Binh Thuan, Dai Ninh HP project has directly increased rehabilitated land for agriculture in Binh Thuan.



Source: Binh Thuan Year Book 2009.

Figure 3: Planted area of crops in Binh Thuan (ha)

3.3.1.2 Results of Calculations of Internal Rates of Return (IRR)

At the appraisal stage, the financial internal rate of return (FIRR) of the project was calculated at 11.9%. The financial costs consist of construction costs, replacement expenses, and operation and maintenance cost (O&M). Financial benefit is the revenue from the amount of electricity generated and sold. For the ex-post evaluation, FIRR was 10.68% which was re-calculated using the actual figures of cost and benefit. This decrease was mainly because of a lower tariff than estimated at appraisal⁵. Although the recalculated FIRR was lower than the FIRR at appraisal, the project was still effective with FIRR greater than 10%.

Economic analysis was made to compare with the replaced thermal power plant. The costs for replaced unit price of the thermal power plant was to be seen that power benefit of the hydropower plant. The re-calculation for Economic Internal Rate of Return (EIRR) was carried out based on the actual conditions which changed such as the increase of investment rate for the thermal power. The result of calculation for actual EIRR is 17.89% while the designed EIRR is 16.15%. In addition, there were other visible benefits such as the road system, especially the benefit from irrigation water for agriculture and forestry which was not included in the above actual calculated figures of EIRR.

3.3.2 Qualitative Effects

+ Improve living standard of indigenous people in the project site

The livelihood of the indigenous people is better as they can participate in the afforestation and forestry protection to get permanent income. They are also guided techniques on breeding chicken, planting rice so that they can get extra income from farming. According to the survey of 75 indigenous people affected by the project, 81% of them believe that they have better livelihood than before the project. In addition, according to Duc Trong People Committee's comments, the IPDP with five programs of forestry, agriculture, health, culture and education brought many positive factors such as better fertilizer, better breeding animal and plant, better varieties and better farming tools helped indigenous people to have better livelihood. And if they have enough irrigation water in the dry season, the indigenous people even can have better income. In addition,, the program of health, culture and education created the better conditions to support the indigenous people in health, culture and condition to improve education.

The result of the survey shows that the indigenous people have better infrastructures, better access to public service, including school, hospital, and market. Before the project, they had a bigger land but a very poor house, often made of low quality wood. They now have much better house with a suitable private toilet and a well for clean water. At the time of site observation, in the middle of dry season, the well has enough clean water for their daily life.

In general, 83% of the indigenous people participating in the survey are satisfied with the IPDP and 71% of them satisfied with the Dai Ninh Hydropower Project. Because of the project they have better living condition.

⁵ At the appraisal stage, tariff was assumed to be 7 cent/kWh in 2005 and expected to be 7.9 cent/kWh in 2010. However, the actual tariff was 6.0 cent/kWh in 2010. If the selling price estimated at the appraisal stage were applied, the re-calculated FIRR would have been 14.6%. It cannot be said that the appraisal overestimated the selling price because other similar studies also apply similar rates (around 7 cent/kWh). Electricity prices are under control of the government.

At the appraisal stage, the distribution loss was assumed at 19%, but the actual distribution loss was reduced sharply to 8.5% in 2010. If the distribution loss at 19% was applied, the FIRR would be 10.19%.

Another factor affected the actual FIRR is the financial project cost. It was planned at 396.54 million USD but the actual cost was 321.48 million USD.

Although the recalculated FIRR was lower than the FIRR at appraisal, the project was still effective with FIRR greater than 10%

Box 1: Beneficiary survey

(75 indigenous people representative of their households participate in the survey)

1. Date and place of survey: 18 April, Ninh Gia, Phu Hoi and Tahine commute
2. Objective of the survey: to collect information on the living standard of the indigenous people
3. Survey method: the survey is conducted in two stages
 - 1) A focus group of 13 indigenous to explore the major impacts of the project to the life
 - 2) Base on the findings from the focus group interview, a more detailed questionnaire is designed for a larger survey of 75 indigenous from Ninh Gia, Phu Hoi and Tahine.
4. Result of the survey:
 - 1) How is the current situation in comparison with the situation before the project?

How is the current situation in comparison with the situation before the project?	Totally agree	Agree	No ideal	Disagree	Totally disagree
Have a better house	24.0%	61.3%	8.0%	4.0%	2.7%
Have better infrastructure	69.3%	14.7%	16.0%	0.0%	0.0%
Lack of water for irrigation in dry season	57.3%	8.0%	20.0%	9.3%	5.3%
Lack of clean water for daily life	8.0%	6.7%	12.0%	45.3%	28.0%
Difficult to divide the resettlement parcel for married sons/daughter	61.3%	21.3%	9.3%	8.0%	0.0%
Better access to public service (school, hospital, market)	52.0%	36.0%	5.3%	6.7%	0.0%
Better community activities	88.0%	12.0%	0.0%	0.0%	0.0%
Better livelihood	64.0%	17.3%	16.0%	2.7%	0.0%

- 2) How do you satisfied with the IPDP?

Very satisfied	37 (49.3%)
Satisfied	25 (33.3%)
No ideal	5 (6.7%)
Dissatisfied	6 (8.0%)
Very dissatisfied	2 (2.7%)
- 3) How do you satisfied with the Dai Ninh Hydropower Project?

Very satisfied	27 (36.0%)
Satisfied	26 (34.7%)
No ideal	19 (25.3%)
Dissatisfied	2 (2.7%)
Very dissatisfied	1 (1.3%)

The above analysis shows evidence for the improvement in living standard of indigenous people in the project site

One small issue with effectiveness is the use of the pump system for rehabilitation. The pump systems have never been in used for irrigation with two main reasons: 1) No budget for operation and maintenance of the pump systems 2) The design of the pump system was not convenient for farmers uses. In the last part of the report, recommendations are drawn to best utilize this output of the project.



Photo 6: Getting clean water from the well at resettlement site

This project has largely achieved its objectives; therefore its effectiveness is high.

3.4 Impact (Rating: 3)

3.4.1 Impact on economic development

Table 5: GDP growth rate of Vietnam and Binh Thuan, Lam Dong province

GDP growth rate (%)	2005	2006	2007	2008	2009	2010
Binh Thuan	13.40	13.90	12.10	16.20	10.07	11.95
Lam Dong	20.78	18.17	14.35	13.89	12.88	13.3
Vietnam	8.44	8.23	8.46	6.31	5.32	6.78

As described in the table 5 above, GDP of Vietnam and the Southern region of Vietnam have experienced high growth rates. This rapid economic development required a higher energy supply and Dai Ninh HP is considered as a motivated factor to the economic development. Although the project contributes a very small portion directly to GDP of Vietnam, its indirect contribution is high. Electricity is an irreplaceable input for other industries' operation. As a result of the project, electricity supply is increased by 1,226 GWh/year. This increase supports the development of other industries, and indirectly contributes to GDP growth rate of Southern region and of Vietnam. In addition, the project has a strong positive impact on agriculture production of Binh Thuan (ref. + Impact on agriculture development of Binh Thuan and Lam Dong). This is also an indirect contribution to GDP growth of Binh Thuan and Vietnam.

According to people committee of Lam Dong and Binh Thuan, the project can be seen as a key factor supporting the economic development of Lam Dong and Binh Thuan, as well as GDP of Vietnam. The project supported and pushed the process of industrialization and modernization of the two provinces.

3.4.2 Impact on power supply in Vietnam

With the average annual output of 1,226 GWh, the project has contributed to narrow down the gap between demand and supply of electricity of Vietnam. Table 6 shows that the demand site increases sharply, as a result the gap is widened. Thanks to the operation of the Dai Ninh HPP, the electricity demand and supply gap was narrow down by 5% in 2008. In addition to the energy output of Dai Ninh HP, Bac Binh HP⁶ with the capacity of 33MW started to supply

⁶ Bac Binh HP is the HP which utilizes the water from Dai Ninh HP. Without Dai Ninh HP, there is no reservoir for Bac Binh HP.

electricity in 2009. It supplied an addition of 104.7 GWh in 2010.

From this finding, it can be said that the project has contributed toward a more stable power supply in Vietnam.

Table 6: Gaps between demand and supply before and after project (million kWh)

	2005	2006	2007	2008	2009	2010
Vietnam demand	51,769	59,014	66,773	74,226	84,756	97,349
Vietnam supply	41,186	46,465	50,001	53,093	57,002	59,088
Vietnam supply without Dai Ninh HPP	41,186	46,465	50,001	51,943	55,702	57,978
Gap without Dai Ninh HPP	10,583	12,549	16,772	21,133	27,754	38,261
Annual power generation by Dai Ninh HPP				1,150	1,300	1,110
Gap with Dai Ninh HPP	10,583	12,549	16,772	19,983	26,454	37,151

3.4.3 Impact on agriculture development of Binh Thuan

As a result of providing more and controlable irrigation water to Binh Thuan, especially to Bac Binh district, Bac Binh paddy production has increase sharply since the operation of Dai Ninh HPP. Table 7 shows that Bac Binh paddy production increase at a very high rate of 31.5% in 2008, the year Dai Ninh HPP started is operation.

Table 7: Bac Binh Paddy production (ton)

Year	2005	2006	2007	2008	2009
Paddy	57,896	59,111	70,934	93,267	113,576
Growth rate	-	2.1%	20%	31.5%	21.8%

Source: Binh Thuan Year Book 2009

With irrigation water, not only paddy but also other agriculture products were benefited. Although there was no quantitative evidence on the impact of the project to agriculture products of Binh Thuan, according to the interviews with Bac Binh people committee and Binh Thuan people committee, they all agree that the project has pushed up the growth of agriculture in the province. Table 8 showing a constant growth in gross output of agriculture in Binh Thuan.

Table 8: Gross output of agriculture in Binh Thuan

	2005	2006	2007	2008	2009
Gross output of agriculture at constant 1994 prices					
Binh Thuan	2,015,369	2,007,199	2,222,686	2,367,801	2,460,381

Unit: Mil. VND

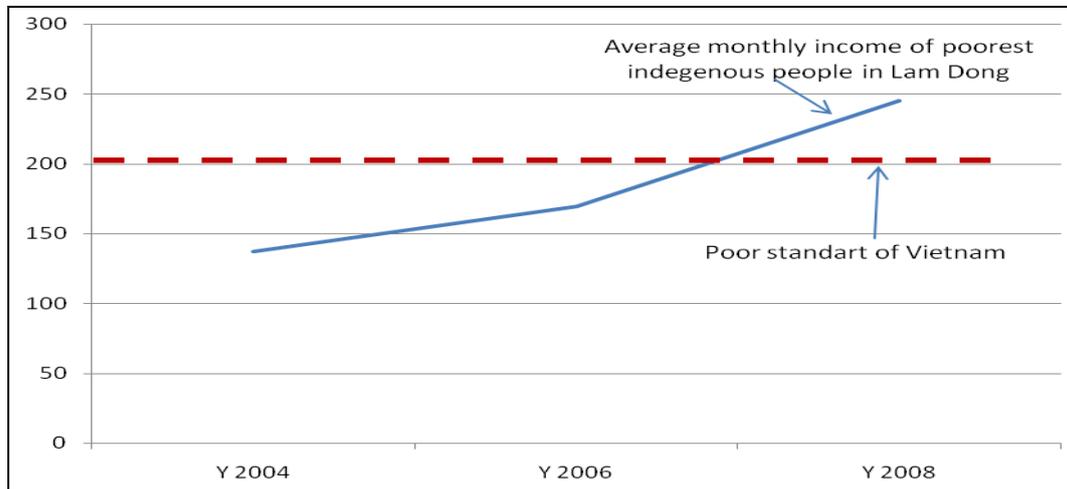
Source: Lam Dong and Binh Thuan Year Book 2009

Besides, the discharge water of Dai Ninh Hydropower Plant will be supplied to:

- (1) The Bac Binh Hydropower Project has the design capacity of 33MW and annual power generation of 114 million kWh/year. Bac Binh HP has completed in 2009.
- (2) The Phan Ri-Phan Thiet Irrigation Project which has been under construction and it is expected to be completed in 2012. This irrigation project funded by Japan ODA serves approximately 15,000 ha of farm in Binh Thuan province.

3.4.4 Impact on living standard of the indigenous people

In order to improve the living standard of the indigenous people in the project site, the project included IPDP and RRAP. According to the report of Lam Dong People Committee, and the report of Hydropower Project Management Board No.6 on compensation and resettlement works, the program attracted almost all the eligibilities, 96,1% indigenous people participate in the program in 2003.



Source: Lam Dong year book 2009

Figure 4: Average monthly income of the poorest (most are indigenous people) in Lam Dong

Figure 4 shows that the average monthly income of most indigenous people in Lam Dong has increased since the implementation of the IPDP in Lam Dong. As a result, their monthly income was higher than national poor standard in 2007.

3.4.5 Environmental Impact

The environmental impact assessment (EIA) for this project was approved by GOV in Dec. 30 1998. According to EIA, the project site was not located in the protected area and no endangered species existed in the area. During construction, the Vietnam Institute for Tropical Technology and Environmental Protection (VIPTEP) who performed monitoring water quality, air quality, noise level and vibration level once a month. After the hand-over, Dai Ninh Hydropower Company performed monitoring water, air, noise and vibration once a year. According to those monitoring results and interviews with the provincial governments and Dai Ninh Hydropower Company, no environmental problem is seen.

Accident Prevention Measures:

- As provided in the contracts, there will be safety team, the member of which is from Employer, Consultant and Contractors. This team shall do frequent safety patrol at project construction sites.
- A few days before flood discharging is to be operated, the notification in writing shall be informed to local inhabitants living in and vicinity. Before flood discharging, the warning shall be made directly by site in 3 times.

3.4.6 Improvement of Transportation (Impact of Road Construction)

- The infrastructures built for the construction of the project such as roads, bridges contribute much to the development of local area. Ninh Gia, a commune in Duc Trong district, used to be a poor commune but now it develops very fast and the district has a plan to build Ninh Gia as a city within the district. The Luy river bridge and the accessing road (70 km) have reduced traveling time between Lam Dong and Binh Thuan. It becomes a key road connecting Lam Dong and Binh Thuan.



Photo 7: Luy river bridge

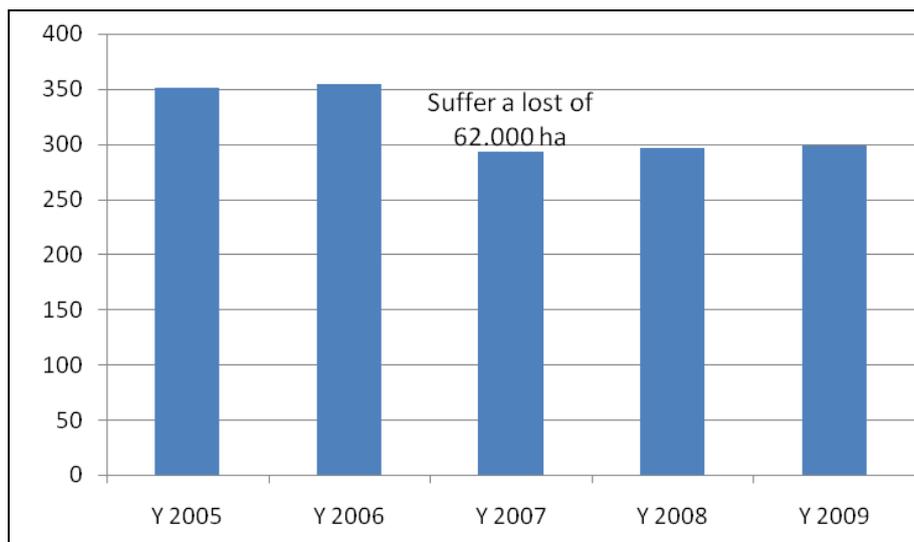
- Before the project, local residents had to cross the river by boat, and no car can run on the road. Luy river bridge belong Binh Thuan Province has been constructed by the project.

3.4.7 Land Acquisition and Resettlement Rehabilitation Action Plan (RRAP)

Positive impacts, as discussed in 3.3.2, the indigenous people are better due to the project with five programs of forestry, agriculture, health, culture and education . The major positive impacts are: better living standard, better house and infrastructure, easy access to public service and clean water. Although compensation was provided in accordance with the agreed resettlement plan but the resettlement people complaint about the negative impacts which are lack of water for irrigation in dry season ($0,7m^3/s$) and smaller parcel for their children ($40m^2$ house built in $400m^2$ land)

3.4.8 Unintended negative impact

After the construction of dams had been completed and impounding of reservoirs commenced, the flow regime has been changed considerably. To protect the eco-system and agricultural production of the downstream, the project designed to keep the minimum flow to downstream to be $0.7m^3/s$. However, the Dai Ninh HP Company has discharged of $0.7m^3/s$ to downstream only in the daytime and stop discharging in the night time. As a result, the volume of discharging water is not always sufficient especially in the night time of dry season. It might possible cause the reduction of agricultural production in some area such as Duc Trong and the water shortage of Pongour waterfall.



Source: Binh Thuan year book 2009

Figure 5: Area of forest in Binh Thuan (1.000 ha)

According to Binh Thuan people committee, it was allowed to deforest 400 ha forest to construct Dai Ninh HPP and related facilities. Binh Thuan has its own afforestation program to recover the area of forest loss by the Project. However, the figure 5 shows a huge loss of forest in 2006-2007 in Binh Thuan and it was not recovered yet. This huge loss of forest is not due to the Dai Ninh HPP but insufficient implementation of afforestation program and forest protection programs in Binh Thuan. This large-scale deforestation can be considered as one of the reason that caused flood in Binh Thuan in 2009 and 2010 which caused the agricultural and human damages in the area.

According to Bac Binh People committee, when it was flooding, Dai Ninh HPP kept to operate at its full capacity which discharged $55\text{m}^3/\text{s}$ to Bac Binh. This full capacity operation might make the flood in Bac Binh being more harmful. In 2010, Bac Binh people committee had more experience in preventing flood and the damages reduced.

3.5 Sustainability (Rating: 3)

3.5.1 Structural Aspects of Operation and Maintenance

The operation and maintenance of the hydropower plant including reservoir and dams is under responsible of Dai Ninh HP. Dai Ninh HP is a member company of EVN. Its financial and personnel management are depend on the management of EVN. Dai Ninh HP has 6 departments which cover all the activities of the plant. The department of operation has 5 generator operation teams and one dam operation team. These team are well organized to operate the plant 24 hours/day and 365 days/year. In addition, EVN may support personnel and financial if the plant has any problem in operation. Figure 6 shows the organization chart of Dai Ninh HP. In the aspect of structure, it is highly sustainable.

3.5.2 Technical Aspects of Operation and Maintenance

Dai Ninh HP has 116 well trained staff and it is enough for operation and maintenance.

All the equipment has its owned manual and it is operated and maintained as stated in the manual. Although there were some technical problems with the two generators and other facilities, all the problems have been solved. During the process of repairing and maintaining The equipments and facilities of the contractors, Dai Ninh HP technical staff learnt the know-how and technique. Now they can repair the equipment and facilities by themselves.

For example, they learnt the technique to joint cracks on.

Dams in 2008. In 2009, a crack appeared in a dam and they have successfully applied the similar technique to fill in the crack.

Di Linh substation also has enough qualified staff for O&M. Its current 23 staff is well trained and can operate effectively the substation 24 hours/day. The O&M manual is well established and used.



Photo 8: Spare part is under maintenance

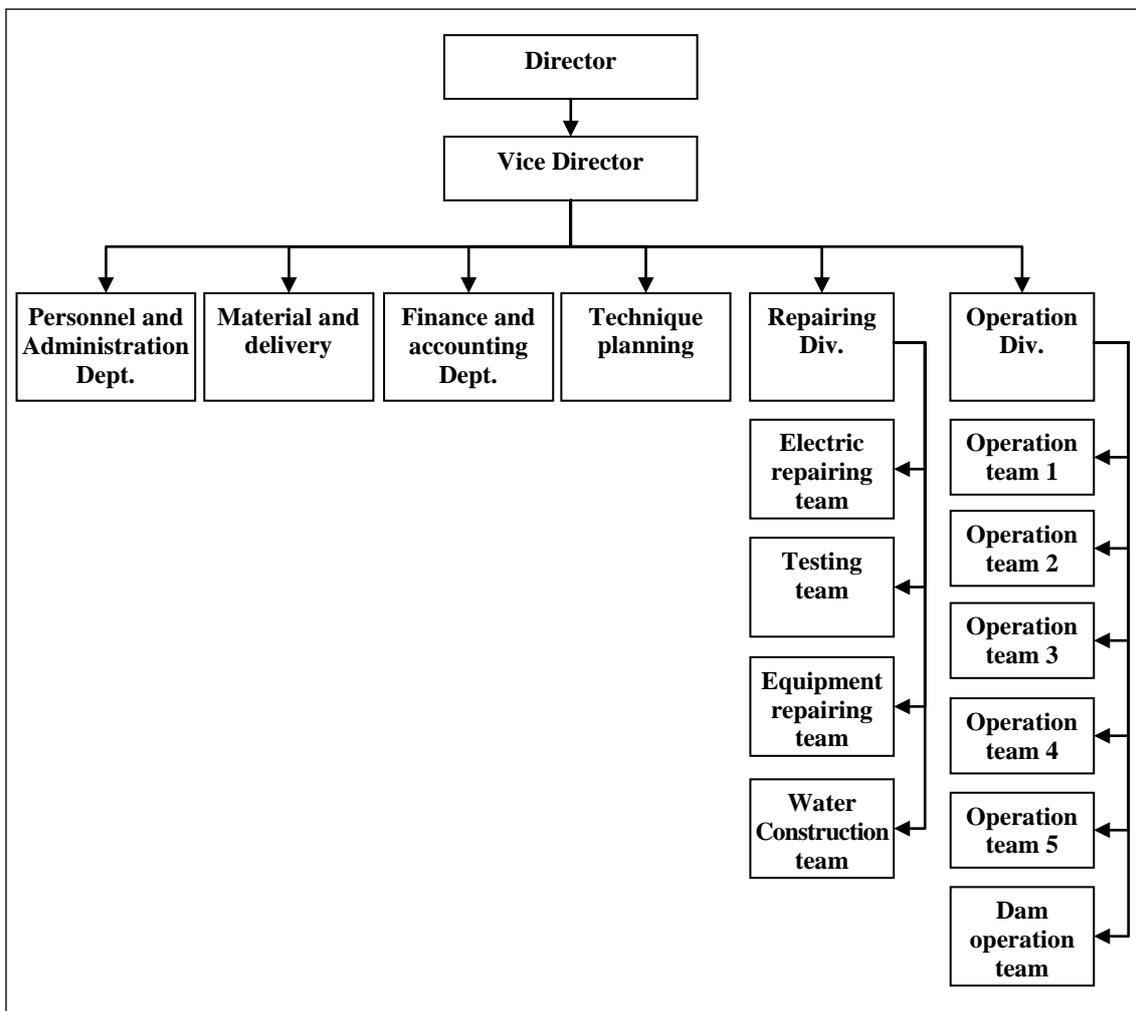


Figure 6: Organization chart of Dai Ninh HP

3.5.3 Financial Aspects of Operation and Maintenance

Dai Ninh HPP yielding a positive profit since operation. Table 9 shows that revenues of Dai Ninh HPP can cover all expenses including O&M cost. It gained 18,516 million. VND profit in 2009 and 136,841 million VND profit in 2010. This earning means that the project has a sustainable financial aspect.

Table 9: Main items in income statement for financial year 2009-2010 of Dai Ninh

Items	Unit: mil. VND	
	2009	2010
Total revenues	331,639	1,175,157
Total cost of good sold	306,952	992,703
Net profit from operation	24,687	182,455
Gross profit before tax	24,687	182,455
Profit after tax	18,516	136,841

Source: Dai Ninh income statement for financial year 2009-2010, provided by EVN

3.5.4 Current Status of Operation and Maintenance

As a result of the site observation and report of Dai Ninh HP, Phan Ri and Di Linh substation, all the equipments are in good condition. They have enough qualified staff for operation and maintenance. All the equipments, facilities are maintained regularly in accordance with the O&M manual. The plant, the dams and substations are operating properly.

3.5.5 Current status of using the houses and agriculture land of settlement

Infrastructures of the houses in resettlement site are in good condition. The access road to the existed houses in resettlement site is much better than the access road to their houses which they had before the project. The agriculture resettlement areas at Ninh Gia, Ta In and Phu Hoi communes of Lam Dong Provinces were handed over to the affected households and now it has been used mainly to plant the coffee trees.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Completion of all project components

* The relative parties such as Dai Ninh HPP Company, the Contractor and HPMB No.6 should continue measures to solve the problems of the communication system between Spillway, intake and Powerhouse as captioned in the Item 3.2.1 above.

* The local authorities of Lam Dong Province should check and solve problem of the pump systems at rehabilitation sites in Ninh Gia, Ta In and Phu Hoi communes seeking advice from HPMB6 as mentioned above.

4.2.2 Improvement of the operation system

* It was found that in the dry season, downstream of dam lacked of irrigation water. Therefore, it is recommended that the Dai Ninh HP should strictly commit to discharge 0.7m³/s or higher in full time basis (24 hours/day) to the downstream. In addition, Duc Trong People committee need to built a reservoir at downstream of the dam to save water for irrigation.

- * When it is flooding in Binh Thuan at warning level 2 or above, Dai Ninh HP should report to National Load Dispart Center (NLDC-A0) to ask for lower operation capacity.
- * Binh Thuan People committee should invest more on afforestation program and forest protection program to recover the forest to prevent flood.

4.3 Lessons Learned

4.3.1 Project preparation

a) Land acquisition, compensation and resettlement

- In this project, the land acquisition, compensation, resettlement stage 1 except reservoir, T/L & 500kV Di Linh S/S completed in April 2003 before requesting JICA concurrence and commencement of construction of the contract of civil works. Due to this convenience, the lots of civil works had been implemented smoothly and had no claim which relative with land acquisition occurred. Future project could follow this good practice as a means to improve effectiveness and impact.
- Land acquisition and compensation carried out well due to support of local authority and related agencies. The following considerations that the project took could be good practices for future projects:
 - Encourage people to understand government policies on hydropower construction;
 - Create all the favorable conditions in land acquisition as follows:
 - + A Land acquisition and compensation Council was established at the affected Districts in Project site for managing the land acquisition and compensation process.
 - + A task force was established to handle the forest tree issue to acquire land in a timely manner for construction.
 - + The compensation and support scheme was quickly appraised and approved to speed-up the disbursement to the local people.
 - + All the obstacles had been solved in a timely manner by the local authorities.
 - Maintenance of a regular good relationship with the province, district and commune People Committees, in a spirit of cooperation and collaboration to fulfill the tasks.
 - All the obstacles should be discussed and solved with mutual understanding and concerns based upon the government's policies and regulations.

b) In this project, indigenous people got a sustainable support to compensate for their change of life due to the project. As a result, the project gets much consensus from both local government and residents. Therefore, similar projects on hydropower plant should support indigenous or affected people in a sustainable way—not only compensate them by other land, resettlement site, money but also support them in education, health care, culture... so that they can get on well with the changing life.

c) The design and construction works for rehabilitation areas with its facilities such as pumps systems, tanks and control houses should taken in account with respect of the habit of doing in agriculture production and the convenience in use of the affected local residents and farmers, so that the effectiveness for the rehabilitation areas could be improved more.

4.3.2 Implementation

With the participation of operation agencies in the soon construction stage (i.e. as a

member of the interim operation management board), experience was enriched for O&M. Future Projects could follow this good practice as a means to improve sustainability.

4.3.3 Operation and maintenance

In the early operation stage, there often occur technical problems, so the coordination between the Employer (including Management Unit and Operation Unit) and the Contractor should be closely to solve the problem better. It is necessary to present the Contractor's engineers in the early operation stage at the site even the installation works were completed in order to have a smooth operation and commissioning.

Comparison of the Original and Actual Scope of the Project

Items	Unit	Plan (I/A dated March 30, 1999)	Actual
1. Outputs			
(1) CIVIL WORKS			
<u>a) Waterways</u>			
Inlet Canal Length	m	1600	1789
Headrace Tunnel Length	m	10 795	11 258
Surge Tank Height	m	129.45	<u>130</u>
Powerhouse		Surface	Surface
Tailrace Gallery Length	m	682	<u>715</u>
Tailrace Canal Length	m	247.5	<u>184</u>
River Training Length *	m	-	<u>9800 *</u>
<u>b) Head works</u>			
Connecting Canal Length	m	2550	<u>2530</u>
Da Nhim Dam			
Type		Earth fill	Earth fill
Crest Length	m	415	<u>420</u>
Height	m	56	56
Da Queyon Dam			
Type		Earth fill	Earth fill
Crest Length	m	1725	<u>1688</u>
Height	m	58	58
Spillway			
Gated	unit	3	3
Height	m	18	18.5
Width	m	15	15
Emergency Spillway			
Type		Fuse dykes	Fuse dykes
Crest Length	m	82.8	82.8
Bottom Width	m	17	32
Height	m	12.7	12.7
Saddle Dam No.1			
Type		Earth fill	Earth fill
Crest Length	m	1200	<u>1217</u>
Height	m	19.3	22
Saddle Dam No.2			
Type		Earth fill	Earth fill
Crest Length	m	2090	2096
Height	m	15	17
Saddle Dam No.3			
Type		Earth fill	Earth fill
Crest Length	m	520	<u>517</u>
Height	m	30	31
Saddle Dam No.4			
Type		Earth fill	Earth fill
Crest Length	m	185	<u>186</u>
Height	m	32	<u>35</u>

Items	Unit	Plan (L/A dated March 30, 1999)	Actual
(2) EQUIPMENT			
<u>a) Hydro mechanical Equipment</u>			
Penstock			
Diameter	m	3.2	3.2
Length	m	1787	<u>1820</u>
<u>b) Electromechanical Equipment</u>			
Turbine Type		Pelton 6 Nozzles x 2	Pelton 6 Nozzles x 2
Generator	MW	150 x 2	150 x 2
Main Transformer			13.8/242kV, 180MVA
Transformer Switchyard Equipment			
(3) TRANSMISSION LINES AND SUBSTATIONS			
<u>a) 220kV Transmission Lines:</u>			
Construction of	km	Dai Ninh Powerhouse-Dai Ninh Switchyard, 2xACSR330, 2xS/C 1.2km	Dai Ninh Powerhouse-Dai Ninh Switchyard, 1cct x ACSR330, 0.6km x 2 routes
Construction of	km	Dai Ninh Switchyard - Bao Loc Substation, D/C 2xACSR330, 70.3km	Dai Ninh Switchyard - 220kV Di Linh S/S, 1x ACSR330, 40.8km
Construction of	km	Bao Loc Substation - Long Binh Substation, S/C 2xACSR330, 136.5km	Connection section for existing line (220kV Da Nhim S/S - Bao Loc S/S) 2cct x ACSR 410, 2.1km
<u>b) 220kV Substation</u>			
Extension		Bao Loc Substation 220kV feeder bay 3cct	
Extension		Long Binh Substation 220kV feeder bay 1cct	
<u>c) 110kV Transmission Line</u>			
Construction of	km	Dai Ninh Switchyard - Phan Ri Substation S/C 1xACSR185, 12.2km	Dai Ninh Switchyard - Phan Ri Substation S/C 1xACSR185, 46km
<u>d) 110kV Substation</u>			
Extension		Phan Ri S/S	
		110kV feeder bay, 1cct	110kV feeder bay, 1cct
		110kV transformer bay, 1 cct	110kV transformer bay, 1 cct
		Transformer 110/22kV 3 phase x 1 x 16 MVA	Transformer 110/22kV 3 phase x 1 x 16 MVA
		22kV feeder bay, 4cct	22kV feeder bay, 4cct
<u>e) 500kV Substation (New construction)</u>			<u>500kV Di Linh Substation</u>
Main Transformer 500/220/22kV			1phase x 3 x 150/150/50MVA x 1 banks
Outdoor type bus - bar			Double bus-bar system with transfer bus-bar
500kV			(i) 2 bays for line to Pleiku S/S and Tan Dinh S/S. (ii) 1 bay for 500/220kV Main Transformer
220kV			(i) 2 bays for line to Dai Ninh HPP

Items	Unit	Plan (L/A dated March 30, 1999)	Actual
			(ii) 2 bay for line from Da Nhim HPP and Bao Loc S/S. (iii) 1 bay for 500/220 kV main transformer. (iv) 1 bay for the connecting breaker.
<u>f) Communication System:</u>			
		PLC equipment and the related facilities	PLC equipment and the related facilities
(4) CONSULTING SERVICE			Review of Detail Design, RRAP, IPDP and Tender Documents
			Review of Feasibility Study for Transmission Line and Substation, preparation of Detail Design and Tender Documents
			Additional design
			Additional design was prepared on basis of the review of Detail Design and Tender Document
			Revision of design and Bidding document for Transmission Lines
			Support for procurement
(5) INDIGENOUS PEOPLE DEVELOPMENT PROGRAMS (IPDP): IPDP have had 5 programs:		Implementation of IPDP follows the updated schedule and contents in closed collaboration with the relative Local Compensation Councils and authorities	Contract supervision 1. Forestry program: - Afforesting program: 1983ha - Protecting Forests: 28560ha 2. Agriculture program: - Experiment of Chinese high quality Khang Dan 18 rice: 440kgs - Experiment of Chinese chicken of Luong Phuong: 900 chickens - New Corn planting: 84kgs - Sind Cow : 52 3. Education Program: - Awards: 2370 students - Scholarships: 1890 students - Training for the Ethnic Minority teachers: 165 teachers - King Teachers study K'ho language: 153 teachers 4. Medical program: Provide the protein medicine free for: - Malnourished children: 1406 children - For Pregnant and lactation women: 1729 women 5. Culture program: Build up - 2 Cultural centers at the 2 communes of Ninh gia and Tahine - 3 traditional houses at 3 schools at the 3 communes of

Items	Unit	Plan (L/A dated March 30, 1999)	Actual
			Ninh Gia, Tahine and Phu Hoi.
(6) DEVELOPMENT OF RESETTLEMENT AND REHABILITATION ACTION PLAN		The number of PAHs, crops and areas affected by the Project must be re-counted by the Local compensation Councils before land acquisition and compensation implementation	- Resettlement: 255 households (HHs), including to 139HHs received money, 57HHs resettlement, 67HHs land to built. - Rehabilitation: 220hectares
2. Project Period		March 1999 – December 2004 (69 months)	March 1999 – April 2008 (109 months)
3. Project Cost			
Amount paid in Foreign currency		40,126 million yen	28,600 million yen
Amount paid in Local currency		2,144,663 million dong (equivalent 21,447 million yen)	1,250,000 million dong (9,615 million yen)
Total		61,573 million yen	38,215 million yen
Japanese ODA loan portion		48,439 million yen	28,600 million yen
Exchange rate		dong 1= yen 0.01 (October, 1998)	Dong 1 = yen 0.013 (Average between 1999 and 2008)

Note: (*) The scope of work for Matin River Training changed much due to additional design.