

# Ex post evaluation – Vietnam

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**Sector:** Energy generation, renewable sources – multiple technologies (CRS code: 23210)

**Project:** Grid Connection for Lai Chau Hydropower Plant (BMZ No. 2013 663 92)\*

**Implementing agency:** National Power Transmission Company (NPT)



## Ex post evaluation report: 2020

		Project (Planned)	Project (Actual)
Investment costs (total)	EUR million	118.3	115.7
Counterpart contribution	EUR million	20	33
Funding	EUR million	98.3	82.7

\*) Random sample 2018

**Summary:** The project provides financing to grid-connect the Lai Chau hydropower plant on the Black River (Song Da) in northern Vietnam. To this end, a roughly 160km-long, 500 kV high-voltage transmission line was built from Lai Chau to Son La, and the switchboard plant in Son La was expanded accordingly. As a result, the Lai Chau hydropower plant, still under construction at the time, was connected to the Vietnamese interconnected grid in order to supply high-demand centres predominantly located in northern and central Vietnam. The FC financing was not used to fund the construction of the Lai Chau hydropower plant, although this is nonetheless considered a related project – especially in terms of environmental and social factors.

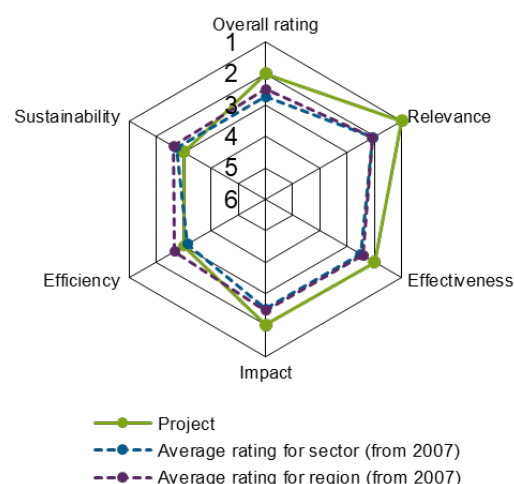
**Development objectives:** The objective at outcome level was to contribute to ensuring that Vietnam's growing demand for electricity was met in an environmentally friendly, socially affordable and cost-effective manner. The objective at impact level was for both consumers and the environment to benefit from environmentally, ecologically and socially responsible energy supply and consumption in Vietnam. In addition, the project aimed to strengthen the capacities of state and non-state actors in the energy sector to implement the goals and specifications of the Green Growth Strategy and the Power Development Plan (PDP).

**Target group:** The project's target group consisted of all end-use consumers in northern Vietnam, who were intended to benefit from having a reliable and affordable electricity supply. The complementary measure's target group was the households that had to be relocated for the construction of the hydropower plant and the transmission line.

## Overall rating: 2

**Rationale:** The high-voltage line from the Lai Chau hydropower plant to the Son La substation connected the plant to the Vietnamese interconnected grid. As a result, the hydropower plant became an associated project for German FC. All the project indicators were surpassed; however, the complementary measure was delayed in order to relocate the households affected. The sustainability of the resettlement is still ensured despite the shortcomings of the complementary measure..

**Highlights:** The evaluation paid particularly close attention to the complementary measure, which involved relocating the households affected, due to the potentially serious unintended negative consequences of relocation measures.



## Rating according to DAC criteria

### Overall rating: 2

#### Ratings:

Relevance	1
Effectiveness	2
Efficiency	3
Impact	2
Sustainability	3

#### General conditions and classification of the project (for complex projects only)

The evaluation paid particularly close attention to the complementary measure (CM). One reason for this was the potentially serious unintended adverse impact of resettlement measures. At the same time, photos of the operator's monthly inspections of the junction boxes were evaluated and two randomly selected pylons were visited. The CM also had to be carefully scrutinised due to the challenging topography and resulting long travel distances between resettled villages north of the hydropower plant and the high-voltage line to its south.

#### Relevance

The construction of the high-voltage line from the Lai Chau hydropower station to the Son La substation connected the Lai Chau hydropower station, which was not the object of FC financing, to the Vietnamese integrated grid. Previously, there was only a 110 kV transmission line to supply power to the hydropower plant construction site, although this was not sufficient to transmit the volume of electricity generated at the plant. The project financed was crucial, since generation capacity can only be utilised – and, in turn, can only have an impact – if there is a reliable connection to the grid in place and the grid is capable of receiving and transmitting the electricity that has been generated. The hydropower plant itself was part of the Vietnamese government's long-term master plan. As a result, the project financed was also an implicit part of this long-term plan, meaning that it aligned with the priorities of our Vietnamese partners. In addition, a 20–30 % reduction in greenhouse gas emissions from energy production by 2030 compared with a business-as-usual scenario was first set out as a firm goal in the Green Growth Strategy, which was adopted in 2012. In particular, this adds extra importance to the expansion of hydroelectric power and the grid expansion carried out in line with increased generation capacities, especially given that electricity demand continues to grow at double-digit rates in Vietnam.

A sustainable, reliable and affordable supply of electricity is an important prerequisite for positive economic and social development in a given country – a reality that is also reflected in Sustainable Development Goal 7. The results chain underlying the project is plausible, even if the FC investment only starts at the second step in the chain ("increase in generation capacity due to construction of hydropower plant → all electricity generated by hydropower plant supplied to Vietnamese interconnected grid due to construction of 500 kV high-voltage line and expansion of switchboard plant → elimination of generation and supply bottlenecks → security of electricity supply → contribution to social and economic development"). This again illustrates the high relevance of the relationship between the two projects, as neither the hydropower plant nor the high-voltage transmission line would have suitable for achieving positive impacts on their own.

Vietnam was and remains a partner country of German development cooperation and the energy sector has been a key cooperation sector in the country since 2013. The FC measures implemented were in line with the BMZ sector strategy adopted in 2007.

Although the FC financing was not used to fund the construction of the Lai Chau hydropower station, the project financed by the Vietnamese government was considered a related project as per KfW's Sustaina-

bility Policy – in particular, with regard to environmental and social factors. The activities undertaken in a CM included ensuring that the construction and operation of the hydropower plant progressed in accordance with international environmental and social standards. This is understandable and highly relevant due to the potentially negative impacts of dam projects in particular, the large number of households affected by the resettlement measures, and other potential serious impacts on humans, the environment and the climate. This is also in line with the BMZ’s sectoral strategy papers and human rights guidelines.

From today’s perspective, we rate the relevance of the project and the CM as very good.

**Relevance rating: 1**

**Effectiveness**

The objective at outcome level was to help ensure an environmentally friendly, socially affordable, reliable and inexpensive means of meeting the increasing demand for electricity in Vietnam. This also included ensuring that the relevant hydropower plant was run in an eco-friendly and socially responsible manner. Achievement of the outcome-level target that the ex post evaluation (EPE) is based on is summarised in the table below.

Indicator	Status PA, target PA	Ex post evaluation
(1) Annual quantity of electricity transmitted via the 500 kV line (GWh)	PA: 0 Target value: 4,692 GWh (annual average)	Achieved: 4,411 GWh (average, 2016–2018) <sup>1</sup> 3,660 (2016) 4,450 (2017) 5,124 GWh (2018)
(2) The technical availability of the line means that the station can be operated as planned at all times	PA: 0 Target value: 100 %	Achieved
(3) Three years after the resettlement is completed, household income of resettled households (per person per year) is at least equivalent to per person annual income prior to resettlement	PA: VND 11.7 million (average; farming households) VND 12.8 million (average; non-farming households) <sup>2</sup> Target value: at least VND 11.7 million (farming households) and at least VND 12.8 million (non-farming households)	Achieved: VND 24.8 million (average) <sup>3</sup>
(4) At least 85 % of the residents in the resettled villages have (and use) a latrine or chemical toilet	PA: 33 % Target value: 85 %	Achieved: 100 % <sup>4</sup>

<sup>1</sup> As planned, full capacity was not yet available in 2016 (installed capacity of 800 MW instead of 1,200 MW). This must be taken into account when interpreting the indicator. The planned installed capacity of 1,200 MW was available from 2017 onwards.

<sup>2</sup> No data was collected on household income during the project appraisal. Data was first collected through a household survey at the end of 2015. By this point, all the villagers had already been resettled. One village had even been resettled as early as 2009. As a result, the figures on household income were calculated retrospectively and, in the case of farming households, are primarily based on their recollection of production quantities. The production volumes they specified were calculated using market prices from 2015.

<sup>3</sup> B2.1 Household Data Survey. 4008/11 - Version 2. AF-Consult Switzerland. August 2016. Resettlement Completion Report. AF-Consult Switzerland. August 2019.

<sup>4</sup> Target achievement for indicators 4–9 at the time of the EPE was measured via a separate survey of 14 village representatives (78%) from a total of 18 resettlement sites.

(5) At least 85% of the residents in the resettled villages have a water service connection	PA: 71 % Target value: 85 %	Not achieved: 71 %
(6) 100 % of the residents in the resettled villages have a power connection	PA: 50 % Target value: 85 %	Achieved: 100 %
(7) 100 % of the residents in the resettled villages have sufficient quantities of rice available	PP: N/A Target value: 100 %	Achieved: around 100 %
(8) The primary school is no further away than before the resettlement (km)	PA: 2.1 km (average) Target value: ≤2.1 km	Achieved: 1.64 km (average)
(9) The nearest health stations are no further away than before the resettlement (km)	PA: 8.8 km (average) Target value: ≤8.8 km	Achieved: 3.07 km (average)

Indicators 1 and 2 measure the achievement of objectives in relation to the investment measure. Both indicators were clearly achieved. The line consists of two separate circuits, which are designed with redundancy. The fact that at least one of the two circuits was always in operation during the entire previous operating period meant that the electricity produced in the power plant could be transmitted at any time.

Indicators 3 to 9 measure target achievement for the CM. All the indicators except 5 and 7 were clearly achieved.

Indicator 3: No primary data was collected on household income during the course of the EPE. However, individual interviews were conducted with 28 village residents on the topics “quality of housing” and “standard of living”, which can be considered an important proxy indicator for income development. The results provide anecdotal evidence that corroborates the secondary data on household income. A total of 86 % of interviewees said that the quality of their home had improved, 11 % said that the quality had remained the same and only 4 % thought that the quality of their residence had worsened after they were resettled. Similar answers were given to the question of how their standard of living had changed since being resettled, with 86 % stating that their standard of living was better (36 %) or much better (50 %) after their resettlement. A total of 9 % said that their standard of living had remained the same and 5 % felt that their current standard of living was lower than before their resettlement. Household income per person per year doubled compared with the amount calculated for the pre-resettlement period. When evaluating this very high level of target achievement, it is necessary to bear in mind that people’s livelihoods in most villages have changed significantly – from predominantly subsistence agriculture (70 % before resettlement) to income-based lifestyles. This also means that households have to spend considerably more of their disposable income on basic food items (in this case, rice). According to calculations, each household has to buy an average of around 100 kg per person per year at a price per kilogram of between VND 7,800 and 9,000. As a consequence, households have to spend VND 780,000–900,000 per person when buying rice. But even when these additional new expenses are factored in, the average income of VND 24.8 million per person per year is significantly higher than the pre-resettlement income level of around VND 12 million per person per year.<sup>5</sup>

Indicator 5: The results of the interviews conducted at village level as part of the evaluation mission are generally confirmed by the information provided in the consultant’s final report. Yet according to the consultant’s report, target achievement again fell below the levels specified on the basis of the primary data

<sup>5</sup> AF-Consult Switzerland. Resettlement Completion Report. AF-Consult Switzerland. August 2019, p. 46–.

collection. All in all, 15 water supply systems had been built as part of the resettlement measures. In May 2019, only nine of these were operational (60 %). This is mainly on account of the challenging geographical conditions; for instance, the water pipes are very easily damaged by landslides. It is also common for households connected to the water system to covertly connect to the central water supply system via a second access point in order to reduce their water expenses. This often leads to the collapse of entire water supply systems, the report notes.<sup>6</sup> Both of these experiences were confirmed by the on-site visits.

Indicator 7: In the interviews conducted during the evaluation mission, data on the general availability of rice was also collected at village level. Households were asked whether they had enough rice available, whether home-grown or shop-bought. A total of 57 % answered “yes”, 7 % answered “no”, the situation was unclear for 29 %, and 7 % said that it depends. In two of the four villages, respondents explicitly mentioned that households without a sufficient amount of rice available receive subsidies in the form of rice packages from the government. We can therefore assume that all households without enough rice available will receive state assistance. This assistance measure was also part of the resettlement plan, but no separate questions were asked about assistance measures during the evaluation. This is why at first glance, the indicator may appear not to have been achieved. At the same time, however, household income data and calculations on the quantity of rice that needs to be purchased show that all households have enough rice available. As a result, the indicator regarding sufficient availability of rice can be regarded as having been achieved. Nevertheless, the availability of land, especially for rice cultivation, is a problem for the inhabitants. Although calculations show that the actual hectare area currently available for rice production (paddy and hill rice) is not significantly less than before resettlement, 18 % of individuals interviewed said that the availability of farmland was a problem (not representative).

Overall, we give the project an effectiveness rating of 2 due to the slight shortcomings in achieving two indicators for the CM.

### Effectiveness rating: 2

#### Efficiency

The time required to implement the investment measure was extended by one month to a total of 42 months. Even when this very brief extension is taken into account, the entire investment project was carried out in a relatively short period. The only delays were in the procurement of two reactors for the substation expansion, which was due to the normal production time frame for this equipment. At that time, both the hydroelectric power plant and the transmission line were already in operation, so that the delay in the delivery of the reactors for several months led to an increased risk for the equipment in case of an extraordinary voltage increase (caused e.g. by a sudden, unplanned load shedding). However, this risk did not materialise, meaning that the delayed reactor delivery had no impact on the operation of the power plant and line. The estimated total cost was not exceeded – and, at EUR 120 million, was slightly lower than the estimated cost of EUR 125 million. Both the development loan and the promotional loan, at 20 % and 15 % respectively, were well below the estimated costs of EUR 46 million and EUR 60 million. This significant shortfall stemmed from a substantial increase in the executing agency’s counterpart contribution (from the initially planned EUR 20 million to EUR 33 million).

It is impossible to make a conclusive statement as far as production efficiency is concerned. There are no international or regional reference costs for the construction of a 500 kV high-voltage line. To further complicate any comparison of production costs, the prices of steel and aluminium are highly volatile. Another factor here is the topographical conditions, which can only be considered exceptional in this project’s case. These conditions are not internationally comparable and have a significant impact on the actual production costs. Nevertheless, two facts must be viewed as disadvantageous in terms of production efficiency. First, the construction work for the high-voltage line was awarded in ten separate lots to a total of five construction companies. Internationally, it is common practice to award a transmission line of this length to one or, at most, two construction companies. We can only assume that this factor had a negative impact on costs. (ii) The construction work was awarded directly to the contractors without international competitive bidding. Again, it must be assumed that this approach adversely affected production costs.

<sup>6</sup> AF-Consult Switzerland. Resettlement Completion Report. AF-Consult Switzerland. August 2019, p. 24.

However, it is also worth noting that considerable time was saved both through the direct award of contracts and the parallel construction work by the different contractors. This was pivotal since the completion of the high-voltage line had to coincide with the commissioning of the hydropower plant. If this had not occurred, the hydropower plant would not have been able to start up as planned, undoubtedly incurring much higher costs in the process. Given this state of affairs, the circumstances described above, which in all likelihood had a negative impact on production efficiency, are deemed to be of lesser importance. In our assessment, the allocation efficiency of the investment measure was ensured due to the size of the target group benefiting from a reliable electricity supply.

The time required to implement the CM was extended by 17 months to a total of 53 months. However, the total estimated cost was not exceeded and amounts to EUR 1.095 million as initially planned, of which EUR 0.97 million had been disbursed by the end of October 2018. The remaining funds had been paid out by the end of August 2019. The delays were mainly due to the protracted approval process for additional funds due to be spent on livelihood restoration measures and additional infrastructure measures. The application to increase funding was made in June 2016. Approval was granted 17 months later, on 14 November 2017. Even once approved, the funds were not available for several months, as an onlending agreement first had to be concluded between the executing agency and Vietnam Development Bank. In order to avoid further delays, the executing agency eventually approved the pre-financing from its own funds. This lengthy process had a substantial negative impact on the CM's implementation efficiency. We rate the CM's allocation efficiency as positive due to the large number of people who were and still are affected by the resettlement measures resulting from the construction of the hydropower plant and the high-voltage line, who also consequently benefit from the CM (altogether around 8,700 people).

Despite the extremely efficient implementation of the investment measure, we rate the measure's overall efficiency as satisfactory – in particular, due to the delays affecting the implementation of the CM.

**Efficiency rating: 3**

## Impact

The goal at DC programme impact level was for both consumers and the environment to benefit from environmentally, ecologically and socially responsible energy supply and consumption in Vietnam. In addition, the project aimed to improve the capacity of state and non-state actors in the energy sector to implement the goals and specifications of the Green Growth Strategy and the Power Development Plan (PDP).

No indicators were defined at impact level. However, since the outcome indicators for the investment measure were met, we can surmise that the project played a direct role in improving energy supply and consumption in Vietnam across its various dimensions. A more granular assessment is required for the contribution made towards the second DC programme objective ("improve the capacity of state and non-state actors in the energy sector to implement the goals and specifications of the Green Growth Strategy and the Power Development Plan"). The invitations to tender extended to local firms strengthened private sector capacity. The construction of the hydropower plant with an installed capacity of 1,200 MW helps to advance the goal of increasing installed capacity (hydro only) to 27,800 MW by 2030, as envisaged in the PDP. Naturally, the construction of the high-voltage line and expansion of the switchboard plant do not directly increase installed capacity; however, they do directly contribute to its utilisation, which is an implicit objective of the PDP. The expansion of the 500 kV high-voltage grid is another goal set out in the PDP. On the other hand, the Green Growth Strategy focuses much more heavily on reducing greenhouse gas emissions. The project cannot be demonstrated to have made a direct contribution towards reducing greenhouse gases (nor, in turn, towards the Green Growth Strategy), since its main objective was to help meet the increasing demand for electricity in Vietnam, as well as setting out to increase installed capacity rather than replace conventional energy sources with hydroelectric power.

The CM is not included among the development objectives at impact level. As a result, no indicators were specified for this.

Overall, we give the impact a rating of 2.

**Impact rating: 2**

## Sustainability

The National Power Transmission Corporation (NPT), a wholly owned subsidiary of EVN, is responsible for operating and maintaining the transmission lines. The NPT is well equipped to handle routine upkeep work, employing 2,336 staff (as of 31 December 2018) who are responsible for maintaining a total of 7,827.34 km of 500 kV transmission line. In the course of its routine maintenance work, monthly inspections are carried out along the entire transmission line and all the pylons. There is a 33-person team responsible for the maintenance of the high-voltage line under evaluation. Routine maintenance on the entire line takes between five and seven days. Non-routine inspections of the transmission line are also carried out in the event of failure or after heavy rainfall. Although we regard the monthly inspections as an adequate arrangement in principle, deficiencies were found during the mission at the pylons visited. At one of the pylons visited, the soil had eroded so deeply that the foundation on one leg of the pylon was exposed by about 1.5 metres. This pylon was at a relatively flat location, which meant that no additional erosion protection measures had been taken during construction. During conversation with the executing agency, it became clear that they were aware of the situation, and they assured the mission team that the erosion they identified had been factored into the design and that there was no risk to the stability of the entire high-voltage line. On a more critical note from our perspective, some of the bolts used to fix and balance the pylons were loose. Since the mission randomly selected the pylons visited, it is not unlikely that other pylons are also affected. If the faulty fixtures are left uncorrected, the stability of the pylons will be at high risk due to improper load distribution among the steel grids. The increase in repair work this would require would reduce the line's availability and result in increased costs. In a worst case scenario, a severe storm could even cause individual pylons to collapse, causing a temporary blackout along the entire line. After detailed discussions with the project partner, taking into account the executing agency's strong awareness of the issue as well as the strategic importance of the high-voltage line, we assume that tightening the anchor bolts will be viewed as a greater priority during future maintenance rounds and that the measure's sustainability is therefore not at any heightened risk.

With regard to the sustainability of the CM, soil erosion also poses an enhanced risk. In particular, several houses were threatened by landslides in one village. A wall was built at this location to protect the houses from landslides. The hillsides above the wall were terraced during the time of the evaluation visit to minimise the risk of further landslides occurring. However, afforestation measures must also be implemented to minimise the risk of landslides in the long term. The chemical toilets in the villages could also represent a future environmental risk. Awareness of this issue differed greatly from village to village. Residents in some villages are mindful of the problems associated with emptying chemical toilets, with a tank truck reportedly used to pump out the toilets. This is provided as a private service, although the mission was unable to obtain information about how much this service costs and whether the residents are able to pay for it. In other villages, however, there was no awareness at all of this potential future problem.

Waste disposal in the villages potentially poses another environmental risk. Even though the resettled villages were much cleaner than the non-resettled villages on the whole, the methods of dealing with waste removal and disposal vary dramatically. The visible refuse predominantly consists of paper and plastic waste. Electronic waste and similar refuse items were not noticeable. In most cases, households collect and burn their own waste, which is regarded as "traditional waste disposal". In some villages, the refuse is transported and dropped off at a central location inside or outside the village. Properly built and operated solid waste dumps were not found in any of the villages. In one village, recyclable materials were separated, collected and weighed, with the disposal service paying the villagers by the kilogram. This is a positive example, which will hopefully be adopted in the other villages as well.

Overall, taking the above-mentioned limitations into account, we still classify the sustainability of the measure as satisfactory.

**Sustainability rating: 3**

### Notes on the methods used to evaluate project success (project rating)

Projects are evaluated on a six-point scale, the criteria being **relevance, effectiveness, efficiency** and **overarching developmental impact**. The ratings are also used to arrive at a **final assessment** of a project's overall developmental efficacy. The scale is as follows:

<b>Level 1</b>	Very good result that clearly exceeds expectations
<b>Level 2</b>	Good result, fully in line with expectations and without any significant shortcomings
<b>Level 3</b>	Satisfactory result – project falls short of expectations but the positive results dominate
<b>Level 4</b>	Unsatisfactory result – significantly below expectations, with negative results dominating despite discernible positive results
<b>Level 5</b>	Clearly inadequate result – despite some positive partial results, the negative results clearly dominate
<b>Level 6</b>	The project has no impact or the situation has actually deteriorated

Rating levels 1-3 denote a positive assessment or successful project while rating levels 4-6 denote a negative assessment.

### Sustainability is evaluated according to the following four-point scale:

Sustainability level 1 (very good sustainability): The developmental efficacy of the project (positive to date) is very likely to continue undiminished or even increase.

Sustainability level 2 (good sustainability): The developmental efficacy of the project (positive to date) is very likely to decline only minimally but remain positive overall. (This is what can normally be expected).

Sustainability level 3 (satisfactory sustainability): The developmental efficacy of the project (positive to date) is very likely to decline significantly but remain positive overall. This rating is also assigned if the sustainability of a project is considered inadequate up to the time of the ex post evaluation but is very likely to evolve positively so that the project will ultimately achieve positive developmental efficacy.

Sustainability level 4 (inadequate sustainability): The developmental efficacy of the project is inadequate up to the time of the ex post evaluation and is very unlikely to improve. This rating is also assigned if the sustainability that has been positively evaluated to date is very likely to deteriorate severely and no longer meet the level 3 criteria.

The **overall rating** on the six-point scale is compiled from a weighting of all five individual criteria as appropriate to the project in question. Rating levels 1-3 of the overall rating denote a "successful" project while rating levels 4-6 denote an "unsuccessful" project. It should be noted that a project can generally be considered developmentally "successful" only if the achievement of the project objective ("effectiveness"), the impact on the overall objective ("overarching developmental impact") and the sustainability are rated at least "satisfactory" (level 3).