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IMPLEMENTATION COMPLETION AND RESULTS REPORT  
(IDA-50860)  
ON A  
CREDIT  
IN THE AMOUNT OF SDR 85.2 MILLION  
(US\$132 MILLION EQUIVALENT)  
TO THE  
REPUBLIC OF CAMEROON  
FOR THE  
LOM PANGAR HYDROPOWER PROJECT

December 23, 2019

Energy and Extractives Global Practice  
Africa Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective August 31, 2019)

Currency Unit = CFA Francs (XAF)

US\$1 = XAF 594.38

SDR 1 = XAF 813.31

FISCAL YEAR

July 1–June 30

## ABBREVIATIONS AND ACRONYMS

ADSCR	Annual Debt Service Coverage Ratio
AES-SONEL	American Electricity Supply Corporation-National Electricity Company ( <i>Société Nationale d'Electricité</i> )
AFD	French Development Agency ( <i>Agence Française de Développement</i> )
AfDB	African Development Bank
ARSEL	Electricity Sector Regulatory Agency ( <i>Agence de Régulation du Secteur d'Electricité</i> )
ATESI	Independent Technical Audit of Social and Environmental issues. ( <i>Audit Technique Environnemental Et Social Indépendant</i> )
BDEAC	Central African States Development Bank ( <i>Banque de Développement des Etats d'Afrique Centrale</i> )
BRG	Grievance Settlement Office ( <i>Bureau de Règlements des Griefs</i> )
CAS	Country Assistance Strategy
COB/ISL	Coyne et Bellier/ISL
CPF	Country Partnership Framework
CWE	China International Water & Electric Corporation
DDNP	Deng Deng National Park
E&S	Environmental and Social
EDC	Electricity Development Corporation
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
EIS	Water Information System
ENEO	Energy of Cameroon
ENPV	Economic Net Present Value
ESDP	Energy Sector Development Project
ESMP	Environmental and Social Management Plan
FEP	Foreign Exchange Premium
FIDIC	International Federation of Consulting Engineers – ( <i>Fédération Internationale des Ingénieurs-Conseils</i> )
FIRR	Financial Internal Rate of Return

FM	Financial Management
FNPV	Financial Net Present Value
FOCC	Financial Opportunity Cost of Capital
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GOC	Government of Cameroon
HFO	Heavy Fuel Oil
HV	High-voltage
ICR	Implementation Completion and Results Report
IFC	International Finance Corporation
IPP	Independent Power Producer
ISR	Implementation Status and Results Report
LDP	Local Development Plan
LNG	Liquefied Natural Gas
LPHP	Lom Pangar Hydropower Project
LV	Low-voltage
M&E	Monitoring and Evaluation
MAC	Marginal Abatement Cost
MIGA	Multilateral Investment Guarantee Agency
MV	Medium-voltage
PAD	Project Appraisal Document
PDO	Project Development Objective
PIR	Compensation and Resettlement Plan ( <i>Plan d'indemnisation et de réinstallation</i> )
PIU	Project Implementation Unit
PPP	Public-Private Partnership
ROE	Return on Equity
RSF	Financial Monitoring Report ( <i>Rapport de Suivi Financier</i> )
SI	Sensitivity Indicator
SNV	Foundation of Netherlands Volunteers ( <i>Stichting Nederlandse Vrijwilligers</i> )
SONATREL	National Society of Electricity Transport ( <i>Société Nationale de Transport de L'électricité</i> )
SV	Switching Value
TA	Technical Assistance
TTL	Task Team Leader
WACC	Weighted Average Cost of Capital

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**DATA SHEET**

**BASIC INFORMATION**

**Product Information**

Project ID	Project Name
P114077	CM - Lom Pangar Hydropower Proj. (FY12)
Country	Financing Instrument
Cameroon	Investment Project Financing
Original EA Category	Revised EA Category
Full Assessment (A)	Full Assessment (A)

**Organizations**

Borrower	Implementing Agency
Electricity Development Corporation (EDC)	Electricity Development Corporation (EDC)

**Project Development Objective (PDO)**

Original PDO

The project development objective of the proposed LPHP is to increase hydropower generation capacity and reduce seasonal variability of water flow in the Sanaga River and to increase access to electricity.



**FINANCING**

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
<b>World Bank Financing</b>			
IDA-50860	132,000,000	132,000,000	121,034,628
<b>Total</b>	<b>132,000,000</b>	<b>132,000,000</b>	<b>121,034,628</b>
<b>Non-World Bank Financing</b>			
Borrower/Recipient	199,000,000	199,000,000	142,156,013
African Development Bank	29,000,000	65,913,661	19,446,710
Development Bank of the Central African States	15,000,000	40,080,160	7,449,265
EC: European Investment Bank	40,000,000	40,000,000	39,436,286
FRANCE: French Agency for Development	79,000,000	79,000,000	54,001,268
<b>Total</b>	<b>362,000,000</b>	<b>423,993,821</b>	<b>262,489,542</b>
<b>Total Project Cost</b>	<b>494,000,000</b>	<b>555,993,821</b>	<b>383,524,170</b>

**KEY DATES**

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
27-Mar-2012	19-Mar-2013	13-May-2015	31-Dec-2018	28-Jun-2019



### RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
01-Dec-2018	119.36	Change in Loan Closing Date(s)

### KEY RATINGS

Outcome	Bank Performance	M&E Quality
Satisfactory	Satisfactory	Substantial

### RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	02-Jun-2012	Satisfactory	Satisfactory	0
02	30-Dec-2012	Moderately Satisfactory	Moderately Satisfactory	0
03	10-Jul-2013	Moderately Satisfactory	Moderately Satisfactory	40.78
04	18-Nov-2013	Moderately Satisfactory	Moderately Satisfactory	46.47
05	17-May-2014	Moderately Satisfactory	Moderately Unsatisfactory	50.95





06	11-Nov-2014	Moderately Satisfactory	Moderately Unsatisfactory	68.37
07	22-Jun-2015	Moderately Satisfactory	Moderately Satisfactory	84.42
08	31-Dec-2015	Moderately Satisfactory	Satisfactory	90.27
09	12-Jul-2016	Moderately Satisfactory	Satisfactory	104.15
10	08-Feb-2017	Moderately Satisfactory	Moderately Satisfactory	111.15
11	18-Oct-2017	Moderately Satisfactory	Moderately Satisfactory	113.43
12	05-Jun-2018	Moderately Satisfactory	Moderately Satisfactory	115.54
13	12-Mar-2019	Moderately Satisfactory	Moderately Satisfactory	120.24

## SECTORS AND THEMES

### Sectors

Major Sector/Sector	(%)
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<b>Health</b>	<b>1</b>
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Health	1
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<b>Energy and Extractives</b>	<b>85</b>
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Renewable Energy Hydro	75
------------------------	----

Public Administration - Energy and Extractives	10
------------------------------------------------	----



<b>Social Protection</b>	<b>1</b>
Social Protection	1
<b>Transportation</b>	<b>13</b>
Rural and Inter-Urban Roads	13
<b>Themes</b>	
Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
<b>Public Sector Management</b>	<b>2</b>
Public Finance Management	1
Public Expenditure Management	1
Public Administration	1
Transparency, Accountability and Good Governance	1



<b>Social Development and Protection</b>	<b>6</b>
Social Protection	6
Social Insurance and Pensions	6
<b>Urban and Rural Development</b>	<b>16</b>
Rural Development	16
Rural Infrastructure and service delivery	16
<b>Environment and Natural Resource Management</b>	<b>76</b>
Environmental Health and Pollution Management	12
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## A. CONTEXT AT APPRAISAL

### Context

#### *Power Sector Context*

- 1. Cameroon had the third largest hydropower potential in Sub-Saharan Africa, with the Sanaga River basin providing nearly half of the untapped potential.** About 50 GW of hydropower ready for immediate development was identified in Sub-Saharan Africa, making this source of energy the lowest cost and largest renewable energy resource available to the region. Trailing Ethiopia and the Democratic Republic of Congo, Cameroon's hydropower development potential was estimated at over 12,000 MW, with the Sanaga River basin providing nearly half of the untapped potential. At project appraisal, the total installed electricity generation capacity from all sources in Cameroon was only 933 MW, with 77 percent of it coming from hydropower and the balance being relatively costly and polluting thermal energy.
- 2. While the country's hydropower potential would be enough to meet domestic electricity demand and support large industrial development and electricity export, the energy demand exceeded supply, thereby deterring growth.** At project appraisal, Cameroon's power system consisted of three isolated grids, which negatively affected the system robustness. A private electricity concessionaire (American Electricity Supply Corporation-National Electricity Company [*Société Nationale d'Electricité*, AES-SONEL]) was operating a total generation capacity of 933 MW, which was insufficient to meet existing demand and left an estimated shortfall of 50–100 MW. In 2010, electricity sold by AES-SONEL amounted to 3,580 GWh. Approximately 70 percent of the produced power was supplied to the public and the remaining 30 percent to industrial high-voltage (HV) customers, mainly Cameroon Aluminum Company (*Compagnie camerounaise de l'aluminium*), the public aluminum company. The rural electrification rate in Cameroon was a mere 14 percent, and the high electricity costs made power unaffordable for many households.
- 3. At appraisal, the electricity supply relied on a mix of hydropower generation, as well as thermal and gas-powered plants.** Three large hydropower sites—Song Loulou (384 MW), Edéa (265 MW), and Lagdo (72 MW)—together accounted for close to 90 percent of hydropower generation. Due to lower water flows during the dry season, however, thermal backup capacity was needed. The 88 MW Dibamba heavy fuel oil (HFO) project came online in 2009. In addition, in the election year 2011, the Government of Cameroon (GOC) added emergency generation capacity of 40 MW through three diesel-fired thermal power plants in Bamenda, Ebolowa, and Mbalmayo operated by the Electricity Development Corporation (EDC) and rented 60 MW of generation capacity in the Yaoundé area for one year. Going forward, the 216 MW Kribi Gas Power Project was expected to start producing power in the first half of 2013. The 200 MW Memve'ele hydropower project on the Ntem River in southeast Cameroon was under construction and was partially funded by the Export-Import Bank of China.
- 4. A major step toward developing Cameroon's largely unexploited hydropower potential was the construction of a regulating dam at the Lom Pangar site in the Sanaga River basin.** The regulating dam's purpose was to increase the guaranteed all-season hydropower capacity on the Sanaga River by



approximately 40 percent. The regulating dam was to be 46 meters high and 7 meters wide at the crest and be composed of: (i) a 182-meter-long central concrete overflow section located in the river, (ii) two compacted earth embankment wings with a total length of 1170 meters, and (iii) an auxiliary 425-meter-long saddle dam on the right bank. Due to a rock section that splits the embankment dam on the right bank, an auxiliary saddle dam has been required to close the reservoir. The regulating dam was to be operational between the minimum operating level of 649 meters Above Mean Sea Level (AMSL) and the normal top water level of 673 meters AMSL. The dam was to include a gated spillway with four radial gates for the rapid discharge of flood water with a total capacity of 1600 m<sup>3</sup>/s and three regulating bottom gates with a maximum capacity of 860 m<sup>3</sup>/s.

5. The dam construction would immediately translate into the addition of 120 MW at existing downstream hydropower plants as they will also generate electricity in the dry season. In the medium term, the Lom Pangar dam was to allow for further downstream development of large-scale hydropower plants by ensuring firm all-season water flows. In this respect, the project was structured as a typical public good. In addition, the Lom Pangar Hydropower Project (LPHP) powerhouse was to generate 30 MW of electricity and provide first-time electricity services to over 2,400 rural households and improve reliability of supply to about 22,000 households in the Eastern Grid.

6. **The Lom Pangar regulating dam would increase the potential to generate reliable all-season, industrial-scale hydropower potential by a 40 percent jump.** The total hydropower potential of the Sanaga River was estimated at up to 6,000 MW. The total capacity of large hydropower sites was estimated at 4,200 MW, with the remaining 1,800 MW being smaller (mainly upstream) sites which were not suitable for industrial-scale hydropower development. The Sanaga River was regulated by three regulating dams—at Mapé, Bamendjin, and Mbakaou. However, regulation capacity was limited, and the all-season capacity of the potential hydropower sites suitable for industrial-scale generation was therefore still considerably lower than the installed capacity. The construction of other regulating dams in the basin could further increase the all-season hydropower production at these sites, including the case of the Lom Pangar dam that would increase the production potential by an estimated 40 percent from approximately 1,750 MW.

### ***Power Institutional Context***

7. **Starting 1998, the GOC undertook to reform the electricity sector and improve its governance and efficiency.** Measures implemented to reform the electricity sector and improve efficiency and governance gains included the following: (a) the creation of a sector regulator (Electricity Sector Regulatory Agency (*Agence de Régulation du Secteur d'Electricité*, ARSEL) and a Rural Electrification Agency (*Agence d'Electrification Rurale*) in 1999, (b) the establishment of a 20-year concession in 2001 between the Government and AES Corporation to operate and invest in the state-owned, vertically integrated, power utility (AES-SONEL), (c) the creation in November 2006 of EDC with the mandate to develop, own, and operate hydropower assets, and (d) finally, the creation of the Rural Energy Fund in 2009.

8. **In 2011, the pursuit of the electricity reform agenda aimed to unbundle the electricity sector and to open it up to the private sector.** The 2011 Electricity Law intended to attract additional private investment by promoting the development of hydropower projects by auto producers and further



unbundle the sector by creating a transmission company. The law foresaw a model where the development of such hydropower sites could be allocated to large industrial customers with significant consumption needs, obliged concessionaires utilizing hydro resources for electricity production to optimize the size of their developments, tasked industrial auto producers to provide a portion of electricity produced to the national grid, and paved the way for the GOC to create a new publicly owned transmission company, thereby unbundling the vertically integrated power sector.

9. **Getting right the water and power tariffs was a critical concern in strengthening the electricity sector and in developing the hydropower potential.** In a Policy Letter signed by the Prime Minister in February 2012, the GOC committed to specific actions regarding the development of the hydropower sector framework for the Sanaga basin and to develop all secondary legislation under the 2011 Electricity Law in consultation with stakeholders. Priority was to be accorded to regulations pertaining to the introduction of water rights and all aspects pertaining to hydropower. The tariff for the electricity supplied to the public grid was to be determined by the regulator, ARSEL, on a ‘cost of service’ basis. These provisions were designed to ensure that every end user will benefit from low-cost hydropower generation and introduced a water tariff for hydropower producers on the Sanaga River through a secondary legislation.

#### Rationale for World Bank Involvement

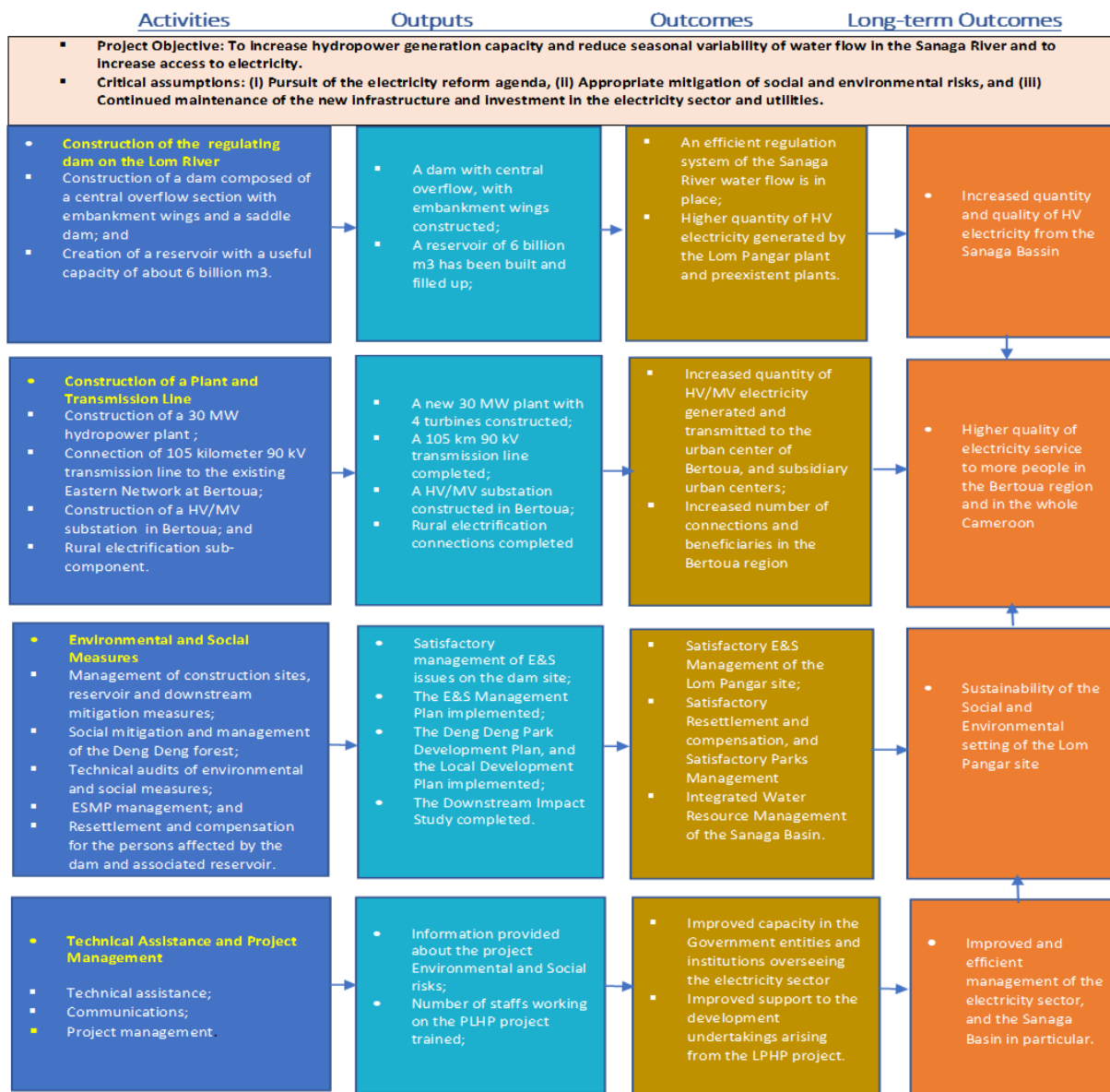
10. **The proposed operation was at the core of the World Bank Group’s Country Assistance Strategy (CAS) 2010–13, (Report No. 52997-CM) in addressing the country’s electricity challenges.** In the context of the 2010–13 CAS, IDA’s support to improve competitiveness was to focus on increased infrastructure investments in the energy, transport, and telecommunications sectors, including the delivery of the LPHP which aimed to deepen IDA’s support to Cameroon in the power sector. The existing IDA energy portfolio with Cameroon also included (a) the Energy Sector Development Project (ESDP), (b) the Environmental and Social Capacity Building Project for the Energy Sector, and (c) the IDA Partial Risk Guarantee for the Kribi Gas Power Project. IDA and the International Finance Corporation (IFC) were also jointly supporting the Kribi Gas Power Project. Finally, the IDA-financed ESDP was supporting the GOC in its work to improve access to electricity in rural areas.

11. **This project was enabled by the World Bank Group’s convening power, which leveraged other donors’ funding to complement IDA resources and deliver the Lom Pangar dam and reservoir.** The LPHP was aligned with the World Bank Africa Region Strategy, supporting competitiveness and employment and working in partnership with other stakeholders. The project was enabled by the World Bank’s convening power, which leveraged IDA resources through cofinancing resources made available by several development partners, including the French Development Agency (*Agence Française de Développement*, AFD), the European Investment Bank (EIB), the African Development Bank (AfDB), and the Central African States Development Bank (*Banque de Développement des Etats d’Afrique Centrale*, BDEAC). The project was aligned with the World Bank Group’s Sustainable Infrastructure Action Plan, which encouraged increased cooperative approaches among different institutions of the World Bank Group, the donor community, and the private sector on large and complex energy infrastructure projects in Africa. IFC acted as an adviser to the GOC in the privatization of AES-SONEL, led arrangements for a €250 million syndicated loan for AES-SONEL’s five-year investment program, and provided a €70 million loan. IFC had been providing a syndicated foreign currency loan for the Kribi Gas Power Project.



Theory of Change (Results Chain)

12. **Causality.** The key expected long-term outcomes of the project were (a) an increased quantity and quality of HV electricity from the Sanaga basin, (b) a higher quality of electricity service to more people in the Bertoua region and in the whole of Cameroon, (c) satisfactory sustainability of the environmental and social (E&S) setting of the Lom Pangar site, and (d) finally, an improved and efficient management of the electricity sector, especially the Sanaga basin. Table 1 illustrates the extent to which the planned interventions were to generate the expected outputs, the latter paving the way to achieving the expected outcomes and the long-term goals.







13. The theory of change for the objective of reducing the seasonal variability of water flow in the Sanaga River was that the construction of the regulating dam on the Lom River and the creation of a reservoir with a useful capacity would lead to an efficient regulation system of the Sanaga River water flow. The result chain for the objective of increasing hydropower generation capacity resided in that the new foot plant power and increased all-season hydropower production for existing and new downstream power plants would allow higher quantity of HV electricity generated by the Lom Pangar plant and downstream power plants as well. Finally, the results chain of the objective of increasing access to electricity was that the construction of a power plant on the Lom River and transmission lines to Bertoua, coupled with increased power generation in downstream power plants, would permit increased quantity of HV/medium-voltage (MV) electricity generated and transmitted to the urban center of Bertoua and subsidiary urban centers as well as increased number of connections and beneficiaries in the Bertoua region and in the whole country.

14. For the achieved outcomes to be sustained, identified assumptions in terms of long-term development were as follows: (a) the pursuit of the electricity sector reform agenda and most importantly the finalization of the water rights agenda, (b) the need to uphold and strengthen the measures and actions to mitigate the E&S risks, and (c) the need to mobilize sufficient financial resources to ensure a continued maintenance of the new infrastructure and promote private investment in the electricity sector.

15. **Outcome attribution.** The key outcomes achieved at project closing are attributable to (a) the GOC for the preparatory work, the creation of conditions to launch this project, and the supply of counterpart financial resources used to fund different parts of the project; (b) the World Bank for its convening capacity and the supply of the major part of funding covering the construction of the dam and the reservoir, as well as the mitigation actions of E&S risks, and supporting local technical capacity; (c) the EIB which co-funded the construction of the dam and the reservoir; (d) the AFD, which funded and oversaw much of the implementation of actions to mitigate E&S risks; (e) the AfDB, which funded the Lom Pangar power plant and the transmission line linking the dam site to the Bertoua regional center; and (f) finally, the BDEAC, which has been funding rural electrification and energy access in the Bertoua region.

16. **Counterfactuals.** This project aimed to fund the Lom Pangar dam and reservoir, the construction of the power plant, the transmission line to Bertoua, and the additional grid connection in the regional centers of Bertoua. The Lom Pangar regulation reservoir was the most upstream infrastructure identified on the Sanaga River to regulate the water flow coming from the Sanaga basin. Assuming at project approval that the dam will have an economic life of 50 years, the predicament for efficiency calculations was that there would be no alternative regulating dam during the project life period.. In any case, there was no alternative project that was ready to fund the abovementioned activities at approval. The expected positive impact from the project and from the downstream dams of the Sanaga basin could not have been achieved otherwise during the project implementation timeline.

### **Project Development Objectives (PDOs)**

17. **The project development objective of the proposed LPHP is to increase hydropower generation capacity and reduce seasonal variability of water flow in the Sanaga River and to increase access to**



**electricity.** The statement of the PDO in the Financing Agreement was identical to the one in the Project Appraisal Document (PAD) and was not revised during project implementation.

**Key Expected Outcomes and Outcome Indicators**

18. **The key expected outcome and outcome indicators at appraisal delineated in Table 1 remained unchanged throughout the period of project implementation:**

**Table 1. Expected Outcomes and Outcome Indicators<sup>1</sup>**

<b>The project development objective of the proposed LPHP is to increase hydropower generation capacity and reduce seasonal variability of water flow in the Sanaga River and to increase access to electricity.</b>	
<b>Expected Outcomes</b>	<b>Original Outcome Indicators (2012)</b>
<ul style="list-style-type: none"> <li>Increased generation of hydroelectricity from the new and downstream plants</li> </ul>	<ul style="list-style-type: none"> <li>Quantity of hydroelectricity additionally generated under the project               <ul style="list-style-type: none"> <li>At the two existing plants on the Sanaga River</li> <li>New capacity at Lom Pangar</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>Improved regulation of water toward uniform all-season generation of hydroelectricity</li> </ul>	<ul style="list-style-type: none"> <li>Guaranteed all-season water flow of the Sanaga River</li> </ul>
<ul style="list-style-type: none"> <li>Increased number of connected households</li> </ul>	<ul style="list-style-type: none"> <li>Number of households newly connected to the electricity grid</li> </ul>
<ul style="list-style-type: none"> <li>Increased level of electricity access</li> </ul>	<ul style="list-style-type: none"> <li>Direct project beneficiaries (number)</li> </ul>
<ul style="list-style-type: none"> <li>Increased level of electricity access for female</li> </ul>	<ul style="list-style-type: none"> <li>Direct project beneficiaries (number) of which female (percentage)</li> </ul>

**Components**

19. **The four components of the project detailed in the following list were unchanged throughout project implementation:**

- Component 1: Lom Pangar Regulating Dam (total cost at appraisal of US\$216 million, of which US\$115 million from IDA, US\$40 million from the EIB, US\$12 million from the AFD, and US\$49 million from the Government’s counterpart financing; estimated IDA actual cost of US\$110.86 million).** This component was to finance the construction of the Lom Pangar regulating dam on the Lom River. Planned activities to be funded were (a) the dam engineering, procurement, construction, and construction management; (b) contingency; (c) preparatory works; and (d) owner’s engineer services.
- Component 2: Lom Pangar Power Plant and Transmission Line (total cost at appraisal of US\$62 million, of which US\$29 million from the AfDB, US\$15 million from the BDEAC, and US\$18 million from the Government’s counterpart financing; total actual unavailable as activities are still under way).** This component intended to construct the Lom Pangar power plant and a transmission line and to provide rural electrification in the Eastern Region along

<sup>1</sup> Original outcome indicators targets and actuals achieved at project closure are presented in Annex 1.



the transmission line corridor. The component included the following infrastructures and activities: (a) a hydropower plant, (b) a 90 KV transmission line and high-tension/medium-tension substations, (c) rural electrification in the Eastern Region, and (d) social management.

- **Component 3: Environmental and Social Measures (total cost at appraisal of US\$73 million, of which US\$6 million from IDA, US\$58 million from the AFD, and US\$9 million from the Government's counterpart financing; estimated IDA actual cost of US\$1.45 million).** This component intended to ensure that the E&S impacts of the LPHP are mitigated as described in the Environmental and Social Management Plan (ESMP) and the Resettlement Action Plan for the dam. The component also included a subcomponent on local development activities, which were beyond the minimum requirements for safeguards compliance, to ensure that affected local populations secure long-term enhancements to their economic prospects. The component had the following subcomponents: (a) E&S management of construction sites, (b) management of the reservoir and cumulative downstream mitigation, (c) social mitigation, (d) management of the Deng Deng forest, (e) technical audits of E&S measures, (f) ESMP implementation, (g) resettlement action plans implementation, and (h) local development plans (LDPs).
- **Component 4: Technical Assistance and Project Management (total cost at appraisal of US\$42 million, of which US\$11 million from IDA, US\$9 million from the AFD, and US\$22 million from the Government's counterpart financing, estimated IDA actual cost of US\$8.59 million).** The purpose of this component was to assist EDC in improving project management and operation and the management of water resources in the Sanaga River basin. The component included the following activities: (a) technical assistance (TA), (b) strategic communication and consultation, and (c) project management.

## **B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)**

### **Changes in PDOs, Outcome Targets, PDO Indicators, and Components**

20. **The Level 2 restructuring in December 2018 extended the project closing date but did not revise the components, the PDOs, and the outcome targets.** The main goal of the restructuring was to extend the closing date of the project from the original date of December 31, 2018, until June 28, 2019. While the dam had been successfully commissioned in June 2017, the implementation of the Component 3 activities aimed to address immediate social and development needs of local communities affected by the project was still under way. The extension also allowed the borrower to closely monitor the completion of all contractual obligations by the contractor under Component 1 and deliver all social infrastructures in favor of the affected population under Component 3. This extension also allowed the borrower to catch up with capacity-building and training activities in favor of the staff that had been delayed, as staff could not be totally free during the period of overseeing the dam and reservoir construction. The completion of the Component 2 activities was delayed, as one co-financier could not disburse on time, but the World Bank decided not to extend the project closing date further, as the World Bank was not a co-financier to the Component 2 activities.



21. In line with the above factors, there were no changes in the PDOs, the outcome targets, the PDO indicators, and the components of the project during the entire period of project implementation.

### **Rationale for Changes and Their Implication on the Original Theory of Change**

22. The original theory of change was not affected during project implementation as there were no changes in the PDOs, the outcome targets, the PDO indicators, and the project components.

## **II. OUTCOME**

### **A. RELEVANCE OF PDOs**

#### **Assessment of Relevance of PDOs and Rating**

Rating: High

23. **The statement of the PDOs was clear and the objectives were measurable and achievable.** “The project development objective of the proposed LPHP was to increase hydropower generation capacity and reduce seasonal variability of water flow in the Sanaga River and to increase access to electricity.” The three PDOs were high-level and complementary goals toward improving the delivery of high-quality energy services to an increasing number of the country’s population. The Results Framework identified indicators to measure performance in the three areas of focus that were measurable and achievable.

24. **The PDOs reflected the borrower’s priorities.** In its development strategy, Vision 2035, the GOC aims to transform the country into an industrial economy. The 2009 Strategy Document for Growth and Employment (*Document de Stratégie pour la Croissance et l’Emploi*) translated the Vision 2035 into specific objectives to be achieved by 2020. The associated Strategy for Growth and Employment 2010–2019 aimed to increase non-oil growth by investing in key infrastructure, improving productivity and the business climate, and strengthening human development and regional integration. In the energy sector, actions included increasing hydropower production and renewable energy, boosting energy efficiency, and reducing losses through improved transmission and distribution. At the same time, the GOC initiated the update of the master plan for the electricity sector (the ESDP 2030), which was the point of reference for the optimization of future hydropower projects for household and industrial use.

25. **The PDOs were in line with the World Bank’s strategy at project closure.** Out of the 12 objectives of the World Bank Group’s Country Partnership Framework (CPF) for 2017–2021 (Report No. 107896-CM), two were devoted to modernizing the electricity infrastructure and to achieving outcome in that sector as follows: (a) the fifth objective aimed to have in place improved access to local infrastructure, and the target outcome was an increase in access to electricity, particularly in rural areas and in the northern regions, and (b) the sixth objective intended to achieve increased national availability of electricity, with the following expected outcomes: (i) additional megawatt of electricity generated, with a focus on renewable energy and public-private partnership (PPP) arrangements and (ii) the reduction in annual power outages.

26. **The project scope and the implementation arrangements were appropriate.** The World Bank’s contribution was mainly to support the construction of a dam and a reservoir and to fund capacity building



in the electricity sector and to cover the cost of project implementation. Parallel financing was sought from (a) the EIB to cofinance the dam construction, (b) the AFD to support the mitigation of the environmental impact of the project, and (c) the AfDB and BDEAC to fund the construction of the Lom Pangar hydropower plant, the transmission line, and the rural electrification. Project ownership was exemplified by the Government's contribution in the funding and implementation of each of the components of the project. While the implementation arrangements were complex (see paragraph 70) at appraisal, things were smoothed out during implementation, following a close oversight by the Prime Minister's office of the reforms in the electricity sector, in general, and of the role to be played by the LPHP in developing the Sanaga basin.

27. **Overall, the PDOs were highly relevant.** The project's scope was adequate, the components were realistic, and the PDOs were in line with the priorities of the borrower and the World Bank's strategy in Cameroon aimed at increasing hydropower generation capacity, reducing seasonal variability of water flow in the Sanaga River, and increasing access to electricity. Finally, the borrower showed strong ownership of the project, and the World Bank used its convening capacity to bring in other external donors.

## **B. ACHIEVEMENT OF PDOs (EFFICACY)**

### **Assessment of Achievement of Each Objective/Outcome**

#### **Objective 1: To reduce seasonal variability of water flow in the Sanaga River**

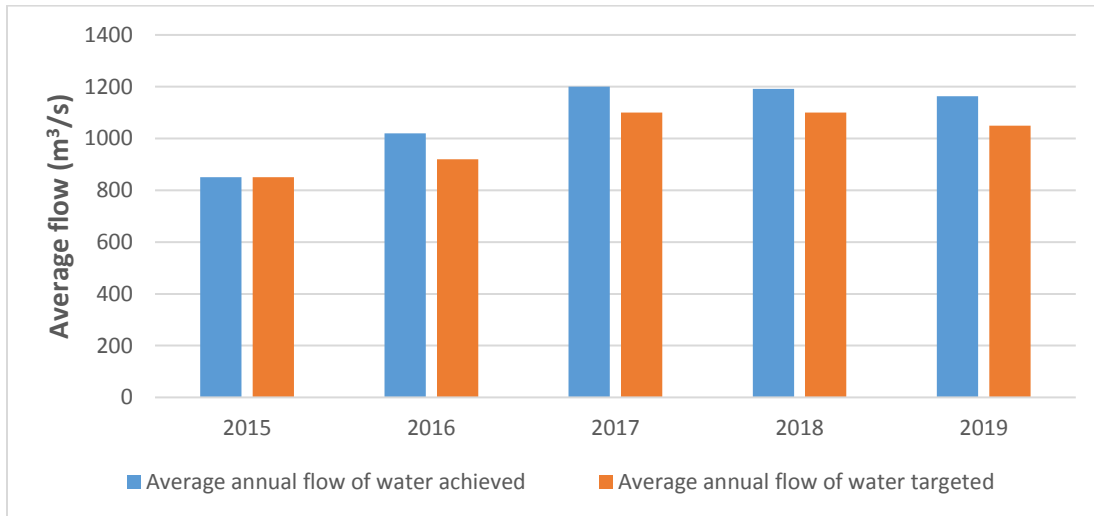
Rating: High

28. **The initiation of the LPHP drew from the concept of creating a classic public good that will permit the supply of an increased level of all-season energy from existing or new downstream hydropower plants.** The goal was the integrated management of water resources of the Sanaga basin in a comprehensive way, using thought-through operational solutions financially compatible with the existing technology, with the objective that the LPHP could catalyze increased private investment in hydropower development along the Sanaga River, paving the way for further expansion of the country's hydropower potential.

29. **Because of the dam construction, the level of guaranteed all-season water flow on the Sanaga River was significantly increased by 44.4 percent, and the target was slightly exceeded by 1 percent.** Following the partial impoundment of the dam in September 2015, 3 billion m<sup>3</sup> of water was stored and used during 2016. The guaranteed flow to Song Mbengue for this purpose was 920 m<sup>3</sup>/s, 90 percent of the time. After the complete reservoir impoundment in June 2016, it was possible to store 6.284 billion m<sup>3</sup> of water that was used during 2017. The latter allowed an average flow of water of 1,050 m<sup>3</sup>/s to Song Mbengue in 2017. As shown in figure 1, not only there was a surge in the average flow of water starting 2017, but over 2016–2019, the average flow during the low water period has surpassed the targeted water flow level.



Figure 1. Average Flow during Low Water Period (m<sup>3</sup>/s)



Source: EDC.

30. **The PDO of reducing seasonal variability of water flow in the Sanaga River was met in June 2016, 15 and 36 months ahead of original and revised project closing dates, respectively.** Reflecting the performance in the project implementation, the reduction of the seasonal water variability allowed additional generation capacity to the existing Sanaga hydropower plants downstream of the dam. The LPHP will have a similar and proportional impact on the Nachtigal hydropower plant as soon as the latter becomes operational in 2022.

**Objective 2: To increase hydropower generation capacity**

Rating: High

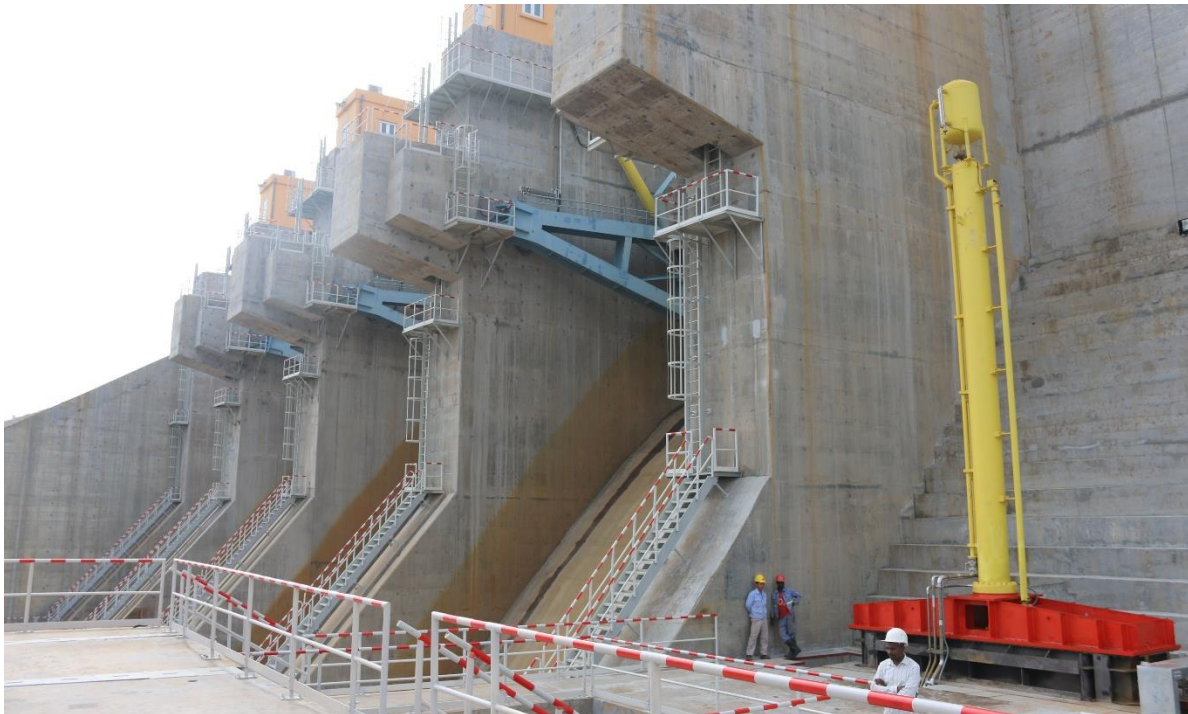
31. The regulation dam was completed and commissioned 15 months ahead of the initial project closing date. The constructed dam is a mixed structure approximately 1.3 km long and 55 m high, composed of a roller-compacted concrete core at the bottom of the valley, extended on the banks by rock-filled embankments. The main dam is completed by a right-bank embankment saddle dam, which serves to close a topographic depression. The dam was successfully commissioned in June 2017 (see figure 2 and figure 3), ensuring the regulation of the Sanaga River and increasing the generation in the downstream plants by 450 GWh per year, equivalent to an additional installed capacity of 120 MW. There is a reoxygenation weir downstream of the dam, and the other associated infrastructures include (a) access roads outside and inside the Lom Pangar site and (b) the residential city for different categories of manpower that worked on the dam construction.



**Figure 2. Aerial View of the Lom Pangar Dam and Reservoir after the Final Impounding**



**Figure 3. Partial View of the Lom Pangar Dam**

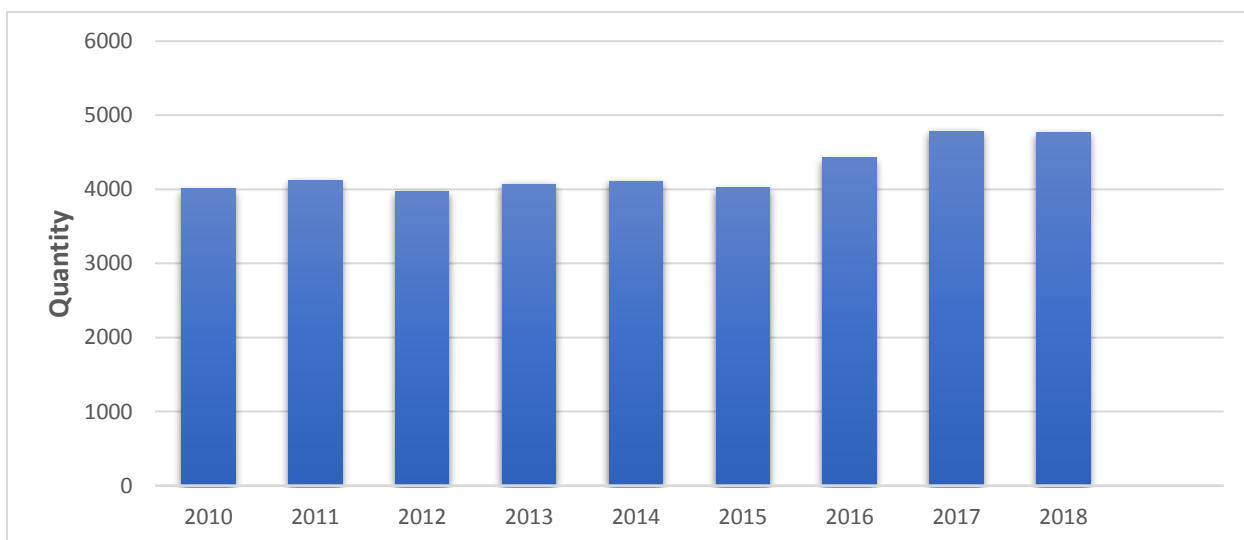




32. **The complete impoundment of the reservoir occurred in June 2016, allowing the maximum of water storage starting 2017 and increased electricity generation.** The partial impoundment of the reservoir took place in September 2015; as a result, the amount of water stored and used in 2016 amounted to 3 billion m<sup>3</sup>. The amount of additional energy produced in 2016 was 323 GWh. The complete impoundment of the reservoir took place in June 2016, allowing an increase in the amount of water stored and used in 2017 to 6.284 billion m<sup>3</sup>. The amount of additional energy produced in 2017 was 684 GWh.

33. **The quantity of energy produced by the downstream power plants (Edéa and Song Loulou) surged after the partial impounding in 2016 and increased by 19 percent in 2017 compared to the 2015 level.** The completion of the dam and the reservoir impoundment allowed to (a) improve the production capacity of the two existing hydropower plants downstream (Song Loulou and Edéa); (b) unlock the hydropower potential of the Sanaga River (estimated at up to 6,000 MW) by reducing seasonal variability of flow and attract private investments on downstream concessions; and (c) over time, lower electricity production costs with inexpensive hydropower generation. Figure 4 illustrates the surge in electricity production in downstream hydropower plants following the complete impoundment of the reservoir.

**Figure 4. Annual Quantities of Energy Produced by the Edéa and Song Loulou Power Stations in GWh**



Source: EDC.

34. **The work to build the Lom Pangar hydropower plant and the HV line from the Lom Pangar site to the Bertoua provincial city is under way.** The financial partners (the AfDB, BDEAC, and GOC) have firmly committed to provide the funding for the Lom Pangar 30 MW power plant and the HV line and the rural electrification. The awarded firm (China CAMC Engineering) launched the construction activities of the Lom Pangar hydropower plant in March 2019 for a duration of 32 months. At the current rate of work progress, the commissioning timetable of the plant is as follows: (a) completion of the evacuation station in March 2021 and (b) the commissioning of the four units respectively in May, July, September, and November 2021. Another consortium group (CEGELEC Maroc/CEGELEC Cameroun) has been awarded the construction of the HV transmission line linking Lom Pangar and Bertoua and the Bertoua station in 24





months, and the work progress was estimated at 6 percent (earthworks and deforestation) as of June 2019.

35. The planned completion of the Lom Pangar hydroelectric plant by 2021 will increase the quantity of energy produced between 141.5 GWh and 270.1 GWh. The electricity production by the plant will be gradually increasing following the commissioning schedule of the units and respectively put in operation in April, June, August, and October 2021. Expected production starting 2022 with respect to the operational mode of reservoir management is as follows: (a) 141.5 GWh in management mode prioritizing the Sanaga basin regulation (utilization factor of 54 percent) or (b) 270.1 GWh in the management mode prioritizing hydropower generation (utilization factor of 100 percent). Figure 5 shows a chronogram of delivery of the Lom Pangar hydropower plant, the transmission line linking the power plant to the Bertoua provincial city, and the MV/low-voltage (LV) distribution lines serving the cities of Abong-Mbang and Batouri.

**Figure 5. Chronogram of Delivery of the Lom Pangar Plant and the Associated Transmission and Distribution Infrastructure**

	Duration in months	2018		2019		2020		2021	
		S2	S1	S2	S1	S2	S1	S2	
<i>Foot plant/Evacuator station</i>	32								
<ul style="list-style-type: none"> <li>▪ Evacuator station</li> <li>▪ Unit 1</li> <li>▪ Unit 2</li> <li>▪ Unit 3</li> <li>▪ Unit 4</li> </ul>				Works were launched on March 15, 2019					<b>Delivery expected:</b> <ul style="list-style-type: none"> <li>▪ Post on March 15, 2021</li> <li>▪ Unit 1 on May 15, 2021</li> <li>▪ Unit 2 on July 15, 2021</li> <li>▪ Unit 3 on Sept. 15, 2021</li> <li>▪ Unit 4 on Nov.15, 2021</li> </ul>
<i>Line 90kV Lom Pangar -Bertoua, and Bertoua Station</i> <ul style="list-style-type: none"> <li>▪ Line 90kV Lom Pangar</li> <li>▪ Bertoua Station</li> </ul>	24	Works were launched on Nov. 26, 2018							<ul style="list-style-type: none"> <li>▪ Commissioning of the line on Nov. 26, 2020</li> <li>▪ Station delivery on October 01, 2020</li> </ul>
<i>Line 90kV Abong Mbang-Bertoua, Line 90kV Bertoua/Batouri and the Abong-Mbang and Batouri stations.</i>	24	Contract at negotiation phase							
					Works planned to start on October 01, 2019				
<i>Construction of the LV and MV distribution network, and public lighting in Bertoua.</i>	20	Contract at negotiation phase							
					Works planned to start on October 01, 2019				
<i>Construction of the LV and MV distribution network, and public lighting in Abong-Mbang</i>	19	Contract at negotiation phase							
					Works planned to start on October 01, 2019				
<i>Management system of the prepaid meters</i>	6	Works planned to start on March 1, 2020							

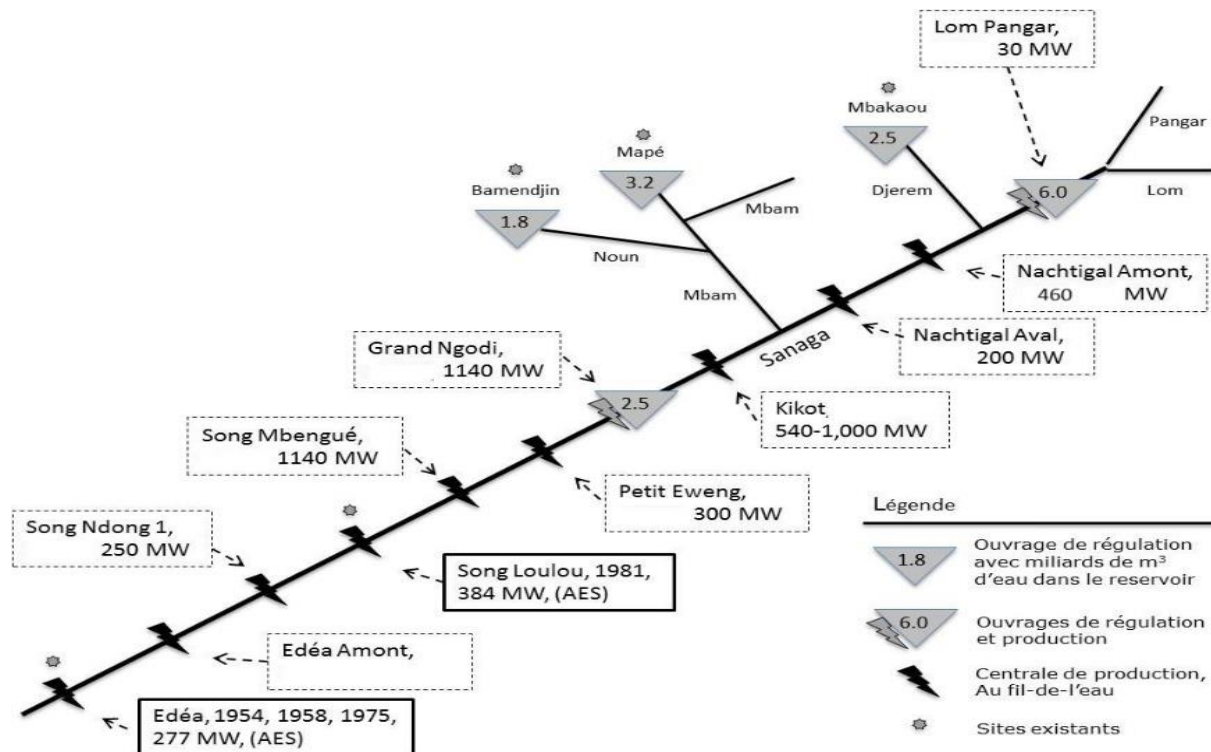
Source: EDC

36. The LPHP was a critical step toward unlocking the downstream privately developed Nachtigal Hydropower Project and the capacity of existing hydropower plants on the Sanaga River and increasing the river’s overall generating potential. The Nachtigal project was approved by the World



Bank Group (IFC, the World Bank, and Multilateral Investment Guarantee Agency [MIGA]) in July 2018 and will give an additional installed capacity to Cameroon. Moreover, Lom Pangar regulation has allowed to increase the firm energy produced downstream at Song Loulou and Edea hydropower plants and this additional firm energy is equivalent to an added installed capacity of 120 MW. This impact will be identical on any future downstream projects. Based on the estimated potential of the Sanaga downstream of Lom Pangar, the equivalent installed capacity to this increase in energy production is estimated to 1,250 MW. This brings significant added production to the downstream sites with increased firm energy being a major added value for bankability. The figure 6 below shows the scheme of hydropower development on the Sanaga Basin

Figure 6. Scheme of Hydropower Development on the Sanaga Basin



Source: EDC.

**Objective 3: To increase access to electricity**

Rating: Substantial

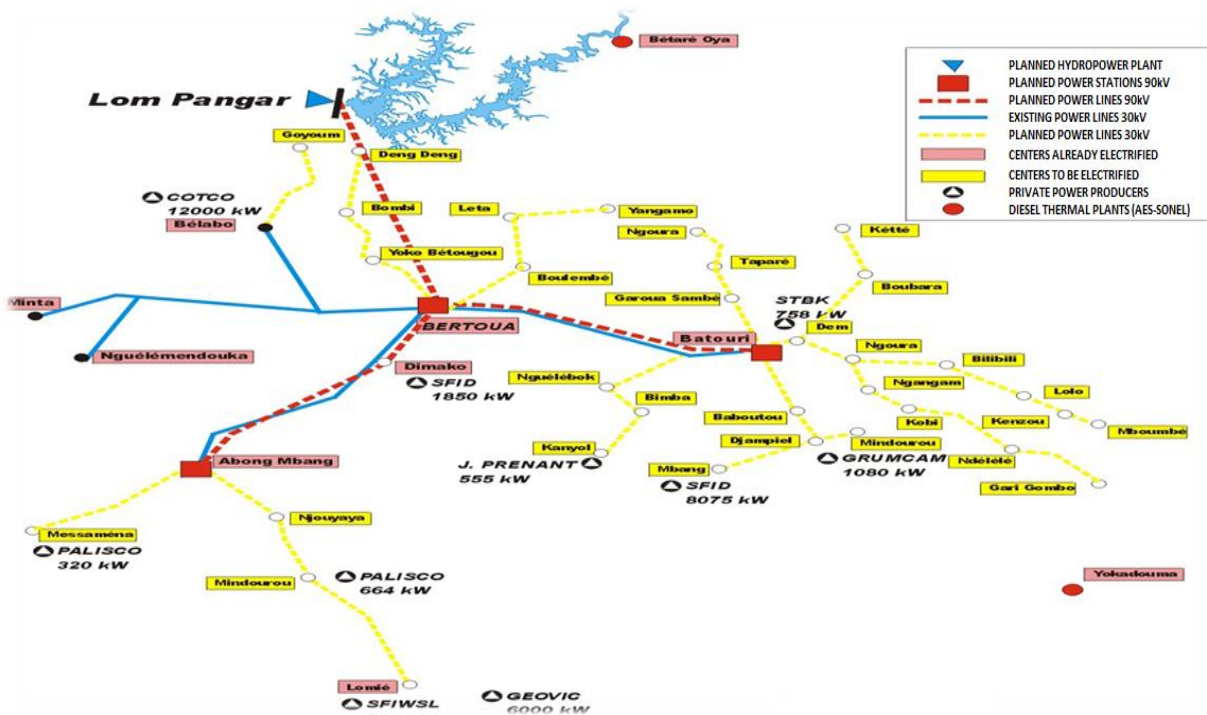
36. **Increased access to electricity will arise from the completion of the transmission lines and electric stations funded by the project.** With the already-secured funding from the GOC and the AfDB, the following activities are under way: (a) the construction of a 105 km transmission line in 90 kV to connect the Lom Pangar plant to the HV/MV substation in Bertoua and (b) the construction of 200 km of HV lines from the Bertoua substation to the two substations to be built in Batouri and Abong-Mbang.



37. **Additional installations in support of increased electricity access are also under way.** With the already-secured funding from the GOC and the BDEAC, the following activities have started and will be completed by 2022: (a) the installation of 25 stations of 50 kVA, (b) the installation of 170 substations of 25 kVA, (c) the construction of 800 km of MV lines and 200 km of LV lines, (d) the supply and installation of 10,000 single-phase and three-phase connections, (e) the installation of 100 public lighting, and (f) the acquisition of batches of meters for 5,000 connections.

38. **The completion of the HV/MV/LV transmission and distribution lines will allow increased energy connection.** Figure 6 illustrates the configuration of the site of the Lom Pangar dam and reservoir, including the position of the power plant; the HV line linking Lom Pangar and the localities of Bertoua, Abong-Mbang, and Batouri; and finally the localities surrounding the Bertoua City and the posts of Abong-Mbang and Batouri that will benefit from electrification as soon as all HV/MV/LV lines have been installed. As illustrated in figure 6, the completion of the above-described activities will enable the electrification of 150 localities in the Eastern Region of Cameroon, including nine headquarters of administrative units and the connection of 10,000 new subscribers.

Figure 7. Planned Electrification Supplied by the Lom Pangar Hydropower Plant



Source: EDC.

39. **Increased connection to electricity will also arise from the reduction of seasonal variability brought in by the LPHP.** The reduction of seasonal variability of the flow of water of the Sanaga basin will



allow the Song Loulou and Edéa power plants to provide enhanced electricity services, including the possibility to expand energy services. The 2017 Energy of Cameroon (ENEO) annual report indicated that countrywide there were about 100,000 new connections during the period after the completion of the dam construction (2015-2017). A portion of those connections occurred in the Southern Interconnected Network, which includes the power plants of the Sanaga basin.

40. **A higher number of households benefitted from an increased energy service.** At project closure, there were 1,184,372 connected households in the Southern Interconnected Network that benefitted from an improved electricity production at Song Loulou and Edéa plants. Applying an average of five persons per household, direct project beneficiaries reached 5,921,860, against the target of 5,143,000.

**Justification of Overall Efficacy Rating**

Rating: High

41. Performance toward the PDO indicator targets was either High or Substantial as summarized in Table 2 and in the following paragraphs:

- (a) Achievements toward reducing seasonal variability of water flow in the Sanaga River are high, because the level of guaranteed all-season water flow on the Sanaga River was significantly increased by 44.4 percent, and exceeded by 1 percent the PDO indicator target, which was met 36 months ahead of the revised project closing date.
- (b) Performance toward increased hydropower generation capacity is high, because the quantity of energy produced by the downstream power plants surged by 19 percent in 2017 compared to the 2015 level. The project also unlocked the privately developed Nachtigal Hydropower Project and the Sanaga River’s overall generating potential is estimated to reach 1,250 MW.
- (c) Toward the third objective, results will be substantial and will include (i) a higher number of households that will benefit from an increased energy service and (ii) increased connections to electricity that will also arise from the completion of the construction of the Lom Pangar power plant and the HV/MV/LV transmission and distribution lines.

**Table 2. Status of PDO Indicators at End-June 2019**

	<b>Results Indicators</b>	<b>Baseline</b>	<b>Original Targets in 2012</b>	<b>Achievement at End-June 2019</b>	<b>Comments</b>
1	Quantity of hydroelectricity additionally generated under the project: (a) At the two existing plants on the Sanaga River (GWh)	0	601	684	<b>Exceeded.</b> The target of quantity of additional hydroelectricity was exceeded by 14 percent at end-June 2019, reflecting an increase in water supply to the downstream plants following the final dam impounding in June 2016.



	Results Indicators	Baseline	Original Targets in 2012	Achievement at End-June 2019	Comments
	(b) New capacity at Lom Pangar (GWh)	0 GWh	223 GWh	0 GWh	<b>Partially achieved.</b> The Lom Pangar power plant is in full-speed construction (20% completed). The power turbines will be gradually and one each commissioned in May, July, September, and November 2021. Expected yearly production starting 2022 with respect to the operational mode of reservoir management is as follows: (a) 141.5 GWh in management mode prioritizing Sanaga basin regulation (utilization factor of 54%) or (b) 270.1 GWh in the management mode prioritizing hydropower generation (utilization factor of 100%).
2	Guaranteed all-season water flow of the Sanaga River	720 m <sup>3</sup> /s	1,040 m <sup>3</sup> /s	1,050 m <sup>3</sup> /s	<b>Exceeded:</b> The level of guaranteed all-season water flow on the Sanaga River significantly increased by 44.4 percent, and the target was slightly exceeded by 1 percent. After the complete reservoir impoundment in June 2016, it was possible to store 6.284 billion m <sup>3</sup> of water that was used during 2017. The latter has allowed the flow of water of 1,050 m <sup>3</sup> /s to Song Mbengue for 100% of the time.
3	Number of households newly connected to the electricity grid	0	2,400	0	<b>Partially achieved.</b> The following activities have been launched and are expected to be finalized by June 2022: (a) the construction of a 105 km transmission line in 90 kV to connect the Lom Pangar plant to the HV/MV substation in Bertoua and (b) the construction of a 200 km MV line from the Bertoua substation to the 2 other substations to be built in Batouri and Abong-Mbang. Activities are under way to electrify 150 localities in the Eastern Region, including the headquarters of 9 administrative units and the connection of 10,000 new subscribers.
4	Direct Project Beneficiaries (number)	0	5,143,000	5,921,860	<b>Exceeded.</b> The target was exceeded by 15 percent. At project closure, there were 1,184,372 connected households in the Southern Interconnected Network that benefitted from an improved electricity production at Song Loulou and Edéa plants. Applying an average of 5 persons per household, direct project beneficiaries reached 5,921,860.
5	Direct Project Beneficiaries (number) of which female (percentage)	0	50.6	50.6	<b>Achieved.</b> The target was fully achieved. The assumption underlying the performance under this PDO is that changes in providing electricity services that affected the connected households affected the female members in the same way and proportion.

Source: EDC.



## C. EFFICIENCY

### Assessment of Efficiency and Rating

Rating: Substantial

42. **The economic and financial efficiency of the project was high.** The PDO was achieved with an economic internal rate of return (EIRR) at 28 percent, an economic net present value (ENPV) of XAF 199.6 billion or US\$445.6 million, and a levelized cost of XAF 93/kWh or US\$0.2/kWh, using the appraisal's principle of discounting to 2011 at 10 percent discount rate in 2008 real prices. The ENPV was equivalent of about 1.7 percent of the gross domestic product (GDP) of Cameroon in 2008. Using the World Bank's guidance on the social discount rate estimated at 5 percent, the ENPV was XAF 603 billion or US\$1.3 billion with a levelized cost of XAF 101/kWh or US\$0.2/kWh. At appraisal, the ENPV was XAF 184 billion or US\$411 million and the EIRR was 18 percent, with a levelized cost of XAF 32/kWh or US\$0.1/kWh. The ENPV was equivalent of about 1.6 percent of Cameroon's GDP in 2008. The project also contributed to avoiding greenhouse gases (GHGs) and local air pollutants from the reduced use of thermal generation capacity, as the total CO<sub>2</sub>e abated is estimated at about 16 million tons (undiscounted).

43. **The fiscal impacts of the project were positive.** Avoided fuel costs in the electricity sector and saving in the petroleum sector totaling XAF 13.5 billion per year in 2008 real prices at an estimated Cameroonian Government's targeted return on equity (ROE) at 4 percent, real,<sup>2</sup> could contribute to reducing the Government's operational subsidies for ENEC (for example, XAF 24.5 billion in nominal prices or 0.1 percent of the GDP in 2017) and to potentially increasing liquefied natural gas (LNG) export. The potential fiscal impact was reflected in the financial analysis as the Government is the owner of the project. The impacts of taxes, social security, employment and housing funds contributions, the foreign exchange premium (FEP), and so on (captured in the distribution analysis in annex 4) and the service and commitment charges would be insignificant.

44. **Financial results showed net benefits to financiers and the Government as the owner of the project.** From the total project investment perspective, the financial net present value (FNPV) was XAF 727 billion or US\$1.6 billion discounted at an estimated weighted average cost of capital (WACC) of 3 percent, real, as a proxy of the financial opportunity cost of capital (FOCC), with a financial internal rate of return (FIRR) of 37 percent and a levelized cost of XAF 142/kWh or US\$0.3/kWh. Annual debt service coverage ratios (ADSCRs) and loan life cover ratios (LLCRs) were satisfactory. From the owner's perspective, the FNPV was XAF 834 billion or US\$1.9 billion at the ROE of 4 percent, real, with an FIRR of 70 percent and a levelized cost of XAF 137/kWh or US\$0.3/kWh. The appraisal included neither an FNPV nor an FIRR in the PAD.

45. **Administrative and implementation efficiency was rated Substantial.** The total project administration cost was about 5.7 percent of the total project cost at completion, compared to 5.4 percent at appraisal. The actual project cost was higher than the expected cost at appraisal mainly due to the increased cost of the dam, and most of the additional cost was covered by the borrower's resources. The project closing date was extended from December 31, 2018, to June 28, 2019, to complete the LDP. However, one financier (the BDEAC) could not provide the needed resources on time to fund the Lom

<sup>2</sup> Based on the Government's five-year treasury bonds to finance infrastructure for 2016–2021 at nominal 5.5 percent.



Pangar Plan and the transmission and distribution infrastructure and the rural electrification. This incident significantly affected the operational efficiency of the project and some achievements were delayed. However, performance in completing the main infrastructure was outstanding, as the dam and the reservoir were delivered 15 months ahead of the project closing date.

#### D. JUSTIFICATION OF OVERALL OUTCOME RATING

Outcome Rating: Satisfactory

46. The PDOs were highly relevant, as the scope of the project was right and the PDOs were in line with the priorities of the borrower and the World Bank's strategy in Cameroon. Overall efficacy of the project is rated High, because the results toward increasing hydropower generation capacity and reducing seasonal variability of water flow in the Sanaga River are high, while performance toward increasing access to electricity was substantial. The project's efficiency was rated Substantial, justifying a rating of Satisfactory for the project's overall outcome.

#### E. OTHER OUTCOMES AND IMPACTS (IF ANY)

##### Gender

47. **The female population near the Lom Pangar site will take advantage of improved energy access and service, and the new infrastructure completed in the context of the LPHP, but the impact scope has not been assessed yet.** Improved energy access and service from the project's outcome will positively influence both the female and male populations. It is expected that direct project beneficiaries will reach about 5,921,860 people (see Table 3) and that ongoing activities will permit the electrification of 150 localities in the Eastern Region of the country, including the headquarters of nine administrative units and the connection of 10,000 new subscribers. About 50.6 percent of the beneficiary population is female and will benefit from enhanced electricity service.

48. **The female population living in the proximity of the Lom Pangar site has benefited from the programs of compensation and resettlement and of restoration of livelihood conditions initiated to mitigate the social risks of the LPHP, but the impact scope is not documented yet.** With the support of the project, EDC has launched programs aimed to (a) compensate and resettle the displaced households and (b) restore the livelihood conditions of the households that were affected by the inundation caused by the dam construction and reservoir impoundment. Compensations covered (a) the destroyed crops and valuable property, (b) the resettlement of displaced people, (c) the restoration of community infrastructure in the districts of Belabo and Bétaré Oya, and (d) the assistance to vulnerable people. Beneficiaries of these program were predominantly independent females or females who are members of households.



**Table 3. Implementation of the Community Compensation and Reinstallation Program<sup>3</sup>**

Location	Infrastructures	Other Types of Supports and Compensations	Comments
<b>BELABO DISTRICT</b>			
LOM PANGAR	<ul style="list-style-type: none"> <li>• 2 classrooms</li> <li>• 1 health unit</li> <li>• 1 teachers' housing</li> <li>• 2 drying areas</li> <li>• 1 mosque</li> <li>• 1 church</li> <li>• 52 dwellings, with toilets and kitchens</li> </ul>	<ul style="list-style-type: none"> <li>• Food supports three times</li> <li>• Capacity building of farmers, pastoralists, and fishermen</li> <li>• Support farmers and pastoralists</li> <li>• Provision of seeds and tools for farmers</li> <li>• Distribution of agricultural land</li> </ul>	<ul style="list-style-type: none"> <li>• All planned infrastructure, restoration actions, and improvement of living standards were completed.</li> </ul>
OUAMI	<ul style="list-style-type: none"> <li>• A common house</li> <li>• A classroom - primary</li> <li>• Drying area</li> <li>• A water well</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity building for farmers, pastoralists, and fishermen</li> </ul>	<ul style="list-style-type: none"> <li>• All planned infrastructure was completed. However, other restoration actions and improvement of living standards were not provided.</li> </ul>
HAMAN	<ul style="list-style-type: none"> <li>• Drying area</li> <li>• A water well</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity building for farmers, pastoralists, and fishermen</li> </ul>	<ul style="list-style-type: none"> <li>• All planned infrastructure was completed. However, other restoration actions and improvement of living standards were not provided.</li> </ul>
DEOULE	<ul style="list-style-type: none"> <li>• A common house</li> <li>• Drying area</li> <li>• A water well</li> </ul>	<ul style="list-style-type: none"> <li>• Food offerings</li> <li>• Land for bricks press</li> <li>• Capacity building for farmers, pastoralists, and fishermen</li> </ul>	<ul style="list-style-type: none"> <li>• All planned infrastructure, restoration actions, and improvement of living standards were completed.</li> </ul>
GOYOUM	<ul style="list-style-type: none"> <li>• A common house</li> <li>• 1 health unit</li> <li>• A water well</li> <li>• A classroom - high school</li> </ul>	<ul style="list-style-type: none"> <li>• Compensation for 14 farmers displaced on the site of relocation of Lom II village</li> <li>• Food offerings</li> <li>• Distribution of agricultural land</li> <li>• Support for seeds and tools for farmers</li> <li>• Capacity building of pastoralists, farmers, and fishermen</li> </ul>	<ul style="list-style-type: none"> <li>• All planned infrastructure was completed. Some actions of restoration and improvement of living standards remain to be done.</li> </ul>
LOM II	<ul style="list-style-type: none"> <li>• Drying area</li> <li>• A water well</li> <li>• 1 mosque</li> <li>• A palaver shed</li> </ul>	<ul style="list-style-type: none"> <li>• Food supports three times</li> <li>• Capacity building of pastoralists, farmers, and fishermen</li> <li>• Provision of seeds and tools for farmers</li> <li>• Distribution of agricultural land</li> </ul>	<ul style="list-style-type: none"> <li>• All planned infrastructure, restoration actions, and improvement of living standards were completed.</li> </ul>

<sup>3</sup> These activities were funded jointly by IDA and the AFD.





Location	Infrastructures	Other Types of Supports and Compensations	Comments
	<ul style="list-style-type: none"> <li>9 dwellings + 9 toilets + 9 kitchens</li> </ul>		
<b>NGOURA DISTRICT</b>			
PETIT NGAOUNDERE	<ul style="list-style-type: none"> <li>A common house</li> <li>A water well</li> <li>Two classrooms - primary</li> </ul>	<ul style="list-style-type: none"> <li>Food offerings for traditional rituals to welcome the resettled people</li> </ul>	<ul style="list-style-type: none"> <li>All planned infrastructure was completed. Some actions of restoration and improvement of living standards remain to be done.</li> </ul>
GARGA SARALI	<ul style="list-style-type: none"> <li>A common meeting house</li> <li>A water well</li> <li>Two classroom halls - primary</li> <li>An administrative office unit</li> <li>A kitchen and a toilet</li> </ul>	<ul style="list-style-type: none"> <li>Support for drugs and small equipment at the Integrated Health Center</li> <li>Distribution of agricultural land to affected farmers</li> <li>Capacity building of pastoralists and fishermen</li> <li>Support for income-generating activities for vulnerable people</li> <li>Food offerings for traditional rituals to welcome the resettled people</li> </ul>	<ul style="list-style-type: none"> <li>All planned infrastructure was completed. Some actions of restoration and improvement of living standards remain to be done.</li> </ul>
<b>BÉTARÉ OYA DISTRICT</b>			
WOUMBOU	<ul style="list-style-type: none"> <li>Pastoral well with waterer equipped with hand pump</li> </ul>	--	<ul style="list-style-type: none"> <li>All planned infrastructure was completed. However, other restoration actions and improvement of living standards were not provided.</li> </ul>
NDANGA GANDIMA	<ul style="list-style-type: none"> <li>A common meeting house</li> <li>1 health unit</li> <li>A water well</li> </ul>	<ul style="list-style-type: none"> <li>Food offerings for traditional rituals to welcome the resettled people</li> </ul>	<ul style="list-style-type: none"> <li>All planned infrastructure was completed. However, other restoration actions and improvement of living standards were not provided.</li> </ul>
NDOKAYO	<ul style="list-style-type: none"> <li>A mini court house</li> <li>6 classroom halls</li> <li>3 water wells</li> </ul>	<ul style="list-style-type: none"> <li>Support for drugs and small equipment</li> <li>Distribution of agricultural land</li> <li>Food offerings for traditional rituals to welcome the resettled people</li> </ul>	<ul style="list-style-type: none"> <li>All planned infrastructure was completed. Some actions of restoration and improvement of living standards remain to be done.</li> </ul>
GBERI	<ul style="list-style-type: none"> <li>Pastoral well with waterer equipped with hand pump</li> </ul>	—	<ul style="list-style-type: none"> <li>All planned infrastructure was completed. However, other restoration actions and improvement of living standards were not provided.</li> </ul>



Location	Infrastructures	Other Types of Supports and Compensations	Comments
BÉTARÉ OYA	<ul style="list-style-type: none"><li>• 8 kitchens and 8 toilets</li></ul>	<ul style="list-style-type: none"><li>• Capacity building and support to livestock breeders</li></ul>	<ul style="list-style-type: none"><li>• All planned infrastructure was completed. However, other restoration actions and improvement of living standards were not provided.</li></ul>
BODOMO-ISSA	<ul style="list-style-type: none"><li>• 4 classroom halls</li><li>• 1 health unit</li></ul>	<ul style="list-style-type: none"><li>• Food offerings for traditional rituals to welcome the resettled people</li></ul>	<ul style="list-style-type: none"><li>• The class halls are completed at 76%. The construction of the health box has not started yet. However, other restoration actions and improvement of living standards were not provided.</li></ul>
BOULI	—	<ul style="list-style-type: none"><li>• Support for drugs and small equipment</li><li>• Capacity building and support to livestock breeders</li><li>• Food offerings for traditional rituals to welcome the resettled people</li></ul>	<ul style="list-style-type: none"><li>• The class halls are completed at 76%. The construction of the court house has not yet started. Other actions of restoration and improvement of planned living standards have been performed.</li></ul>
Villages in the proximity of Bétaré Oya (Taparé Salao and Longa Mali)	—	<ul style="list-style-type: none"><li>• Food offerings for traditional rituals to welcome the resettled people</li></ul>	<ul style="list-style-type: none"><li>• No infrastructure has been planned in these localities.</li></ul>

Source: EDC



## Institutional Strengthening

49. **The enhancement of technical capacity within EDC was a result of its operational exposure, as well as the training and the oversight of a large project implementation.** The oversight of the LPHP was an opportunity for EDC's staff and the Project Implementation Unit (PIU) to interact with the multiple domestic and external stakeholders, including the construction firm, the owner's engineer, and the independent technical teams which oversaw the construction of the dam and the mitigation of the dam safety issues and E&S risks. Moreover, EDC's staff participated in multiple domestic and overseas training, including in the areas of geotechnical and structural surveillance of dams; concession contracts; and PPP management of technical, legal, and financial aspects of large infrastructures. The technical and operational exposure and the training contributed in strengthening EDC's technical teams, which grew more competent in handling the managerial and operational tasks of oversight of the construction of a large dam and hydropower infrastructure.

50. **Due to EDC's performance in the oversight of the implementation of the LPHP, EDC's mandate and responsibilities were expanded.** The timely completion of the construction of the Lom Pangar dam and the reservoir impoundment was a nationally remarked accomplishment by both the Government and the public. Because of this achievement, a Presidential decision was made to bring under EDC's management the Memve'ele dam and hydropower plant, an infrastructure jointly funded by the GOC (15 percent), China Export-Import Bank (58 percent), and the AfDB (27 percent). The Memve'ele plant, whose cost amounted to about US\$800 million, was expected to inject 201 MW of electricity into Cameroon's energy supply network.<sup>4</sup> The fact that EDC is entrusted with the management of the Memve'ele dam confirms the perception that the oversight of the LPHP has strengthened EDC's institutional capacity. However, a deeper analysis and stronger oversight are required to ensure that this new responsibility will be an opportunity to strengthen its financial stance and its managerial and technical performance.

51. **The Government's oversight of the development of the regional district harboring the Lom Pangar site was strengthened to preempt and address the E&S risks expected to arise from the completion of the dam and the reservoir.** At project approval, all key domestic and external stakeholders were aware of the massive risks of the construction of the dam and the reservoir on the physical site of Lom Pangar and the people living in the proximity of the dam and reservoir. To preempt and address the eventual E&S risks, protocols were signed between EDC and seven ministerial departments overseeing finances, health, security, forest and wildlife, agricultural and rural development, fisheries and husbandry, and handicrafts and culture. At project closure, progress by the respective ministries was variable, but very limited in general. However, the support and contribution of the AFD and the E&S independent technical team (*Audit Technique Environnemental Et Social Indépendant*, ATESI) were substantial in providing TA and advice needed to address the environmental risks.

**By the time of project closing, EDC had prepared a manual establishing the E&S management standards during the period of dam and reservoir exploitation.** A manual of exploitation was prepared according to international standards and aimed to provide advice and guidance for the implementation and operation to all staff in charge of technical and environmental monitoring of the hydroelectric development of the Lom Pangar site. The manual defines the Environmental Management System of the

<sup>4</sup> <https://china.aiddata.org/projects/289>.



operator's activities to continuously improve the E&S management of the hydroelectric development of Lom Pangar. The overarching purpose is for the management of the completed infrastructure to contribute to sustainable development and ensure continuous improvement of environmental performance and make sure that there is no fatal accident, no work accident, and no occupational disease. This manual intends to address issues related to E&S risks during the period of exploitation of the Lom Pangar dam and reservoir that can be considered as a case of institutional strengthening of EDC. The manual was prepared by the Owner's Engineer and updated by EDC with the help of the E&S panel of expert and was submitted to the Bank for review prior to closure of the project.

### Mobilizing Private Sector Financing

52. **Multiple reforms supported by the World Bank in the energy sector led to important results associating the private sector in energy undertakings.** The partnership between the GOC and the World Bank Group has resulted in key institutional reforms in the energy sector, including (a) the creation of a regulator and a rural electrification agency in 1999; (b) the concession of the historical utility to a private operator in 2001 (ENEO); (c) the opening of the sector to independent power producers (IPPs); and (d) under the 2011 Electricity Law, further unbundling of the sector through transfer of the transmission network from the private utility to a separate state-owned entity, SONATREL (*Société Nationale de Transport de L'électricité*).

53. **The completion of the LPHP contributed to unlocking the privately developed Nachtigal Hydropower Project for which IFC played an anchor role.** The Nachtigal project was approved by the World Bank Group in July 2018, when IFC coordinated 11 development finance institutions and five local commercial banks to mobilize long-term financing for the Nachtigal Hydropower Project. Consequently, commercial banks provided the equivalent of US\$200 million in local currency at a tenor of 21 years, accounting for 19 percent of the total project debt. Furthermore, IFC provided an equity investment in the amount of up to €60 million (US\$70 million equivalent) and a loan in the amount of up to €130 million (US\$152 million equivalent) and client risk management swaps having in aggregate an expected loan equivalent exposure of up to US\$10 million. The opportunities created by the completion of the Lom Pangar were critical to the bankability of the Nachtigal Hydropower Project.

54. **The commitment of resources from the commercial banks to the Nachtigal project required the issuance of IBRD and MIGA guarantees.** Toward finalizing the Nachtigal project, the World Bank Group mobilized the following long-term guarantees: (a) an IBRD payment guarantee backstopping the GOC's obligation to reimburse draws on the line of credit, which forms part of the power purchase agreement payment security, and (b) an IBRD loan guarantee provided comfort to local commercial lenders, thereby allowing them to extend the tenor of their loans beyond the seven-year regulatory limit. MIGA provided guarantees in the total amount of up to €224.8 million (US\$262.5 million equivalent) to three private investors, including Energie de France (EDF International SAS of France) and Société Générale S.A. of France. This funding strengthened the project company's financial soundness and creditworthiness and its governance. While there are funds and institutional investors supporting the power infrastructure in certain developing markets, Nachtigal Hydropower Company is the developer of one of the largest private sizable greenfield hydropower projects in Sub-Saharan Africa.



### Poverty Reduction and Shared Prosperity

55. The project's contribution to the country's growth and prosperity occurred and might increase in the future, but it remains generally marginal and unassessed. The immediate value added of the project will come from two recent developments: (a) the increased electricity production from the plants downstream of the dam and the Lom Pangar plant under construction, with its ensuing improved energy access and service, and (b) the growing economic activity (fishing and agriculture) launched by the population that has been settling around the Lom Pangar reservoir. Compared to the global economic output of the country, the abovementioned value added remains marginal, albeit not yet quantified. However, as discussed earlier, the Lom Pangar dam and reservoir will lead to an increase in Sanaga River's overall generating potential from 1,750 MW to 3,000 MW. This expansion of energy production within the Sanaga basin will have a multiplier effect on the country's economic activity in many sectors and may reach a substantial level.

56. **The project's contribution to poverty reduction occurred, but it remained generally localized and unassessed.** The project's key impact on the poor includes infrastructure and equipment provided through the community compensation and reinstallation program activities and the livelihood restoration plan of people affected by the dam and reservoir. Infrastructure and activities completed in the context of the LDP were in the areas of education, health, water, and other infrastructure (see Table 3). The impact on the local poor population is real, but it is generally unassessed.

57. **A regional workshop supported by the project came up with a framework for an improved management of externalities induced by the influx of population near the reservoir.** Key conclusions of the June 2018 workshop included the following: (a) to study the social, spatial, cultural, and economic change in the concerned localities of the department of Lom and Djerem; (b) to optimize and make coherent plans and/or development frameworks implemented or supported by public organizations and bilateral, multilateral, and/or national and international nongovernmental organizations in the cantons concerned; (c) to develop and validate a hybrid action plan to be implemented immediately as well as in the short, medium, and long term by involving all the Government and local authorities concerned to limit the accentuation of the problems linked to the influx of populations, especially migrant fishermen; and (d) to put in place a framework for monitoring and evaluation (M&E) of the implementation of the hybrid action plan under the authority of the Governor of the Eastern Region. The sustainability of the resources and opportunities created by the new reservoir will depend to a large extent on the implementation of this framework and plan.

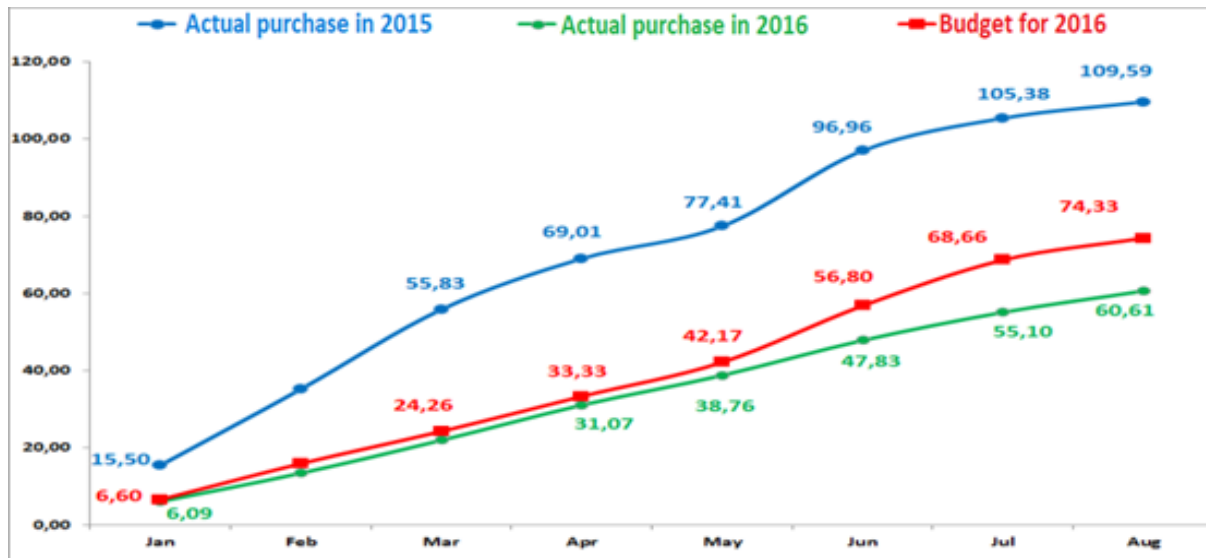
### Other Unintended Outcomes and Impacts

58. **The completion of the regulation reservoir led to reduced consumption of diesel oil in the thermal electricity generation.** The immediate impact of the 44.4 percent increase in the guaranteed all-season water flow on the Sanaga River (from 720 m<sup>3</sup>/s before to 1,050 m<sup>3</sup>/s after the dam construction) was the reduction of the purchased diesel from August 2015 to August 2016, which dropped by 45 percent as shown in Figure 6. These savings have improved further during the period 2017–2019, with the final reservoir impoundment in June 2016 that allowed the jump of the volume impounded up to more than 6 million m<sup>3</sup>, its intended maximum storage capacity. This substantial drop in the consumption of diesel must have generated gains in the entities (including ENEO) overseeing the production and the distribution



of electricity and should have been beneficial to the entire energy sector. A more detailed study could account better for the impact of the regulation reservoir on the efficiency of the electricity sector.

Figure 6. Actual Purchase of Diesel in millions of liters



Source: ARSEL.

59. **The completion of the dam and the reservoir triggered the development of fishing and agriculture activities, which has transformed the initial economic and social fabric of the Lom Pangar site and reservoir.** According to the July 2019 report prepared by ATESI,<sup>5</sup> 1,050 fishermen are currently active on the site, three existing cooperatives have been restructured, seven new cooperatives were created, and four cooperative accounts were opened (Bouli, Bétaré Oya, Lom Pangar, and Haman). Regarding the fishing equipment and infrastructures, 200 boats are operational. Fishing has generated an economic circuit based on a set of small trades starting from the bag salesman to the manufacturer of canoes and the motorcycle taxi. Ouami is the main village, with a population estimated at about 10,000 to 12,000 people from about 5,000 people in 2015. The Ouami mini port remains the most accessible in all conditions, but fishing is carried out in many camps all around the reservoir. The reservoir completion has created a fertile agricultural zone (the reservoir annual drawdown area), which is inundated during the rainy season and proper for agriculture during the dry season. Protocols were signed between EDC and the different sectoral ministries at project effectiveness, but the results related to the oversight of social and economic issues generated by the massive arrival of migrants in search of the fallout of the fishing are limited.

**Due to improper planning and logistical issues, quality timber was immersed following reservoir impounding and this provoked a huge financial loss for the country's economy and might be the source of other adverse effects.** According to the forestry study conducted by Pöyry and ONF International, the flooded forest area (54,000 ha) contained about 1.4 million m<sup>3</sup> of timber, including about 440,000 m<sup>3</sup> of

<sup>5</sup> ATESI, Rapport d'audit No. 13, June 2019.



red wood, 350,000 m<sup>3</sup> of ayous, and 250,000 m<sup>3</sup> of fraké. Only 10 percent of the forest resources in the Lom Pangar reservoir site were recovered. The rest of the wood flooded during impoundment resulted in a significant financial loss, as 100 percent exploitation of the 1.4 million m<sup>3</sup> of timber would have generated an income of about XAF 48.6 billion (including XAF 2.8 billion of municipal taxes) and represented an export value greater than XAF 62.9 billion<sup>6</sup> for the most valuable species (ayous, bété, doussie, and fraké). The lack of planning for the wood removal activity ahead of time and granting the exclusivity of the wood removal to only Forest Stewardship Council-certified operators, thus excluding all local operators, are some of the key reasons that provoked the immersion of valuable timber and the country's financial loss. Furthermore, there are other adverse effects arising from the lack of clearing, such as blockage of the reservoir outlet works due to floating timber and build-up of corrosive gases such as H<sub>2</sub>S which can lead to corrosion of the turbine water passages with the passage of time.

### III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

#### A. KEY FACTORS DURING PREPARATION

##### Project Design

60. **The project design was informed by the World Bank's lessons learned from similar projects implemented in other countries.** Key lessons that were incorporated in the project design include the following: (a) the need to associate investment lending and the strengthening of sectoral foundations support, through the combination of IDA-financed projects and a comprehensive TA supporting reforms of energy sector entities and E&S aspects of energy projects; (b) the consideration of alternatives and design options, as well as E&S mitigation/enhancement measures, to ensure the adoption of the least-cost generation option validated by feasibility studies; (c) a result-based rather than an input-based approach to safeguards; (d) an emphasis on field-based project preparation and supervision with support from a team of leading experts at headquarters; (e) a comprehensive communication strategy that was to be implemented during project preparation and implementation; and (f) finally, the inclusion of a technical audit on E&S measures.

61. **The PDOs were clear and had measurable and achievable targets.** The three PDOs were to (a) increase hydropower generation capacity, (b) reduce seasonal variability of water flow in the Sanaga River, and (c) increase access to electricity. The three PDOs aimed to step up the delivery of high-quality energy services to an increasing number of the country's population. The Results Framework identified indicators to measure performance in the three areas of focus that were measurable and achievable.

62. **The World Bank used its convening capacity to associate external donors with key internal stakeholders for the project preparation and implementation.** Project preparation involved cooperation between the five project donors (the World Bank, EIB, AfDB, BDEAC, and AFD) and leveraged their strengths and presence on the ground, allowing the mobilization of adequate financial resources and the presence of a multidisciplinary team with a dual perspective of integrated water resources management and energy development that considers the broad range of social, economic, and environmental issues.

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<sup>6</sup> At the rate of XAF 583.85 per U.S. dollar, the equivalent in loss in gross export receipts is estimated at about US\$100.00 million.



For the LPHP, a key lesson was that donor preparation and supervision teams should be adequately resourced and staffed and include field presence. Moreover, the hydropower project used the potential synergies and efficiencies available to support a broader landscape of development and poverty alleviation. The local development program included in the LPHP had investments in social infrastructure to support local or regional economic development that were to be executed in parallel with the AFD.

63. **Given the importance of E&S risks, the project design provided categories of resources for strong mitigation measures and actions.** The project underscored the importance of E&S risks by including a Component 3 devoted to addressing them in a comprehensive manner, with a donor (the AFD) taking the lead in the mobilization of the required financial resources and the needed TA. Mitigation strategies were derived from other IDA-financed large infrastructure projects in Africa and included the following: (a) careful identification and assessment of downstream ecology and habitat impacts, (b) extensive formal and informal consultation with, and participation by, stakeholders and project-affected persons, (c) provision of external independent monitoring through a third-party audit, (d) mechanisms for sharing project benefits with project-affected persons, and (e) adequate funding for ESMP implementation. Toward project's benefits sharing, the GoC created the 58,000-hectare Deng-Deng National Park as biodiversity offset for the LPHP, and a critical habitat for gorillas and other forest wildlife. The water rights of nearly XAF30 billion was to be paid directly to EDC by the Power utility and part of the water rights was supposed to be annually dedicated to sustainable management of Deng-Deng National Park, but implementation is still work in progress. LPHP also used non-monetary benefit sharing approach to ensure that local communities benefit from the dam construction by implementing the Local Development Plan described under Table 3.

#### Implementation Arrangements and Capacity

64. **While institutional and implementing arrangements were complex, the line of project coordination and supervision was clear.** A Steering Committee under the authority of the Prime Minister and chaired by the Secretary General of the Prime Minister's office and including representatives from the presidency, ministries involved in the project, and EDC had the oversight of the project implementation. Two additional committees had to report to the Steering Committee: (a) the existing committee supervising AfDB-financed energy projects was to supervise Component 2 of the project and (b) the existing regional monitoring committee was to link different ministries at the regional level. Project activities were to be coordinated by EDC, the GOC's asset holding company in the electricity sector and the sole implementing entity for donor-financed activities under the project. The project was managed under the supervision of EDC's general manager with the LPHP's project coordinator being responsible for the day-to-day management of the project activities.

65. **Because of the PIU's limited local expertise, it was supported by the Government and independent experts funded by the donors.** Given the relatively weak in-country technical and managerial capacity relating to hydropower at entry, the use of a small PIU in EDC was deemed appropriate. The PIU was to be headed by the LPHP's project coordinator and staffed by EDC personnel supplemented by a small number of specialists financed by donors. This included two senior international advisers (a technical specialist on an intermittent basis and an environmental specialist on a full-time basis), a senior engineer serving as a deputy director, a senior environmental specialist, an M&E specialist, a communications specialist, and procurement and financial management (FM) staff. EDC established a

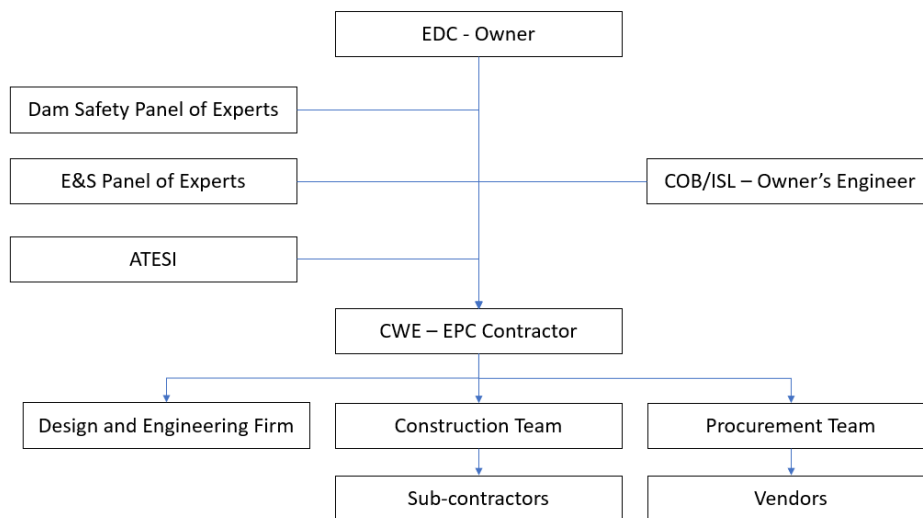




PIU sub-office in Bertoua for regional outreach as well as a team based at the dam construction site in Lom Pangar. Multiple ministries played a regulatory, supervisory, or supporting role for the project. Several ministries played important roles in the implementation of the LPHP, though they did not have fiduciary responsibilities.

66. **The competitive selection of the owner’s engineer and the two independent panels of experts (dam safety and E&S panels) was key to putting the project on a good track.** EDC recruited and mobilized an owner’s engineer to supervise preparatory works and the construction of the regulating dam. An engineering supervision firm was selected competitively to supervise all other engineering works. According to the safety of dams policy (OP/BP 4.37), two independent panels of experts (E&S panel and dam safety panel) provided guidance to EDC during project preparation and continued to do so during the implementation phase. The regulator ARSEL was responsible for setting electricity tariffs. As such, it was closely involved in the studies for and drafting of the water rights secondary legislation and monitored the impact of the LPHP on electricity tariffs as part of its ongoing regulatory activity. In addition, ARSEL sets the tariff to be paid to auto producer for the power supplied to the public grid on a ‘cost of service’ basis.

Figure 7. Implementation Arrangement for EPC Contractor oversight



### Risk Assessment

67. **Most risks were identified at appraisal, except for the default of a financier, and while most of them materialized, they were successfully mitigated.** Table 4 describes the risks that materialized and how the World Bank team and the key stakeholders worked together to minimize the risks and their consequences.



**Table 4. Developments Related to the Key Risks Identified at Project Approval**

Major Identified Risks	Mitigation Actions or Consequences of Absence of Remedy
Country risks: governance and performance (High)	The risk did not materialize, because of strengthened mitigation measures, including the following: (a) the national priority status of the project triggered a clear authorizing environment from the highest levels of government and (b) corruption risks were significantly reduced given that the two major contracts for the project (dam construction and the independent supervisory engineer) were procured according to the World Bank procurement guidelines. However, the overall context of poor governance and lack of transparency has negatively affected the PIU performance in exerting its fiduciary controls and responsibilities, resulting in the project’s FM rated Unsatisfactory at project closing.
Sector risk: benefit capture of downstream hydropower resources (Substantial)	The risks of slow investments in future hydropower plants and inadequate demand to justify downstream hydropower development did not materialize. However, there is a risk that industrial anchor customers will receive preferential treatment compared with domestic users. There is a need to verify two developments: (a) the maximization of the development impact of further hydropower generation in the Sanaga basin through industrial users making lumpy investments in hydropower and (b) the selling of part of the electricity they produce into the public grid for other users at a cost-reflective price.
Sector risk: weak sector governance (High)	The risk materialized and remains an obstacle to improving the efficiency of the electricity sector. There was a risk that the delays in completing the secondary legislation could adversely and directly affect the LPHP. The status of a final draft decree and a corresponding order for the introduction of a water tariff—to ensure the long-term financial sustainability of the LPHP including recurrent financing of the Deng Deng National Park (DDNP)—are pending. A secondary legislation that was to define the process for optimizing future hydropower developments along the Sanaga River in a way that the downstream concessions are shared and the associated lower cost hydroelectric power costs benefit the population has not been completed yet.
Implementation risk: capacity and coordination weaknesses of implementing entities	The risk did not materialize. The project was implemented under the oversight of the office of the Prime Minister and the President, the former chairing the Steering Committee. Since its establishment in December 2011, the Steering Committee and its technical secretariat in the Prime Minister’s office have played a critical role in uniting various ministries and agencies and in accelerating the pace of project preparation.
Implementation risk: poor execution of safeguards instruments (High)	The risk materialized, but mitigation measures and instruments were in place, including (a) a sophisticated set of E&S safeguards instruments, (b) a heightened stakeholder awareness for the need to be proactive in ensuring compliance with these instruments, (c) the hiring of an internationally recruited environmental adviser and a reputable international firm as an independent supervisory engineer responsible for safeguards supervision of works, and (d) a regular third-party technical audit of safeguards measures that will also ensure compliance with safeguard policies. Given the enormity of the E&S challenges, performance of mitigation efforts was mixed, as rating was Moderately Unsatisfactory for most part of the project implementation.
Implementation risk: induced impact risks (High)	The risk materialized, because of the large upstream and downstream scope of technical, operational, and E&S impacts. On the positive side, the project includes an extensive monitoring program on induced and cumulative impacts, and a funding has been available to address identified impact risks.
Implementation risk: hydrological and technical risks (High)	The risk materialized as competing interests between saving water in the dam for later use versus production of the 30 MW at the Lom Pangar powerhouse may emerge, especially during dry years. Climate change and increases in consumptive water use for



Major Identified Risks	Mitigation Actions or Consequences of Absence of Remedy
	agriculture, industry, and potable water production can potentially put more pressure on the river basin and dam operation. Unless there are adequate understandings between potential stakeholders, hydrological and technical risks might endanger the expected long-term efficiency of the project.
Risk of financiers' default (Unidentified)	This risk of financiers failing to provide resources on time was unidentified at appraisal, but it materialized and negatively affected the implementation of Component 2 of the project. A participating development bank had committed to partially fund the activities identified under Component 2 but failed to fund on time the launch of the construction of the Lom Pangar power plant and a transmission line to provide rural electrification. This situation created delays and required new financing arrangements among the financiers through which the Government and the AfDB committed to provide resources to initiate the construction of the power plant and the transmission line, while the regional development bank was to eventually fund the rural electrification.

## B. KEY FACTORS DURING IMPLEMENTATION

### Coordination among Key Stakeholders and Technical Capacity

68. **While implementation arrangements were complex, the overall supervision of the project was effective due to the Government's commitment exemplified by the close oversight by the office of the Prime Minister and the provision of counterpart funding.** The project implementation comprised multiple players in the donor community and in the local stakeholders. Progress could not happen if there had not been a consensus among the five financiers and their full participation, as well as the collaboration of public and nongovernmental entities. At the technical level, the PIU management was effective in monitoring the activities on-site, while at the coordination level, the meetings organized under the Prime Minister's office with the participation of the President's office settled all conflictual issues, thus allowing everybody to stay focused on the delivery of the critical infrastructure. Despite a tight fiscal stance, the Government provided the needed counterpart funding and intervened financially when a financier defaulted to launch the construction of the plant.

69. **While there was a close coordination between the Government and key donors, the default by one financier negatively affected the overall project implementation progress.** Overall, both the Government and the other four financiers (the World Bank, EIB, AfDB, and AFD) were timely in disbursing and in following up with their contractual commitments. However, the BDEAC could not be ready to fund on time the launch of the construction of the hydropower plant and the transmission line. New funding arrangements had to be worked out among financiers to allow the funding of the power plant, the transmission line, and the rural electrification component of the project.

70. **Performance of the PIU was strengthened by the effectiveness of the owner's engineer (Coyne et Bellier/ISL [COB/ISL]) and two independent panels of experts (dam safety and E&S).** At design, two independent panels (E&S panel and dam safety panel) were created, and they played a key advisory role throughout the project implementation. The dam safety and the handling of E&S issues were the critical factors that needed the most attention to make sure that the project was on the right track. The regular meetings of the panels and their substantive reports were critical to the project advancement and the progress achieved toward expected results. The regular review of the pending no-conformities by the two



technical panels has contributed to the quality of work in the construction of the dam and the handling of the E&S issues which emerged during project implementation. The owner's engineer (COB/ISL) played a key role of checks and balances in the oversight of key tasks undertaken by the construction company (China International Water & Electric Corporation [CWE]) and the technical panels and worked productively with the two technical panels to oversee the quality of works and to provide the needed TA.

71. **There were delays in strengthening the technical capacity in the PIU.** Component 4 of the project had resources devoted to project management and capacity building in the PIU and the electricity sector. Because of the pressure of project implementation, formal training, other than on-the-job capacity building, was minimal until the last quarter before the project closure. During the last supervision mission in March 2019, a training plan was agreed upon to be implemented during March–June 2019, with attention to (a) training in operations, (b) E&S safeguards, (c) construction contract management, and (d) the instrumentation of hydroelectric works. The training did not replace the contractual obligations of the contractor and the consulting engineer in terms of capacity transfer and training essential to the proper operation of the structure but complemented it in a wide range of subjects related to development and management of large infrastructures.

### Sector Governance and Fiduciary Management

72. **The major reform of the electricity sector was work in progress and indirectly affected the project efficiency.** The main goal of the Government-led electricity reform aimed to unbundle the electricity sector and to open it up to the private sector. The GOC continued to update and develop the secondary legislation in the form of application decrees to clarify implementation of the principles stated in the 2011 Electricity Law. The stated intention was to (a) enable the Government to extend the transmission network itself and (b) enable open access to future IPPs and thereby pave the way for a more open electricity market. The GOC had started to update and develop the secondary legislation in the form of application decrees to clarify the implementation of the principles stated in the 2011 Electricity Law. Key aspects that were addressed are the following:

- (a) The water rights - redraft the decrees and ordinances already in place and ensure that planned mechanisms are operational (who does what, when, and how) and increased visibility and equity regarding the aspects of collection (resources) and their use (expenditures)
- (b) The integrated water resources management at two levels:
  - (i) Operational, permanent, advisory, and technical
  - (ii) Executive and decision
- (c) Finally, the study on the hydro potential on the Sanaga River

73. **The procurement of the project's goods and services was facilitated by finalizing the key contracts ahead of project launch.** The institutional arrangement was in line with the Financing Agreement. A procurement specialist oversaw procurement activities. An internal EDC tender committee was responsible for contracting project contracts. The PIU indicates that most of the work on the various contracts has progressed in terms of implementation and will have to be completed before the end of the



project. However, it is noted that some ongoing procurement operations, like those that have been the subject of the ex post review, are experiencing some delay in implementation. Attention should also be paid to the management of securities for infrastructure contracts, considering the delays in the realization of guarantees, resulting in delays in the final delivery that may not be completed before the closure of the project. Before the end of the project, the World Bank's procurement team plans to conduct contract management audits relating to (a) the construction of the structure and (b) the project works management.

74. **There was a disconnect between the FM of project financial resources and the way performance was reported through Implementation Status and Results Reports (ISRs).** The FM performance was mostly rated Satisfactory throughout the period of project implementation. However, supervision missions (since November 2015) were often concerned about the completeness of the accounts (particularly, the counterpart funds) and have requested that a comprehensive and detailed account of the use of counterpart funds since the beginning of the project, by component and by activity, be produced and transmitted to the World Bank. An action plan had been developed by EDC, but many points of this action plan have not been realized, to the extent that the supervision mission indicated that the project's financial statements could be systematically rejected, in application of the measures provided in the Credit Agreement up to and including suspension of disbursements.

75. **The tendering process for the construction of the Lom Pangar dam started in 2010 and resulted in the selection of CWE as main contractor, with a contract signature on August 12, 2011 and a commencement date of the work on September 29, 2011.** On September 24, 2014, almost three years into construction, The World Bank Group announced the debarment of (CWE) and its controlled affiliates for a period of three years with conditional release. The debarment is part of a Negotiated Resolution Agreement between the World Bank and CWE following an investigation by the World Bank's Integrity Vice Presidency (INT) into allegations of sanctionable practices involving the company in a hydropower project in Africa and a roads project in South East Asia.

76. **The debarment of the construction company (CWE) had negative effects on the project's disbursement process.** The suspension of the dam construction contractor for three years starting September 24th, 2014, had led the World Bank to stop the finance of any amendment containing a significant change in the contract signed with CWE. The consequence of this provision was that the expenses related to the contracts approved and/or signed before that date were eligible for World Bank financing, while those associated with the amendments or subsequent amendments would not be, at least for the most part. The complexity arising from this situation was that the initial agreement between EDC and the contractor was based on the understanding that the prices were adjustable in the margin of 2 percent of the total contractual amount. Moreover, additional services could be carried out within the frame of the original contract, using work orders issued by the employer/owner's engineer, and thereafter regularized through contract amendments.



## IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

### A. QUALITY OF MONITORING AND EVALUATION (M&E)

#### M&E Design

Rating: Substantial

77. **The M&E framework was simple, inclusive, and consistent with the theory of change.** The comprehensive M&E framework aimed to assess project performance in achieving outcomes, and project impacts were presented in Annex 1 of the PAD. The framework identified key performance indicators, data collection methods, a timetable for collection, and responsible agencies. The PIU in EDC was responsible for the overall management and implementation of the project M&E framework. EDC was to closely coordinate with government agencies, donors, and other stakeholders to ensure efficient data for M&E of outcomes. There was an agreement between the implementing agency and the GOC on data collection and reporting responsibilities. The tools to be used for project M&E included progress reports compiled by the PIU in EDC based on implementing agencies' input. These reports were to be used by the Steering Committee and the donors for monitoring and for periodic technical audits of E&S measures.

78. **The M&E framework was focused on the impact of the energy infrastructure, neglecting to measure the performance in mitigating E&S risks and separate the outcomes by co-financier.** While the project had components devoted to addressing E&S and capacity-building issues, the Results Framework had no indicators to gauge achieved performance in these areas. The PDO indicators aimed to gauge the impact of the electricity infrastructure (additional energy generated, and additional households connected to the grid), and their relevance in achieving the project objectives, but no PDO indicators were identified to measure the performance achieved after the completion of activities supporting E&S risks and capacity building. Finally, the identification of the PDO indicators did not distinguish among outcomes supported by different donors.

#### M&E Implementation

79. **Aide Memoires, ISRs, and technical panel reports were the key instruments for M&E implementation.** Because of the intensity of the works to build a regulation dam and reservoir, the enormity of the E&S risks, and the diversity of the stakeholders, many supervision missions took place, and they were sanctioned by Aide Memoires (15 in total). Aide Memoires were comprehensive and detailed and kept all stakeholders abreast of project implementation on the ground, including key challenges. The technical reports prepared by the dam safety and the E&S panels played an advisory role regarding the work quality in the construction of the regulation dam and in addressing the E&S challenges. The ISRs prepared twice per year drew upon the Aide Memoires and the panel reports narratives, prepared and updated the status of the performance indicators, and informed the World Bank management of progress toward outcome to get guidance to move ahead with project implementation.

#### M&E Utilization

80. **M&E information and data conveyed through the Aide Memoires, ISRs, and panels reports were key to efficacy of project implementation.** The project implementation relied heavily on the M&E data



and information conveyed periodically to the management entities through the Aide Memoires and the ISRs. For instance, the data and information provided through Aide Memoires and ISRs were used to address the case of a defaulting financier which had stalled the launch of the construction of the power plant and the transmission line. Similarly, the reports prepared by the technical and E&S panels were central to identifying the corrective measures to address unexpected challenges in the construction of the regulatory dam and other unintended obstacles.

### Justification of Overall Rating of Quality of M&E

81. Overall, the project's M&E performance was rated Substantial. The M&E design was simple, but the Results Framework could have been strengthened, M&E implementation was effective as regular reporting (ISRs and Aide Memoires) informed key stakeholders on the project progress toward outcome, and M&E utilization contributed to providing input to adjust implementation to ground realities.

## B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

### Environmental and Social Compliance

Rating: Moderately Unsatisfactory

82. **To address the E&S risks identified at appraisal, several mitigation policies were triggered.** The project was classified as a Category A according to the World Bank's policy on environmental assessment, and seven safeguard policies were triggered: (a) Environmental Assessment (OP/BP 4.01), (b) Natural Habitats (OP/BP 4.04), (c) Pest Management (OP/BP 4.09), (d) Physical Cultural Resources (OP/BP 4.11), (e) Involuntary Resettlement (OP/BP 4.12), (f) Forests (OP/BP 4.36), and (g) Safety of Dams (OP/BP 4.37). Moreover, there were two other environmental issues that needed to be taken care of: (a) the DDNP was identified as an environmental offset for the footprint of Lom Pangar dam and reservoir, and it mattered to ensure the viability of the Deng Deng forest's population of endangered large primates, and (b) the adaptation of Chad-Cameroon pipeline had to be managed according to the World Bank Group standards, and the Cameroon Oil Transportation Company carried out a Specific Environmental and Social Impact Assessment for the adaptation works and had also updated the Area Specific Oil Spill Response Plan.

83. **Context and significance of the Inspection Panel.** On December 1, 2017, the Inspection Panel received a Request for Inspection of the Republic of Cameroon: Lom Pangar Hydropower Project from two former workers of the project. The report included concerns relating to working hours, workers' weekly rest, annual leave, right to work issues, job security, occupational safety and health, discrimination based on race, and retrenchment. The Panel registered the request on December 22, 2017. Bank's management issued its response on February 9, 2018, stating that the Bank had carefully reviewed the issues raised in the Request and noting that they were known to the Bank and borrower. Bank's management explained that the Bank has worked during the implementation of the project to satisfactorily address and resolve the issues. Bank's management indicated that, in light of the significant turnover in the workforce over the lifetime of the project, some of the measures put in place by the borrower and contractor over the years may not have benefited every worker who left the worksite before these measures were implemented. A detailed Action Plan was therefore prepared including the increase in scope and staffing of the project's GRM to review and address grievances of current and former workers, and a communications campaign to reach out to current and former workers to inform them of



the extended GRM. The Bank also recruited a local consultant to support supervision, the design of the extended GRM and the outreach campaign. The Panel on March 16, 2018, recommended to the Board that the project not be investigated. In making that recommendation, the Panel took into account management's acknowledgement of the issues raised in the Request and its commitment to work closely with the borrower to understand and address any outstanding grievances. The Board on March 30, 2018, approved the Panel's recommendation. In March 2019, an update on the implementation of the Action Plan evidencing its completion was submitted to the Panel and disclosed on its website.

84. **Improvement in the compliance with legal norms in the management of the Lom Pangar work sites was inspired by regular ATESI<sup>7</sup> visits and a review by the World Bank's Inspection Panel.** With 23 cases of noncompliance opened against the construction company (CWE) after the first E&S audit, the number quickly dropped below 10 from the third audit and then continued to decrease steadily to 2 at the twelfth audit in 2017. This steady improvement resulted from the combination of several factors, including (a) the dedication of CWE and EDC's teams, (b) regular ATESI visits that reinforced the justification of the E&S requirements, and (c) a review by the World Bank's Inspection Panel that led to the strengthening of an Office of Grievances Settlement, which prepared monthly reports on the progress on the social front of the project and implemented an action plan that addressed most of the social site complaints. At project closure, the situation at the Lom Pangar sites was as follows: (a) all construction sites were overall properly demobilized and rehabilitated by CWE, (b) the Navy, the Army, and the Police were on the ground to ensure the safety of people and infrastructure on the site, (c) EDC needed to figure out how to maintain a permanent medical center to ensure the safety of the teams operating the dam and the plant, after the departure of the firm currently constructing the hydropower plant, and (d) most of the social complains had been addressed, and the remaining ones were being handled by the two programs set up to compensate, reinstall, and restore the livelihoods of the affected people (see paragraph 86).

85. **To mitigate the risks linked to the dam's exploitation and potential downstream impacts, higher expertise is still needed to coordinate the entities overseeing the dams on the Sanaga River.** Three accidents were recorded downstream of the dam during project implementation, and the Project Dam Safety Panel underscored the need for coordination between entities operating in the Sanaga basin. At project closure, there were still downstream safety risks for riparian populations and other users of the river during rapid changes in flow rates, and ATESI recommended that EDC urgently recruits an engineer with safety skills expertise to manage the Lom Pangar dam and coordinate with those managing downstream dams to anticipate potentially critical situations. Finally, to ensure the quality of water downstream, ATESI recommends that the management team ensures the monitoring of the level of dissolved oxygen on a daily or weekly basis.

86. **Mitigation of the social impacts has been conducted through (a) the Community Compensation and Reinstallation Program and (b) the program for livelihood restoration for the affected people.** The implementation of the Community Compensation and Reinstallation Program (the World Bank and AFD) led to the construction of six classrooms equipped with benches and tables, 42 latrine blocks, 35 water wells equipped with hand pumps, 21 drying areas, 2 nursing homes; 2 community homes, 2 market sheds,

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<sup>7</sup> ATESI is an association of private entities which contracted with EDC to prepare quarterly M&E reports on the E&S aspects during the implementation of the LPHP. By June 2019, 13 detailed reports were prepared.





and 2 tracks to develop in 15 villages directly affected by the deterioration of the water quality of the reservoir (see Table 3). Regarding the program for livelihood restoration for the affected population, focus has been on agriculture and livestock to improve yields and diversification through the introduction of value-added crops where soils are suitable. An inventory of agricultural and livestock production has been carried out, but the program for livelihood restoration is still at a starting phase and includes the preparation and implementation of LDPs and Cantonal Development Plans, including activities launched by EDC to manage the influx of people to Ouami (classrooms, health units, solar panels, antenna relay, and drilling).

87. **The completion of the dam and the regulating reservoir created major impacts on the forest inside and outside the DDNP, and their management requires enhanced expertise and oversight.** Key identified challenges and priorities to address environmental risks in the proximity of the DDNP are the following: (a) an expert entrusted with the oversight mission of all environmental impacts inside and in the periphery of the DDNP must be recruited, (b) the logging in the forests between Lom and Pangar has become a major concern that EDC has little control over, (c) the anti-poaching program continues with more or less encouraging results, and the implementation of the mobile patrol program should be expanded to the set of peripheral areas as a priority, and (d) finally, the design and implementation of the future PPP that will manage the DDNP must be finalized as a matter of priority.

88. **By the time of project closing, EDC had prepared a manual establishing the E&S management standards during the period of dam and reservoir exploitation.** The manual established the international standards, included and updated the ESMP for the operation phase, and provided advice and guidance for the dam and reservoir operation to all staff in charge of environmental monitoring of the hydroelectric development of Lom Pangar. The manual defines the Environmental Management System of the operator's activities to continuously improve the E&S management of the hydroelectric development of Lom Pangar.

## Fiduciary Compliance

### Financial Management

Rating: Unsatisfactory

89. **While ISRs reported mostly satisfactory FM of the project, an interview of PIU staff uncovered that the conduct of FM operations and transactions was challenging throughout the period of project implementation.** The FM performance was mostly rated Satisfactory throughout the period of project implementation, except for the last ISR. However, supervision missions (since November 2015) were often concerned about the completeness and truthfulness of the project's accounts. The March and June 2019 supervision missions concluded that the administrative, financial, and accounting management of the project was unsatisfactory due to the recurrent shortcomings noted in the budget monitoring, internal control, the non-implementation of the recommendations from the various reviews, the absence of the inventory report of fixed assets, and the deficiencies in the keeping of the accounts and bank reconciliation statements.

90. **The quality of quarterly FM reports was below standards.** The quarterly financial monitoring reports to the World Bank were untimely and required amendments before being deemed acceptable



from the point of view of FM. Their review called for comments on (a) the lack of information on budget monitoring, procurement, and the technical status of the project; (b) the shortcomings on reconciliation statements; (c) inconsistencies between the financial tables; (d) the large balances of the advance accounts that needed to be justified and cleared on time; and (e) the non-inclusion of comments from the review of previous Financial Monitoring Reports (*Rapports de Suivi Financier- RSF*), which justifies their recurrence.

91. **There were major FM weaknesses, pointing to difficulties in closing the project accounts three months ahead of the project closing date.** The March 2019 supervision mission pointed out the non-submission of the project budget to the World Bank, resulting in ineffective monitoring of project activities and exposing the project to high risk of ineligible expenditure and inefficient management of project resources in relation to the objectives set. The June 2019 supervision mission rated the FM system Unsatisfactory due to the non-respect of the contractual obligations with regard to FM while the project was closed, the non-start of the audit of the 2018 accounts after the contractual deadline of transmission of final audit reports to the World Bank, recurrent shortcomings in budget monitoring and internal control, non-implementation of recommendations from the various reviews, absence of the asset inventory report, and major breaches in accounting and bank reconciliation statements. The key requirements were (a) to accelerate the finalization of the project clearance of accounts mission, (b) to launch the audit of the 2018 accounts and the closing accounts and transmit the final reports to the World Bank promptly, and (c) to ensure clearance of debts and proper justification or reimbursement of Client Connection for unjustified advance balance.

92. **The performance of the FM of the project mirrored the governance challenges in the public sector management.** While recent development of the public FM in Cameroon suggests that progress has been under way in budget preparation and procurement, limited internal controls, weak accounting and reporting, and an absence of adequate external audit continued to disrupt transparency and accountability in the public FM. Performance of the project's FM was negatively affected by the country's context of weak financial transparency and accountability.

#### **Procurement**

Rating: Satisfactory

93. **The performance of procurement operations was satisfactory throughout the period of project implementation.** Procurement operation was rated Satisfactory in all ISRs prepared during project implementation. Two factors contributed to the good performance: (a) local capacity was of good quality and (b) the main project's contracts related to the hiring of the construction company and the owner's engineer that were recruited ahead of time, and both firms were experienced in the oversight and the construction of dams.

94. **The debarment of the construction company (CWE) negatively affected the World Bank's contribution to the project's funding.** The suspension of the contractor (CWE) for a period of three years starting September 24th, 2014, had led the World Bank to make the decision not to finance any amendment containing a significant change in the contract signed with CWE. The consequence of this provision was that the expenses related to the contracts approved and/or signed before that date were eligible for World Bank financing, while those associated with the amendments or subsequent



amendments would not be. A third amendment was however approved among parties before the project closing on June 29<sup>th</sup>, 2019 and authorized the World Bank to fund and disburse to cover eligible activities approved after the debarment, provided that the works were deemed necessary for the completion of the dam according to state-of-the-art and international standards. While this amendment allowed the World Bank to cover some key works and activities including the anti-erosion pit (*Pré-fosse d'érosion*), the remaining costs related to dam construction fell under the responsibility of the borrower.

### C. BANK PERFORMANCE

#### Quality at Entry

Rating: Satisfactory

95. **The World Bank's completed, or ongoing hydropower projects and the World Bank's convening power were brought to bear on the design of the project.** Lessons from analytical work on hydropower development carried out by the World Bank inspired and guided the maturation and the design of the project. Moreover, lessons from similar ongoing and past World Bank-financed hydropower projects, such as the Bujagali project in Uganda and the Nam Theun 2 project in Laos, were factored in the design of the project. Finally, the convening power of the World Bank was able to mobilize other bilateral and multilateral donors that supported the project, including the EIB, AFD, AfDB, and BDEAC.

96. **The statement of the PDOs was precise and the scope of World Bank's contribution was measured.** The World Bank was mostly involved in funding and implementing Components 1 and 4. The focus of the World Bank was to build the dam and the reservoir and support capacity building and project implementation. Because of the importance of E&S issues, the World Bank partially contributed to addressing social issues arising from the infrastructure completion through the funding of the LDP.

97. **The project was built on the congruence of interests identified between the borrower and the World Bank.** The country's Strategy for Growth and Employment 2010–2019 aimed to increase non-oil growth by investing in key infrastructure, improving productivity and the business climate, and strengthening human development and regional integration. In the energy sector, actions included increasing hydropower production and renewable energy, boosting energy efficiency, and reducing losses through improved transmission and distribution. The World Bank Group's CPF for 2017–2021 had two pillars devoted to modernizing the electricity infrastructure and achieving outcomes in that sector. The World Bank was able to identify that commonality of interests and to build the project on it.

98. **While the Results Framework was mostly suitable, there was room for improvement.** The PDO indicators were uniquely focused on achieving results in the water regulation, electricity production, transmission, distribution, and access. However, the abovementioned results could not be achieved if the E&S and technical capacity goals are not sustainably maintained. Components 3 and 4 were identified to make sure that environmental sustainability and dam management are warranted in the long run. Performance in implementing Components 3 and 4 was weak in part because there were no adequate PDO performance indicators. The Results Framework could have better indicators to monitor environmental and technical capacity sustainability. Finally, a Results Framework for a project funded by multiple financiers has the potential risks of penalizing those that effectively provide the financial resources when others default.



99. **Implementation arrangements were complex, but coordination setup was strong.** Because of the many internal and external stakeholders, the institutional and implementation arrangements were complex. On the external front, it was a daunting task to work out adequate implementation protocols among a bilateral donor (the AFD) and four multilateral development banks (the World Bank, AfDB, BEI, and BDEAC). On the internal front, implementing the project required that most ministries be associated, including all national stakeholders in the electricity sector. The Steering Committee chaired by the Secretary General of the Prime Minister's office, which included representatives from the presidency and the PIU, played an oversight role that allowed every stakeholder to provide its contribution to the project implementation.

### Quality of Supervision

Rating: Satisfactory

100. **The early recruitment of the construction company and the owner's engineer set the project on a good track of implementation.** The World Bank project team succeeded in the timely hiring of the construction company (CWE) and the owner's engineer (COB/ISL). Despite initial difficulties of collaboration, the two firms succeeded over time to work together and to move forward with the construction of the dam and the reservoir. A clear division of responsibilities and contractual framework between the construction company, the owner's engineer, and the PIU set the stage for accelerating the implementation of Component 1 and allowed the completion of the dam and the regulating reservoir ahead of time.

101. **A strong World Bank team on the ground and regular supervision missions were key to addressing effectively implementation challenges.** From the outset until project closure, the World Bank was in full force in the country office, with the presence of a country director and successive resident task team leaders (TTLs). Having the presence of the World Bank management on the ground and a resident TTL increased the interaction between the borrower representatives, the World Bank team, and other project stakeholders. Moreover, there were several supervision missions comprising representatives from the borrower, the World Bank, and other co-financiers.

102. **Project supervision benefitted strongly from the advice from the two panels of experts (dam safety and E&S).** The dam safety and the handling of E&S issues were the critical factors that needed the most attention to make sure that the project remains on the right track. The multiple field visits and meetings of the two technical panels and their substantive reports were critical to the project advancement and the progress achieved toward expected results.

103. **Efforts to overcome E&S challenges were dwarfed by the limited human and financial resources.** All project stakeholders were aware of the E&S risks since the outset, but earmarked resources to mitigate E&S risks were in disproportion with the magnitude of the ground challenges. Despite the scope of human and financial resources devoted to addressing the E&S issues, the performance in addressing those questions was rated Moderately Unsatisfactory throughout the period of project implementation. In hindsight, the project design should have dug deeper to understand E&S challenges and earmarked larger resources to tackle them, including unexpected developments such as the influx of populations who were attracted by the fishing potential following the completion of the regulating reservoir.



104. **The World Bank could have acted more promptly to support the FM of the project.** Reporting of FM performance was flawed, and recommendations were not followed up as FM of the project resources has been the weak spot throughout the period of project implementation as discussed under Section IV-B, Financial Management, dealing with fiduciary issues. Moreover, there was a disconnect between the FM weaknesses on the ground and the rating in the ISRs, which was mostly rated Satisfactory throughout the period of project implementation. This disconnect hindered the World Bank management and the team from providing the needed support to the FM team of the PIU.

105. **Overall, Bank supervision of the project was robust and was key to the delivery of the dam and the reservoir impoundment ahead of schedule.** Despite the enormity of the task of coordinating all key stakeholders and addressing all ground impediments, including the suspension of the contractor, the involvement of the Inspection panel, the Bank provided the needed oversight, which was central to achieved results. In line with this contribution, the Bank supervision of the project is rated as satisfactory, without losing sight of weaknesses in FM, and E&S aspects of the project.

#### **Justification of Overall Rating of Bank Performance**

Rating: Satisfactory

106. The World Bank performed well in designing this large project and in supervising its implementation despite its complexity and the diversity of stakeholders and the challenges on the ground. The performance to produce satisfactory results in a complex environment is a sign of strength. However, the World Bank should have perceived the fiduciary weaknesses in the PIU and provided timely TA. Overall, the World Bank performance was rated Satisfactory.

#### **D. RISK TO DEVELOPMENT OUTCOME**

107. **The project was successful in achieving vital results, while other ones are still under way.** Key achievements of the project were (a) a reduction of seasonal variability of water flow in the Sanaga River and (b) an increase in the electricity production by the downstream hydropower plants. Other potential results include a further increase in electricity production after the completion of the Lom Pangar electricity plant and the transmission and distribution lines, which will allow increased energy access and service in the Bertoua region. The efforts to address E&S risks are yet to produce results because of the enormity of the challenges on the ground and the limited resources earmarked to address them.

108. **The key risk to development outcome remains the lack of clarity on the financial resources that EDC needs to ensure adequate oversight and maintenance of the dam and the regulatory reservoir and address E&S risks.** As indicated earlier, the project contributed to building the technical and institutional strength of EDC, and the latter has a strong maintenance and exploitation plan prepared with the support of the owner's engineer. However, adequacy of EDC's budget resources has been confronted by two factors: (a) the Government's overall tight finances and (b) the delays in coming to a closure with the establishment of a transparent and equitable mechanism to settle the water rights issue and to allocate on a regular and timely basis the collected revenue among key stakeholders benefitting from the regulation provided by the dam. It is imperative that EDC be endowed with guaranteed financial resources to keep a performing team on the ground, which has the ability and motivation to ensure a quality oversight of the dam and reservoir management and warrant optimal maintenance and operation,



including the E&S developments around the Lom Pangar site. At project closure, the French Development Agency is financing a technical assistance activity supporting the GOC and aimed to establish the fiduciary system allowing the payment of water rights. All legal documentation has been drafted and is now under consideration at the Prime Minister's Office. The amount corresponding to water rights collected by ENEO up to date has been reconciled with the Government of Cameroun and will be released once the fiduciary requirements are in place (XAF 35 billion since 2016).

109. **The second key risk is the imbalance between the enormity of the E&S risks and the low level of commitment and resources earmarked to address them.** The imbalance can be illustrated by the success in delivering the dam and the reservoir 15 months ahead of the project closing, while other activities to mitigate environmental risks made little progress, notably the completion of the Touraké bridge and the creation of a PPP unit to ensure the oversight of the DDNP. A signal of underperformance in this area was the Moderately Unsatisfactory rating of the E&S throughout the period of project implementation, which reflects a limited commitment from the Government and the inadequacy of allocated budget resources. Two mitigation mechanisms are already in place: (a) the presence of a bilateral donor (the AFD), which has been on the ground throughout project implementation and will continue to provide support, especially in supporting the DDNP, and (b) a new TA project (P157733) to address environmental issues in the Sanaga basin.

110. **The expansion of private investment in hydropower in the Sanaga basin will happen only after stepping up of transparency in the management of financial resources underlying the electricity sector and the improvement in the country's business environment.** The 2011 Electricity Law aimed to attract private investors by promoting the development of hydropower projects by auto producers. This expected outcome is currently partially hindered by the unfinished agenda of establishing a trusted mechanism to collect and allocate the revenue from the rights on water to all involved stakeholders. The uncertainties of the business environment are also illustrated by the host of guarantees that had to be assembled to reach financial closure for the privately promoted Nachtigal Hydropower Project. Weaknesses in the transparency and the management of the financial resources underlying the functioning of the electricity sector and in the country's business environment are the key obstacles for the project's outcomes to benefit the private sector.

## V. LESSONS AND RECOMMENDATIONS

111. **There is a positive relationship between the quality of project appraisal and design and the performance in the achievement of the project's outcome.** The completion of this project and its achieved performance epitomize the importance of careful project appraisal and design. The project design drew extensively upon the lessons learned from World Bank's other ongoing or completed hydropower and dam projects in other countries, as well as ongoing TA projects in the country's electricity sector. Identified objectives had measurable and achievable indicators, and the theory of change linking the identified activities to the objectives was strong. While implementation and institutional arrangements were overall complex, the line of accountability and oversight was clear, and the borrower had a total ownership of the project. Overall, the project's performance was determined by the realism of the identified activities, which drew from a quality work at the appraisal and design levels.



112. **This review concluded that the completion of the upstream reservoir management in Cameroon would result in a high rate of return and in a substantial NPV.** IRR and NPV for this project are projected to amount to about 28 percent and 1.7 percent of GDP respectively during the period of project life. It is therefore important to have upstream reservoir management of river basin through public financing done before the competitive award of all downstream projects, with a view of maximizing the design capacity of downstream projects, which must ensure that water availability is priced as part of tariff during the preparation of downstream projects.

113. **When designing and implementing a complex project, the quality of dialogue is critical, and it matters to strike the right balance between the borrower's and the World Bank team's respective preferred options.** While the World Bank team was aware of difficulties in the borrower's public FM governance at appraisal, the team also noted that the project had strong support from the highest levels of the Government. Transparency risks were significantly reduced given that the two major contracts for the project (dam construction and the independent supervisory engineer) were procured according to the World Bank procurement guidelines, and the key PIU staff were under immediate supervisory oversight of the high instances of the Government, creating the conditions for addressing any impediment to project implementation. The quality of the dialogue that took place at appraisal and during implementation was central to the success in overcoming implementation hurdles and in achieving the project's outcome. When there is an underlying agreement between the borrower's and the World Bank's teams on the project's goal, the PDOs are highly relevant, and the project implementation become easier, and the probability to achieve the expected outcome is high. The path to arriving at a balanced agreement between the borrower and the World Bank's team arose from a prolonged concertation among parties.

114. **A more pragmatic approach to associating reforms in the energy sector and the country's strategic investments is more conducive to tangible results on the ground.** Bank support to Lom Pangar project was delayed for several years due to the insistence on the part of the Bank that the Borrower implement institutional and structural sector reforms first. At some point, the Bank decided to adopt a more pragmatic approach and to support the Lom Pangar project in parallel with supporting reforms and the outcome seems to be successful. Overall, pragmatism seems to be more productive than conditionality. As things stand now, some strategic investments in the energy sector were completed or are under way, and in parallel reforms in the energy sector are proceeding well.

115. **For a project implemented in the context of weak economic governance and a breakdown of public accountability, the World Bank needs to step up its mitigation measures in fiduciary oversight of the project implementation.** There is a stark contrast between the satisfactory achievement of the project's outcome and the Unsatisfactory rating of the FM of the project's resources. This confirms the fact that covenants and arrangements concluded to implement one project cannot transform existing weaknesses in the borrower's systems of management of public resources. The most the World Bank can do is to strengthen mitigation mechanisms and provide parallel TA to the PIU and the borrower.

116. **The construction of regulating dams and hydropower plants should be identified as a priority area in the World Bank's interventions in its member countries, because it provides clean energy and has substantial and positive externalities.** The regulating reservoir supported by this project has the potential to increase the capacity of existing hydropower plants on the Sanaga River by 120 MW and to increase the river's overall generating potential from 1,750 MW to 3,000 MW. Increased generation of



electricity will lead to improved energy access and service. Moreover, valuable externalities from this project include (a) the growth of a local economy around the fishing activity and (b) the presence of the Central Government in the proximity of the Lom Pangar site with increased services of security and E&S safeguards. Dams and hydropower projects are the World Bank's recipe unleashing sustainable growth and shared prosperity in borrower countries.

117. **The transparent and sustained interaction between the Borrower, the construction company (CWE) and the owner's supervision engineer was key to the successful delivery ahead of time of the Lom Pangar dam and reservoir.** The cooperation of the two technical entities was difficult at the inception of the Lom Pangar project, and it took time for them to harmonize their work habits and to interact more productively. Their respective experience and their flexibility in working together were essential to their ability to launch and complete the construction of the dam and the reservoir impoundment ahead of schedule. Constructive and productive cooperation between the construction company and the owner's supervision engineer is not always warranted; it requires strict contractual relations and accountability and a sustained oversight and coordination by the borrower. An effective interaction among the two technical entities and the Borrower was central to resolving implementation hurdles, and to the completion of the dam and reservoir impounding ahead of schedule.

118. **The role of independent entities and the panels of experts overseeing the construction of the dam and reservoir was central in achieving the project's outcome.** Project performance under this project is to a large extent attributable to the independent role played by the owner's engineer, ATESI, and other independent teams that monitored the technical and E&S aspects of project implementation. The regular review of the pending no-conformities by the two technical panels contributed to the quality of work in the construction of the dam and the handling of the E&S issues which emerged during project implementation. The owner's engineer played a key role of checks and balances in the oversight of key tasks undertaken by the construction company, and the technical panels worked productively in overseeing the quality of works and in providing the needed advice.

119. **The Borrower's commitment to a project's results and objectives is the main predictor for achieving them during implementation.** The World Bank teams need to be attentive to the borrower's commitment to any project and monitor the risk mitigation measures accordingly. While the country's context was not fully optimal, there were signals that the borrower was ready to provide every contribution needed to move ahead with this project. Despite tight budget constraints, the borrower has provided the counterparts funds, albeit with some delays. For instance, when the BDEAC faced internal financial difficulties, the Government took the lead and together with the AfDB provided the advances to launch the construction of the hydropower plant and the transmission line. Throughout project implementation, the borrower provided counterpart funds that allowed to move forward on critical issues such as E&S risks, social welfare of works, and default of a co-financier, despite competing priorities that the borrower faced.

120. **When designing the Results Framework of cofinanced projects, the performance targets and indicators should aim to be aligned only with the activities funded by the World Bank Group.** There are advantages and risks of cofinancing an infrastructure project like the LPHP. Cofinancing has allowed the mobilization of additional financial resources (50 percent of the cost at appraisal came from the EIB, AfDB, AFD, and BDEAC) needed to launch and complete all activities identified under the project. Without the





convening power of the World Bank and the additional co-financing from the borrower and other external donors, it would have been difficult to undertake the project as designed at appraisal using only the World Bank's resources. On the positive front, the co-financiers brought in the needed additional financial resources, expertise, and TA and shared the project risks with the World Bank. On the negative front, when one co-financier defaults, all other co-financiers suffer from the failure of timely meeting the expected results. In the case of this project, the delays in implementing Component 2 by co-financiers led to delays in achieving performance outcome indicators related to electricity production, transmission, and distribution identified at appraisal, with the potential negative impact on the performance of the overall project.

**121. For a project with a dam construction component, environmental impacts are expected to be significant, and mitigation measures and resources must be well calibrated at appraisal.** Key project stakeholders were aware of the gravity of the E&S risks associated with the project as illustrated by the earmarking of resources to fund Component 3 specifically devoted to E&S issues. It was also illustrated by the creation of two technical panels to oversee technical and environmental issues throughout the period of project implementation. However, there was a problem of determining the scope of financial and human resources needed to match the complexity of the E&S risks associated with the project. Throughout the period of project implementation, performance in handling E&S issues was rated Moderately Unsatisfactory for more than 80 percent of the time.

**122. The sustainability and efficiency of a large infrastructure project such as a dam with a reservoir require progress and resolution in the reforms facilitating the establishment of an efficient mechanism to manage the electricity sector and the water rights.** The borrower needs to develop a simple and effective mechanism ensuring the sustainability of the sector and allowing the operational and financial autonomy of EDC for its water management mission of the Sanaga River. Currently, there is institutional inertia in the Government to address this matter head on, which is threatening the efficiency and sustainability of the electricity sector.

**123. For a project with a dam construction component, reservoir impoundment must be prepared way ahead to avoid the loss of timber wealth. For a project with a reservoir subcomponent, the issue of timber immersion should be addressed way ahead of reservoir impoundment.** Forest sites planned to host hydroelectric projects should be surveyed 3–6 years ahead of the signing of the project effectiveness and organize for the timber removal, as soon as preparatory works start. For this, the project promoter must approach the ministry in charge of forests within this range of time to engage for the recovery of exploitable resources.



ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: Increase hydropower generation capacity

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Generation Capacity of Hydropower constructed or rehabilitated under the project	Megawatt	0.00 02-Aug-2013	120.00 28-Jun-2019	120.00 31-Dec-2018	120.00 27-Feb-2019
Generation Capacity of Hydropower constructed under the project	Megawatt	0.00 02-Aug-2013	30.00 28-Jun-2019	30.00 28-Jun-2019	0.00 27-Feb-2019



Generation Capacity of Hydropower rehabilitated under the project	Megawatt	0.00 02-Aug-2013	120.00 28-Jun-2019		120.00 27-Feb-2019
<b>Comments (achievements against targets):</b>					
The target of quantity of additional hydroelectricity was exceeded by 14 percent at end-June 2019, reflecting an increase in water supply to the downstream plants following the final reservoir impounding in June 2016. This additional generation is equivalent to an additional generation capacity of 120 MW in the existing plants downstream of the Lom Pangar project.					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Quantity of hydroelectricity additionally generated under the project at the two existing plants on the Sanaga River	Gigawatt-hour (GWh)	0.00 01-Mar-2012	601.00 01-Mar-2012		684.00 28-Jun-2019



**Comments (achievements against targets):**

The target of quantity of additional hydroelectricity was exceeded by 14 percent at end-June 2019, reflecting an increase in water supply to the downstream plants following the final reservoir impounding in June 2016

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Quantity of hydroelectricity additionally generated under the project - New capacity at Lom Pangar	Gigawatt-hour (GWh)	0.00 01-Mar-2012	223.00 01-Mar-2012		0.00 28-Jun-2019

**Comments (achievements against targets):**

The power production by the Lom Pangar plant will be gradually and respectively commissioned in April, June, August, and October 2021. Expected production starting 2022 with respect to the operational mode of reservoir management is as follows: (a) 141.5 GWh in management mode prioritizing Sanaga basin regulation (utilization factor of 54%) or (b) 270.1 GWh in the management mode prioritizing hydropower generation (utilization factor of 100%).



**Objective/Outcome:** Reduce seasonal variability of water flow in the Sanaga river

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Guaranteed all-season water flow of the Sanaga River.	Cubic Meter(m3)	720.00	1040.00		1050.00
		01-Mar-2012	01-Mar-2012		28-Jun-2019

**Comments (achievements against targets):**

The target of guaranteed all-season water flow on the Sanaga River was slightly exceeded by 1 percent. After the complete reservoir impoundment in June 2016, it was possible to store a quantity of water of 6.284 billion m3 that was used during the year 2017. The latter has allowed the flow of water of about 1,050 m3/s to Song Mbengue for 100% of the time.



**Objective/Outcome:** Increase access to electricity

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
People provided with access to electricity by household connections	Number	0.00 02-Aug-2013	2400.00 28-Jun-2019		0.00 27-Feb-2019
Ppl pvd wth elec. by hhold conn.–Offgrid/minigrid–Any source except only renewable	Number	0.00 02-Aug-2013	2400.00 28-Jun-2019		0.00 27-Feb-2019
People provided with access to electricity by hhold connections-Grid	Number	0.00 02-Aug-2013	2400.00 28-Jun-2019		0.00 27-Feb-2019
Ppl provided wth elec. by hhold conn.– Offgrid/minigrid–Only renewable sources	Number	0.00 02-Aug-2013	2400.00 28-Jun-2019		0.00 27-Feb-2019



**Comments (achievements against targets):**

Toward achieving the PDO, the following activities are under way: (a) the construction of a 105 km transmission line in 90 kV to connect the Lom Pangar plant to the HV/MV substation in Bertoua; and (b) the construction of a 200 km MV line from the Bertoua substation to the two other substations to be built in Batouri and Abong-Mbang.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of households newly connected to the electricity grid	Number	0.00 01-Mar-2012	0.00 01-Mar-2012		0.00 28-Jun-2019

**Comments (achievements against targets):**

Toward achieving the PDO, the following activities are under way: (a) the construction of a 105 km transmission line in 90 kV to connect the Lom Pangar plant to the HV/MV substation in Bertoua; and (b) the construction of a 200 km MV line from the Bertoua substation to the two other substations to be built in Batouri and Abong-Mbang.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	0.00 01-Mar-2012	5143000.00 01-Mar-2012		5921860.00 28-Jun-2019
Female beneficiaries	Percentage	50.60	50.60 18-May-2018		50.60

**Comments (achievements against targets):**

The target was exceeded by 15 percent. At project closure, there were 1,184,372 connected households in the Southern Interconnected Network that benefitted from an improved electricity production at Song Loulou and Edéa plants. Applying an average of 5 persons per household, direct project beneficiaries reached 5,921,860





A.2 Intermediate Results Indicators

Component: Component 1: Lom Pangar Regulating Dam

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Commissioning of Lom Pangar regulating dam completed	Yes/No	N 01-Mar-2012	Y 01-Mar-2012		Y 28-Jun-2019

Comments (achievements against targets):

The partial impoundment of the Lom Pangar reservoir dam was carried out on September 26, 2015, followed by complete impoundment in June 2016. Provisional reception of the reservoir dam took place on June 30, 2017, and final acceptance took place on June 30, 2019, after a warranty period of two years

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
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Dam Safety Panel recommendations are implemented in a timely and quality manner	Yes/No	N 01-Mar-2012	Y 01-Mar-2012		Y 28-Jun-2019
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Comments (achievements against targets):

Component: Component 2: Lom Pangar Power Plant and Transmission Line

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Transmission lines constructed or rehabilitated under the project	Kilometers	0.00 02-Aug-2013	105.00 01-Mar-2012		0.00 28-Jun-2019
Transmission lines rehabilitated under the project	Kilometers	0.00 02-Aug-2013	105.00 01-Mar-2012		0.00 28-Jun-2019



Transmission lines constructed under the project	Kilometers	0.00 02-Aug-2013	105.00 01-Mar-2012		0.00 28-Jun-2019
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**Comments (achievements against targets):**

The construction of the transmission lines has been launched, and delivery is expected by March 2021.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Commissioning of Lom Pangar power plant completed	Yes/No	N 01-Mar-2012	N 01-Mar-2012		N 28-Jun-2019

**Comments (achievements against targets):**

Based on the progress level of the construction of the plant, the hydroelectric plant will be fully completed by the end of 2021. The four production groups will be gradually and respectively commissioned in April, June, August, and October 2021.



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Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Transmission line constructed under the project	Kilometers	0.00 01-Mar-2012	0.00 01-Mar-2012		0.00 28-Jun-2019

**Comments (achievements against targets):**

**Component:** Component 3: Environmental and Social Measures

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Gorilla population in Deng	Number	300.00	300.00		300.00



Deng Forest	31-Dec-2010	01-Mar-2012		28-Jun-2019
<p><b>Comments (achievements against targets):</b></p> <p>Based on the 2016 expert report of the inventory of the DDNP great apes population, the gorilla population in Deng Deng forest is 1.01 individuals per km<sup>2</sup> in 2016, or 390 individuals. As no recent census of gorillas was conducted in the DDNP, the 2016 number is maintained by end-June 2019.</p>				

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Annual Expert Panel environmental and social monitoring report disseminated and made publically available	Yes/No	N 01-Mar-2012	Y 01-Mar-2012		Y 28-Jun-2019

<p><b>Comments (achievements against targets):</b></p>					
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**Component:** Component 4: Technical Assistance and Project Management

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Operation manual for the dam and reservoir is completed and staff are trained on its use	Yes/No	N 01-Mar-2012	Y 01-Mar-2012		Y 28-Jun-2019

Comments (achievements against targets):

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average annual household income of project directly affected persons	Amount(USD)	1360.00 01-Mar-2012	0.00 01-Mar-2012		1440.00 28-Jun-2019



**Comments (achievements against targets):**

In the absence of official information for this indicator, we present the values of gross national income per capita, which increased by about 6 percent, from a level of US\$1,360 in 2012 to US\$1,440.



**B. KEY OUTPUTS BY COMPONENT**

Area of Intervention, Activities, and Inputs	Generated Outputs
<p><b>Construction of the Lom Pangar Regulating Dam</b></p> <ul style="list-style-type: none"> <li>• Dam Engineering, Procurement, Construction, and Construction Management</li> <li>• Preparatory works and owner’s engineer</li> </ul>	<ul style="list-style-type: none"> <li>• The constructed dam is a mixed structure, approximately 1.3 km long and 55 m high, composed of a roller-compacted concrete core at the bottom of the valley, extending on the banks by earth embankments;</li> <li>• The transition between the central concrete structure and the earth embankments is jam-packed by rockfill dikes to limit the dam’s influence;</li> <li>• The main dam is completed by a right-bank embankment dam, which serves to close a topographic depression. It is an embankment similar in design to the earth dams of the main dam;</li> <li>• There is a reoxygenation weir downstream of the dam;</li> <li>• Associated infrastructure includes (a) access roads outside the Lom Pangar site, especially between the Ouami and Lom Pangar fixed checkpoints; (b) internal access roads to the Lom Pangar site; and (c) the residential city for different categories of manpower working on the dam construction.</li> </ul>
<p><b>Construction of the Lom Pangar power plant and a transmission line</b></p> <ul style="list-style-type: none"> <li>• To construct the Lom Pangar power plant and a transmission line</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of the dam and the 30 MW power plant at the foot of the dam (under way);</li> <li>• The construction of a 105 km transmission line in 90 kV to connect the plant to the HV/MV substation in Bertoua (under way).</li> </ul>
<p><b>Distribution</b></p> <ul style="list-style-type: none"> <li>• To provide rural electrification in the Eastern Region along the transmission line</li> </ul>	<ul style="list-style-type: none"> <li>• The construction of 200 km from the Bertoua substation to the 2 other substations to be built in Batouri and Abong-Mbang (under way);</li> <li>• The electrification of 150 localities in the Eastern Region, including 9 administrative unit headquarters and the connection of 10,000 new subscribers (under way).</li> </ul>
<p><b>E&amp;S Measures</b></p> <ul style="list-style-type: none"> <li>• E&amp;S management of construction sites</li> <li>• Management of the reservoir and cumulative downstream mitigation</li> <li>• Social mitigation</li> <li>• Management of the Deng Deng forest</li> <li>• Technical audits of E&amp;S measures</li> <li>• ESMP management</li> <li>• Resettlement Action Plans</li> </ul>	<ul style="list-style-type: none"> <li>• Technical audits of E&amp;S safeguard measures (the AFD)</li> <li>• E&amp;S management of construction sites</li> <li>• Management of retention and downstream impacts</li> <li>• The study of the downstream impacts of the Lom Pangar reservoir dam aims to ultimately have the relevant parameters, from a qualitative point of view on the environment of the dam to control the</li> </ul>





Area of Intervention, Activities, and Inputs	Generated Outputs
<ul style="list-style-type: none"><li>Local development</li></ul>	<p>cumulative impacts of the current and future dams on the ecosystems of the reservoir of the Sanaga basin.</p> <ul style="list-style-type: none"><li>Management of DDNP, including (a) the census of large primates, (b) the materialization of the natural boundaries of the DDNP through a green line, (c) the installation of nameplates in the DDNP, and (d) the multiplication of patrols in the DDNP;</li><li><b>ESMP infrastructure (the AFD)</b><ul style="list-style-type: none"><li>Bridge on the Lom + Dock and Livestock Park in Touraké</li><li>Construction/rehabilitation of some health units in the Eastern Region</li><li>Construction of the DDNP buildings + Ouami dock</li><li>Construction of 14 drinking water wells in Eastern Townships</li><li>Supply and installation of solar kits in health units</li><li>Supply and installation of a generator at Belabo Hospital</li><li>Supply and installation of biomedical equipment</li><li>Civil works, supply, and installation of the hydro and weather stations</li><li>Housing construction of eco guards of the elephant head secondary life base</li><li>Acquisition and installation of photovoltaic panels for three monitoring stations in DDNP</li><li>Acquisition of geographic information system software and equipment</li><li>Acquisition of software for the Water Information System</li><li>Provision of vehicles for the EIS</li><li>Twinning between EDC and an assets management company</li></ul></li><li><b>Implementation of the complaints' management mechanism</b><ul style="list-style-type: none"><li>Close all site complaints.</li><li>Off-site complaint management:<ul style="list-style-type: none"><li>Determine the list of people whose requests are justified.</li><li>Determine the compensating measures to be implemented.</li><li>Initiate the implementation of compensatory measures.</li><li>Report and monitor the performance of the Grievance Settlement Office (<i>Bureau de Règlements des Griefs-BRG</i>).</li></ul></li></ul></li><li><b>Resettlement and compensation of those affected by the reservoir dam</b><ul style="list-style-type: none"><li>The main objective of the implementation of the Compensation and Resettlement Plan (<i>Plan d'Indemnisation et de Réinstallation -PIR</i>) is to address the social consequences of the construction of the Lom Pangar dam.</li></ul></li></ul>



Area of Intervention, Activities, and Inputs	Generated Outputs
	<ul style="list-style-type: none"> <li>○ States of compensation in the district of BELABO</li> <li>○ States of compensation in the districts of NGOURA and BÉTARÉ OYA</li> <li>○ Resettlement work</li> <li>○ Community compensation work</li> <li>○ Other types of support were granted in the different localities: (a) food support; (b) capacity building for farmers, pastoralists, and fishermen; (c) seed and tools support for farmers; (d) support for farmers; and (e) the distribution of agricultural land</li> <li>● <b>Assistance to vulnerable people</b> <ul style="list-style-type: none"> <li>○ The identification of vulnerable people in the villages and settlements of the three (3) districts affected by the project</li> <li>○ Determination for each vulnerable person identified the assistance action(s) to be provided (material, food, health, and school)</li> <li>○ Donations distributed for material assistance (tricycle for a disabled person and generator) for support to the creation of income-generating activities (crushers, soap, oil, and so on) and for food assistance (rice, sardine, and so on)</li> <li>○ Strategies for implementing health and school support with the relevant structures</li> </ul> </li> <li>● <b>LDP infrastructures</b> <ul style="list-style-type: none"> <li>○ The objective of the development plan is to implement socioeconomic and community infrastructures in the cantons and villages affected indirectly by the LPHP It concerns 28 localities identified in the Eastern Region. Supervision is provided by the delegated contracting authority SNV (Foundation of Netherlands Volunteers).</li> <li>○ Infrastructures: see Table 3</li> </ul> </li> </ul>
<p><b>Capacity Building in the Ministry of Energy and Water</b></p> <ul style="list-style-type: none"> <li>● TA</li> <li>● Strategic communication and consultation</li> <li>● Project management</li> </ul>	<ul style="list-style-type: none"> <li>● Training <ul style="list-style-type: none"> <li>○ Preparation and conduct of a bathymetric study for evaluation of the degree of silting of the lakes (May 2019, Douala)</li> <li>○ Training on geotechnical and structural surveillance of dams (May 2019, Rome)</li> <li>○ International technical conferences, hydropower and dams in Africa (April 2019, Namibia)</li> <li>○ Rescuer resource worker training (June 2019, Douala)</li> <li>○ Environmental and Social Impact Study (June 2019, Douala)</li> <li>○ Contract Training as per standards of the International Federation of Consulting Engineers – (<i>Fédération Internationale des Ingénieurs-Conseils-FIDIC</i>) Sessions 1 and 2 (April and June 2019, Paris)</li> </ul> </li> </ul>



Area of Intervention, Activities, and Inputs	Generated Outputs
	<ul style="list-style-type: none"><li>○ Concession contracts (May 2019, Paris)</li><li>○ PPP management of technical, legal, and financial aspects (May-June 2019, Paris)</li><li>○ Internal control, internal audit, and risk mapping in the public sector (April-May 2019, Abidjan)</li><li>● Communication</li><li>● Project management</li></ul>



## ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

### A. TASK TEAM MEMBERS

Name	Role
<b>Preparation</b>	
Meike van Ginneken	Sector Leader (TTL)
Astrid Manroth	Senior Energy Specialist
Daniel Murphy	Senior Operations Specialist
Arnaud Braud	Financial Specialist
Tjaarda Storm van Leeuwen	Consultant Financial Specialist
Alessandro Palmieri	Lead Dam Specialist
Brent Gary Hampton	Senior Energy Specialist
Franklin Gbedey	Power Engineer
Peggy Mischke	Power Engineer
Gabrielle Puz	Consultant, Water Resources Specialist
Ramon Lopez-Rivera	Consultant, Procurement Specialist
Alexandra Bezeredi	Regional Environmental and Safeguards Advisor
Yves Andre Prevost	Environmental Advisor
Emeran Serge Menang Evouna	Forestry Specialist
Mohamed Arbi Ben-Achour	Consultant, Social Development Specialist
Lucienne M'Baipor	Sr Social Development Specialist
Vivien Foster	Sector Manager, Energy
Cecilia Briceno-Garmendia	Senior Infrastructure Economist



Moez Cherif	Senior Energy Economist
Rita Cestti Senior	Senior Rural Development Specialist
Ahmad Slaibi	Natural Resource Economist
Kouami Messan	Senior Procurement Specialist
Rahmoune Essalhi	Procurement Assistant
Ousmane Kolie	Senior Financial Management Specialist
Sekou Keita	Financial Management Specialist
Enagnon Adda	Financial Management Specialist
Anthony Molle	Senior Counsel
Nathalie Munzberg	Senior Counsel
Heather Worley	Senior Communications Officer
Timothy Carrington	Consultant, Communication
Sarwat Hussain	Senior Communications Officer
Marie-Paule Ngaleu	Program Assistant
Rita Ahiboh	Program Assistant
Laurence Hougue Bouguen	Program Assistant
Natalie Tchoumba Bitnga	Team Assistant
<b>Supervision/ICR</b>	
Nicolas Jean Marie Sans	TTL(s)
Ibrah Rahamane Sanoussi, Sylvie Munchep Ndze, Monique Ndome Didiba Epse Azonfack	Procurement Specialist(s)
Celestin Adjalou Niamien	FM Specialist
Helene Simonne Ndjebet Yaka	Team Member



Bernadette Djapa Nyanjo	Team Member
Stephan Claude Frederic Garnier	Team Member
Kristyna Bishop	Safeguards Advisor
Enagnon Ernest Eric Adda	Team Member
Khady Fall Lo	Team Member
David Vilar Ferrenbach	Team Member
Luciano Canale	Team Member
FNU Owono	Social Safeguards Specialist
Cyrille Valence Ngouana Kengne	Environmental Safeguards Specialist
Nestor Ntungwanayo	ICR Main Author

**B. STAFF TIME AND COST**

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
<b>Preparation</b>		
FY10	34.947	261,867.82
FY11	65.759	466,672.86
FY12	90.496	595,333.35
<b>Total</b>	<b>191.20</b>	<b>1,323,874.03</b>



<b>Supervision/ICR</b>		
FY10	0	0.00
FY13	57.693	393,939.45
FY14	40.932	317,883.38
FY15	24.371	181,646.66
FY16	24.910	215,217.89
FY17	21.405	164,457.47
FY18	34.087	216,896.75
FY19	22.395	216,579.06
FY20	.822	15,776.79
<b>Total</b>	<b>226.62</b>	<b>1,722,397.45</b>



**ANNEX 3. ESTIMATED PROJECT COST BY COMPONENT**

<b>Components</b>	<b>Amount at Approval (US\$, millions)</b>	<b>Actual at Project Closing (US\$, millions)</b>	<b>Percentage of Approval (US\$, millions)</b>
Component 1: Lom Pangar Regulating Dam	115.00	110.86	96.40
Component 2: Lom Pangar Power Plant and Transmission Line	00.00	0.00	0.00
Component 3: Environmental and Social Measures	6.00	1.45	24.17
Component 4: Technical Assistance and Project Management	11.00	8.59	78.09
<b>Total</b>	<b>132.00</b>	<b>120.90</b>	<b>91.59</b>





## ANNEX 4. EFFICIENCY ANALYSIS

### Key Differences between Appraisal and Completion Analyses

1. The analysis both at appraisal and at completion used the cost-benefit analysis approach. The appraisal analysis was performed in 2008 prices and discounted to 2011 at the discount rate of 10 percent, which the completion analysis followed to be comparable. However, the completion analysis updated data, assumptions, and methodologies and had major differences as discussed in the following paragraphs.
2. The completion analysis included (a) total project costs of the AfDB and BDEAC (for example, the AfDB would connect 10,000 customers and 100 streetlights) compared to only part of their project costs at appraisal because based on the projections of demand and total power plants' capacity in Eastern Interconnected Grid, it seemed unlikely that the existing customers and IDA's 2,400 household connections could absorb all the electricity supply from the Lom Pangar hydropower plant; (b) co-financing of the IDA ESDP for the dam supervision; (c) additional financing by the AFD, the French Global Environment Facility, and the Cameroonian Government for the DDNP; (d) the increased government financing to cover the increased cost of the dam; and (e) the replacement cost of the hydropower plant, reflecting the hydropower plant's life of 30 years (PAD, page 99).
3. The completion analysis updated the counterfactual scenario with a natural gas power plant in Southern Interconnected Grid and an HFO power plant with associated infrastructure (for example, fuel storage) in Eastern Interconnected Grid. At appraisal, the counterfactual was no alternative power up to 2064, which appeared unlikely, given the efforts to increase electricity supply and access by the Government, development partners, and the private sector. Also, the PAD discussed alternative thermal power plants and avoided GHG and local air pollutants (pages 110 and 113).
4. Pursuant to the guidance<sup>8</sup> and in consultation with the country economist of the World Bank, the completion analysis also used the social discount rate of 5 percent, in addition to the appraisal's 10 percent to compare with the appraisal.
5. The completion analysis estimated FNPVs and FIRR of the total investment perspective with an estimated WACC at 3 percent, real, as a proxy of the FOCC and of the owner's perspective (Government) with an estimated ROE at 4 percent, real.<sup>9</sup>
6. Values were estimated into economic values and conversion factors, such as FEP (shadow exchange rate),<sup>10</sup> economic opportunity cost of labor (shadow wage rate),<sup>11</sup> fuel inventory (working

<sup>8</sup> Fay, M., S. Hallegate, A. Kraay, and A. Vogt-Schilb. 2016. "Discounting Costs and Benefits in Economic Analysis of World Bank Projects." Data source to arrive at 5 percent was the International Monetary Fund.

<sup>9</sup> Based on the Government's five-year treasury bonds to finance infrastructure for 2016–2021 at nominal 5.5 percent.

<sup>10</sup> Estimated based on the methodology by Jenkins, Glenn P. 2008. "Program on Cost-Benefit Analysis on Economic Analysis/Project Appraisal;" Glenday, Graham. 2011. "Program on Project Appraisal and Risk Management." May 15–June 10, 2011, Economic Opportunity Cost of Foreign Exchange, Duke Center for International Development.

<sup>11</sup> Estimated based on the methodology by Jenkins, G., and A. Klevchuk. 2006. "Appraisal of El-Kureimat Combined Cycle Power Plant;" Jenkins, G. P., C. Y. K. Kuo, and A. C. Harberger. 2011. "The Economic Opportunity Cost of Labor." Chapter 12. Cost-Benefit Analysis for Investment Decisions. (2011 Manuscript).



capital), netback value of natural gas (LNG), and so on, which are consistent with the World Bank guidance.<sup>12</sup>

7. Distribution analysis was included.

8. Pursuant to the World Bank policy, GHG impacts assessed carbon dioxide equivalent (CO<sub>2</sub>e) of natural gas, diesel oil, HFO, lube oils, and dam reservoir and GHG marginal abatement cost (MAC) and followed the 2017 World Bank guidance on carbon prices.

9. Other emissions' impacts on health (particulate matter 10 micrometers or less in diameter [PM<sub>10</sub>], nitrogen oxides [NO<sub>x</sub>], and Sulfur oxides [SO<sub>x</sub>]) were assessed from the thermal plants.

10. The completion analysis focused on the project only<sup>13</sup>. The appraisal analysis included the project as scenario 1, as well as scenarios 2–4 of other projects that were not financed by the project. Scenario 2 with additional 330 MW Nachtigal Hydropower Project was realized as a 420 MW IBRD/IFC/MIGA project, approved in 2018 with appraised estimates of an EIRR of 21 percent and an ENPV of US\$1.2 billion at a discount rate of 6 percent, but the price attributes (year of prices, real, constant, or nominal prices, and so on) of the estimates were not found in the Nachtigal Hydro Power Project's PAD. Regarding scenarios 3–4, the hydropower development plan has been updated (the Nachtigal Hydro Power Project's PAD, page 64), but no further detailed data were available.

11. Financial costs in the financial analysis included initial capital and replacement costs and residual values, fix and variable costs, personnel costs, working capital, taxes and customs, social security, insurance, and other contribution. Financial costs are converted to economic values in the economic analysis. Annual reduction of hydro plant utilization (%), after 20 years, is assumed to be 0.5%. Economic life: Dam 50 years, Lom Pangar Hydropower Plant 30 years, and Transmission Line and Connection 40 years.

### Economic Analysis

12. **The economic and financial efficiency of the project was high.** The PDO was achieved with an EIRR at 28 percent, an ENPV of XAF 199.6 billion or US\$445.6 million, and a levelized cost of XAF 93/kWh or US\$0.2/kWh, using the appraisal's principle of discounting to 2011 at a 10 percent discount rate in 2008 real prices. The ENPV was equivalent of about 1.7 percent of the GDP of Cameroon in 2008. Using the World Bank's guidance on the social discount rate estimated at 5 percent, the ENPV was XAF 603 billion or US\$1.3 billion and a levelized cost of XAF 101/kWh or US\$0.2/kWh. At appraisal, the ENPV was XAF 184 billion or US\$411 million and the EIRR was 18 percent, with a levelized cost of XAF 32/kWh or US\$0.1/kWh.

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<sup>12</sup> OPSPQ (Operations Policy and Quality). 2014. "Investment Project Financing Economic Analysis Guidance Note;" Belli, P., J. R. Anderson, H. N. Barnum, J. A. Dixon, and J. P. Tan. 2001. "Economic Analysis of Investment Operations: Analytical Tools and Practical Applications."

<sup>13</sup> Consistent with the PAD's scenario 1." LPHP as a Standalone Project - This scenario takes into account the 30 MW power generated by the powerhouse at the foot of the dam and the increased firm power generation from Edea and Song Loulou hydropower plants downstream. (page 88, PAD).



The ENPV was equivalent of about 1.6 percent of Cameroon's GDP in 2008. The project also contributed to avoiding GHGs and local air pollutants from reduced use of thermal generation capacity.

13. **The distributional impacts (percentage of the total ENPV).** The electricity sector received the largest benefit (85 percent) due to the avoided fuel, less operation and maintenance costs, and less frequency of capital replacement than those of the thermal power plants. The petroleum sector was the second-largest beneficiary (31 percent) due to the saving of natural gas (netback value of LNG) that could be exported as LNG. The local labor was also benefited (1 percent), while affected by the fatal accidents.<sup>14</sup> The society's benefits (3 percent) were transfers of the working capital. The Government did not benefit directly (negative or minus 20 percent) in terms of net of tax revenues, contributions related to social security, housing fund, National Employment Fund, FEP, and so on. However, the Government would likely benefit eventually as discussed in the fiscal impacts and in the financial analysis as the owner of the project.

14. **GHG and local emissions.** The total CO<sub>2</sub>e abated is about 16 million ton (undiscounted). Following the World Bank guidance,<sup>15</sup> with the low value of CO<sub>2</sub>e, the total ENPV was XAF 270 billion (US\$603 million) and an EIRR at 38 percent with a net GHG MAC of negative (minus) XAF 121,000 per CO<sub>2</sub>e ton or US\$270 per CO<sub>2</sub>e ton. With the high value of CO<sub>2</sub>e, the total ENPV was XAF 309 billion (US\$690 million) and an EIRR at 40 percent with a net GHG MAC of negative (minus) XAF 139,000 per CO<sub>2</sub>e ton or US\$310 per CO<sub>2</sub>e ton. The switching value (SV) was negative (minus) US\$170 per CO<sub>2</sub>e with a sensitivity indicator (SI) of 0.14. Including the local emissions (NO<sub>x</sub>, PM<sub>10</sub>, and SO<sub>x</sub>) in addition to high and low CO<sub>2</sub>e values, the results of ENPVs and EIRRs differed little from those with only CO<sub>2</sub>e.

15. **Fiscal impacts of the project were positive.** Avoided fuel costs in the electricity sector and saving in the petroleum sector (total XAF 13.5 billion per year in 2008 real prices at the Government's targeted ROE at 4 percent, real) could contribute to reducing the Government's operational subsidies for ENEO (for example, XAF 24.5 billion in nominal prices or 0.1 percent of the GDP in 2017) and to potentially increasing LNG export. At completion, an estimated average annual service and commitment charge for 2013–2052 was relatively small, XAF 187 million or US\$0.4 million (0.002 percent of 2008 GDP), in the present value in 2008 prices at the ROE of 4 percent, real.<sup>16</sup> At appraisal, an estimated average annual service and commitment charge for 2012–2052 was XAF 252 million or US\$0.4 million (0.002 percent of 2008 GDP) in the present value in 2008 prices at the ROE of 4 percent, real.

## Financial Analysis

16. The total financial results showed the net benefits to financiers and the Government as the owner of the project. From a total project investment perspective, the FNPV was XAF 727 billion or US\$1.6 billion discounted at an estimated WACC as a proxy of the FOCC of 3 percent, real, with an FIRR of 37 percent and a levelized cost of XAF 142/kWh or US\$0.3/kWh. ADSCRs and LLCRs were satisfactory with the

<sup>14</sup> Used a value of statistical life as a proxy (XAF 3.8 billion in 2008 prices). Although this value is based on the willingness to pay to reduce mortality risk from air pollution, it was used only because the value was regardless of the age, income, or other population characteristics of the affected population. <https://www.epa.gov/environmental-economics/mortality-risk-valuation>.

<sup>15</sup> World Bank. 2017. "Guidance Note on Shadow Price of Carbon in Economic Analysis." November 12, 2017. Shadow Price of Carbon in Economic Analysis Cover Note.

<sup>16</sup> IDA's commitment charges was waived. Estimates were of IDA and AfDB. The other financiers' information is unavailable.



minimum of 3.9 for the entire period, except for the first year (ADSCR as negative or minus 16.13). From the owner's perspective, the FNPV was XAF 834 billion or US\$1.9 billion at the ROE of 4 percent, real, with an FIRR of 70 percent and a levelized cost of XAF 137/kWh or US\$0.3/kWh. The appraisal included neither the FNPV nor the FIRR in the PAD.

### **Sensitivity and Risk Analysis**

17. A number of sensitivity tests with SIs and SVs were carried out to identify critical parameters affecting the project's performance. Regarding the macroeconomic risks, inflations in Cameroon were relatively sensitive to the results, and inflations in euro areas were also relatively sensitive to the financial results. Inflation in the United States, Manufactures Unit Value Index, SDR exchange rates, and fuel prices (crude oil, HFO, and diesel fuel) showed little sensitivities to the results. Regarding the performance, the capital costs and associated infrastructure of the thermal power plants were relatively sensitive to the economic results. Heat rate degradation, hydropower degradation, and plant utilization factor were relatively less sensitive to the results. Based on the sensitivity analyses, the key variables were identified. An appropriate probability distribution and the likely range of values for each risk variable were estimated, based on a historical observation of those variables. A Monte Carlo risk simulation was carried out over 10,000 trials with the Crystal Ball software. The Tornado analysis of Crystal Ball was conducted to analyze the critical variables. The results suggested a robustness of the project.

### **Design and Implementation Efficiency**

18. The total project administration cost was about 5.7 percent of the total project cost at completion, compared to 5.4 percent at appraisal. The actual project cost was higher than the expected cost at appraisal mainly due to the increased cost of the dam. The project closing date was extended from December 31, 2018, to June 28, 2019, to complete the LDP. Those changes in the project life and costs did not significantly affect the efficiency of the project achievements. However, performance in completing the main infrastructure was outstanding, as the dam and the reservoir were delivered 15 months ahead of the project closing date.



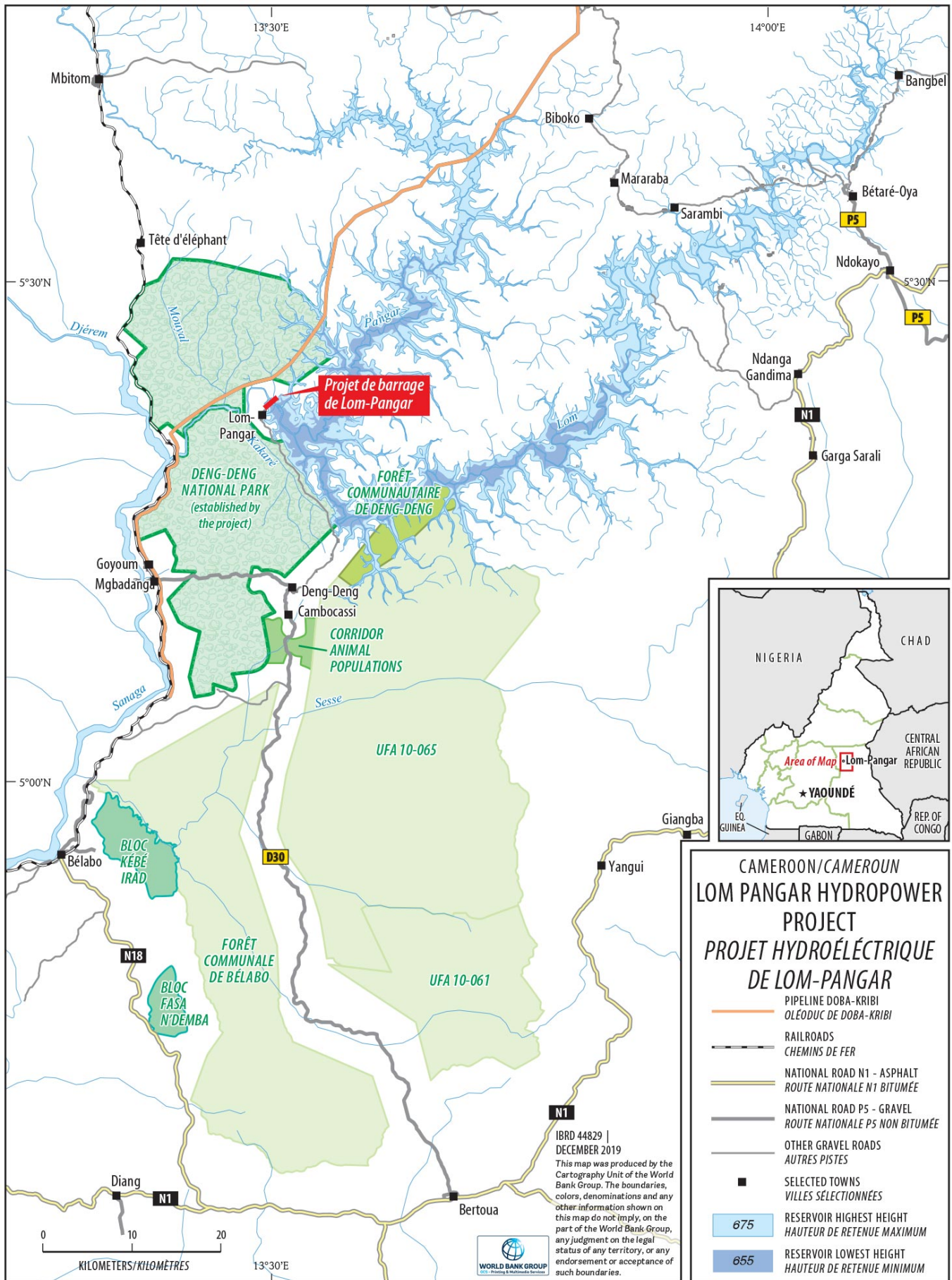
**ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS**

None



**ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)**

1. The World Bank: The Lom Pangar Hydropower Project, Report No. 67174-CM
2. The World Bank: Restructuring Paper: Report No. RES34346
3. The World Bank: Project ISRs (2012–2019)
4. The World Bank: Project Aide Memoires (2012–2019)
5. AFD: Project Aide-mémoire, 2018
6. EDC: Project multiple reports
7. Draft Report from the borrower, November 2019
8. ATESI Reports (1–13)



**CAMEROON/CAMEROUN**  
**LOM PANGAR HYDROPOWER PROJECT**  
**PROJET HYDROÉLECTRIQUE DE LOM-PANGAR**

- PIPELINE DOBA-KRIBI  
OLEODUC DE DOBA-KRIBI
- RAILROADS  
CHEMINS DE FER
- NATIONAL ROAD N1 - ASPHALT  
ROUTE NATIONALE N1 BITUMÉE
- NATIONAL ROAD P5 - GRAVEL  
ROUTE NATIONALE P5 NON BITUMÉE
- OTHER GRAVEL ROADS  
AUTRES PISTES
- SELECTED TOWNS  
VILLES SÉLECTIONNÉES
- 675 RESERVOIR HIGHEST HEIGHT  
HAUTEUR DE RETENUE MAXIMUM
- 655 RESERVOIR LOWEST HEIGHT  
HAUTEUR DE RETENUE MINIMUM

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