Project Administration Manual

Project Number: 44444
Loan and/or Grant Number(s): {LXXXX&XXXX; GXXXX; TAXXXX}
November 2014

BHU: Second Green Power Development Project

Contents

Project Administration Manual Purpose and Process

The project administration manual (PAM) describes the essential administrative and management requirements to implement the project on time, within budget, and in accordance with Government and Asian Development Bank (ADB) policies and procedures. The PAM should include references to all available templates and instructions either through linkages to relevant URLs or directly incorporated in the PAM.

The Druk Green Power Corporation (DGPC) and Tangsibji Hydro Energy Limited (THyE) are wholly responsible for the implementation of ADB financed projects, as agreed jointly between the borrower and ADB, and in accordance with Government and ADB's policies and procedures. ADB staff is responsible to support implementation including compliance by DGPC and THyE of their obligations and responsibilities for project implementation in accordance with ADB's policies and procedures.

At Loan and Grant Negotiations the borrower and ADB shall agree to the PAM and ensure consistency with the loan and financing agreements. Such agreement shall be reflected in the minutes of the Loan and Grant Negotiations. In the event of any discrepancy or contradiction between the PAM and the loan and financing agreements, the provisions of the loan and financing agreements shall prevail.

After ADB Board approval of the project's report and recommendations of the President (RRP) changes in implementation arrangements are subject to agreement and approval pursuant to relevant Government and ADB administrative procedures (including the Project Administration Instructions) and upon such approval they will be subsequently incorporated in the PAM.

Abbreviations

ADB	=	Asian Development Bank
ADF	=	Asian Development Fund
DGPC	=	Druk Green Power Corporation
EIA	=	environmental impact assessment
EMP	=	environmental management plan
ERP	=	enterprise resource planning
GDP	=	gross domestic product
HPP	=	hydropower project
ICB	=	international competitive bidding
NCB	=	national competitive bidding
OCR	=	ordinary capital resources
PAM	=	project administration manual
QCBS	=	quality- and cost based selection
RP	=	resettlement plan
SPS	=	Safeguard Policy Statement
TA	=	technical assistance
THyE	=	Tangsibji Hydro Energy Limited
TOR	=	terms of reference

I. PROJECT DESCRIPTION[1]

1. The project is a run-of-the-river hydropower development [118 megawatt (MW)]. It will be cross-border power export through a public private partnership (PPP) and clean development mechanism (CDM). It is designed as a post Dagachhu hydropower development (126 MW),[2] which was financed by the Asian Development Bank (ADB) in 2008 under the Green Power Development Project.[3] The project site is the Nikachhu River in Trongsa district in the central region of Bhutan.

2. The executing agencies are the Druk Green Power Corporation (DGPC), and the Tangsibji Hydro Energy (THyE), which was established as the project special purpose company. The project will be supported by a capacity development technical assistance (TA) for Acceleration of Hydropower Trading Development.

A. Impact and Outcome

3. The project's impact will be expanded cross-border power trading, and the outcome will be increased clean hydropower generation in Bhutan.

B. Outputs

4. The outputs will be (i) a 118 MW hydropower generation plant constructed, (ii) DGPC and THyE project management and implementation capacity enhanced, and (iii) hydropower development and trading framework improved.

[1] The outlined project technical description is in ANNEX 1.

[2] The Asian Development Bank (ADB) provided project preparatory technical assistance (PPTA) for Preparing the Green Power Development Project II (TA7889-BHU).

[3] ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Loans, Asian Development Fund Grant, Technical Assistance Grant, and Administration of Grant to the Kingdom of Bhutan for the Green Power Development Project*. Manila.

II. IMPLEMENTATION PLANS

A. Project Readiness Activities

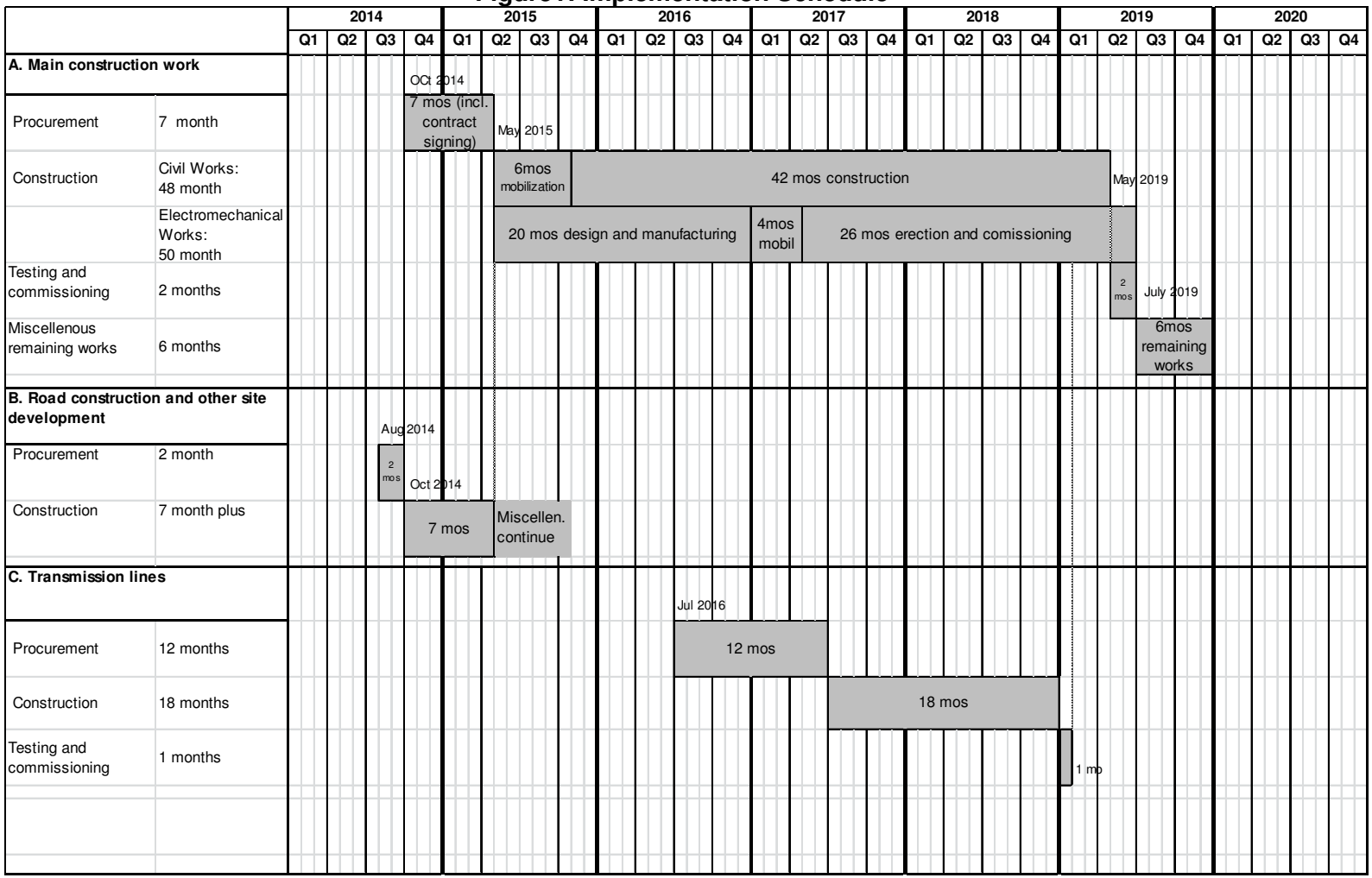
Indicative Activities	Month						Who responsible
	August 2014	September 2014	October 2014	November 2014	December 2014	January 2015	
Establish project implementation arrangements	X						DGPC/THyE
Advance contracting actions			X				ADB/DGPC/THyE
Retroactive financing actions			X				ADB/DGPC/THyE
Loan/grant Negotiations			X				RGOB/DGPC/THyE/ADB
ADB Board approval					X		ADB
Loan/grant signing						X	RGOB/ADB
Government legal opinion provided						X	RGOB
Loan/grant effectiveness						X	RGOB/ADB

ADB=Asian Development Bank, DGPC=Druk Green Power Corporation, RGOB = Royal Government of Bhutan, THyE=Tangsibji Hydro Energy Limited.

B. Overall Project Implementation Plan

5. The project will be implemented over a period of five years after the loan/grant effectiveness, including procurement and construction activities. A detailed implementation schedule is attached in Annex 2.

Figure1: Implementation Schedule[a]



[a] Relevant safeguard activities are followed by the resettlement plan and environmental impact assessments including the environmental management plan.

III. PROJECT MANAGEMENT ARRANGEMENTS

A. Project Implementation Organizations – Roles and Responsibilities

Project Implementation Organizations	Management Roles and Responsibilities
• Ministry of Finance, and Ministry of Economic Affairs	➢ Will be responsible to guide the project on strategic and policy decisions on implementation, and coordinate inter-agency issues.
• **Executing agency** DGPC	➢ Developing and responsible for the project implementation supervision activities for Nikachhu hydropower component.
• **Executing agency**/ **Implementing agency** THyE	➢ Overall responsibility for; (i) project management, (ii) coordinate implementation (iii) function as project implementation unit to assist in day-to-day project implementation. ➢ Preparing overall project implementation plan and consolidated annual work plan. ➢ Preparing standard bid documents to comply with ADB guidelines. ➢ Procuring equipment and services. ➢ Ensuring project compliance with loan and financing covenants. ➢ Coordinating with ADB on matters related to disbursements. ➢ Maintaining project documents and submitting timely reports to ADB and the government. ➢ Obtain necessary clearances.
• ADB/Cofinanciers	➢ To conduct regular project reviews and facilitate the implementation of the project. ➢ monitor and review overall implementation in consultation with the executing agencies/implementing agency including: project implementation schedule, actions required with reference to the summary of poverty reduction and social strategy, environment management plan, and resettlement plan if applicable, timeliness of budgetary allocations and counterpart funding, project expenditure progress with procurement and disbursement, statement of expenditure when applicable, compliance with loan covenants, and likelihood of attaining project development objectives.
• BPC Transmission line component	➢ Supervision responsibility, outsourced from THyE, for; (i) project supervision, (ii) coordinate implementation (iii) function as project implementation unit to assist in day-to-day project implementation, for the transmission line component. ➢ Preparing overall project implementation plan and consolidated annual work plan. ➢ Ensuring project compliance with loan and financing covenants.

Project Implementation Organizations	Management Roles and Responsibilities
	➢ Coordinating with THyE on matters related to disbursements. ➢ Maintaining project documents and submitting timely reports to THyE, ADB and the government. ➢ Obtain necessary clearances if any.

ADB = Asian Development Bank, BPC = Bhutan Power Corporation, DGPC = Druk Green Power Corporation, THyE = Tangsibji Hydro Energy.

B. Key Persons Involved in Implementation

Executing agency

Druk Green Power Corporation (DGPC)
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Ugyen Namgyal,
Director (Finance)
E-mail: director.finance@drukgreen.com
Tel: (975)-2-336415

Executing/Implementing agency

Tangsibji Hydro Energy Limited (ThyE)

Dorji P. Phuntshok
Managing Director
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ADB

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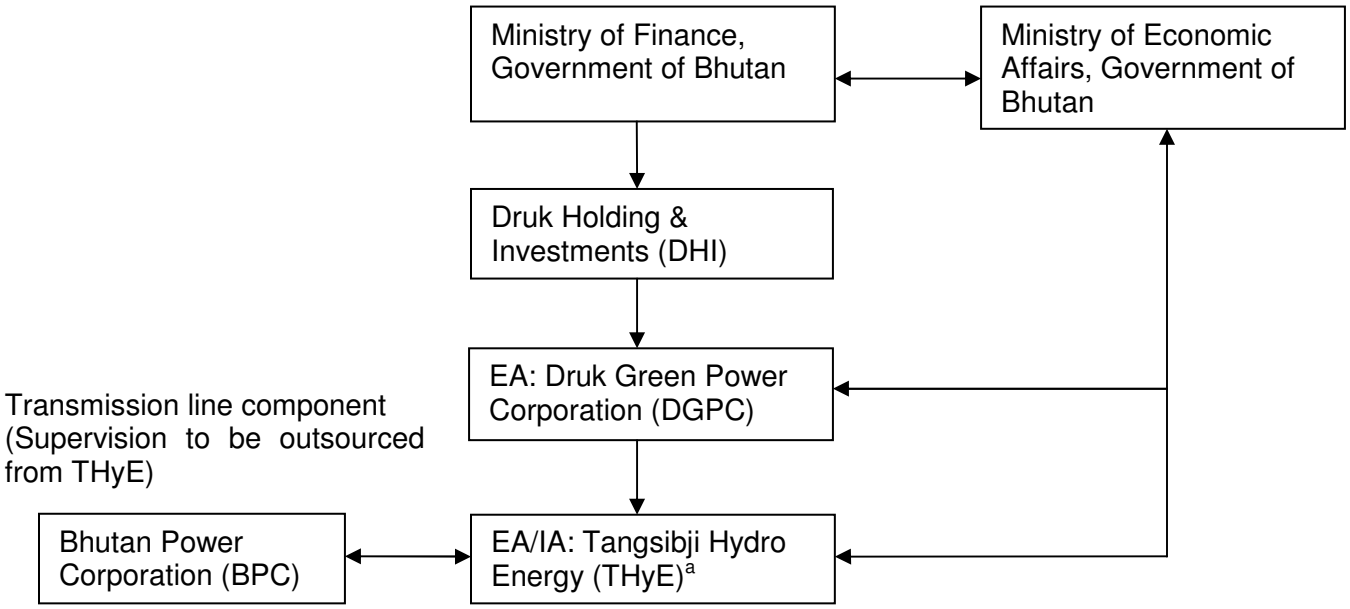
C. Project Organization Structure

6. THyE has been established as a special purpose vehicle for the implementation of the project. It is initially set up as a 100% subsidiary of DGPC. A joint venture partner will be selected through a competitive bidding process to take up to 26% of equity stake in THyE.

7. The key organizations involved in implementation of the project are in Figure 2.

Figure 2: Organization Structure



[a] THyE's organization structure is attached in Annex 3.

IV. COSTS AND FINANCING

8. The total project investment cost is estimated at $198.18 million, including taxes and duties, physical and price contingencies, and interest and other charges during implementation. The investment plan is provided in the **Table 1**.

Table 1: Investment Plan
($ million)

Item	Amount
A. Base cost [a]	
I. Hydropower plant	**109.61**
1. Civil works and hydromechanical equipment [b]	79.23
2. Electromechanical equipment	30.38
II. Associated facilities	**16.92**
3. Transmission line	3.63
4. Project preparatory works (e.g., access roads)	13.29
III. Expenses of safeguards and administration	**19.37**
5. Environmental and social safeguards [c]	2.81
6. Administrative expenses	16.56
Subtotal (A)	**145.90**
B. Contingencies [d]	**31.74**
C. Financing charges during implementation [e]	**20.54**
Total (A+B+C)	**198.18**

[a] At 2014 prices. Taxes and duties are inclusive when applicable. For the items 1 and 2, any incidental expenditure relating to bank charges, local transport, freight and insurance are eligible for ADB financing.
[b] Includes taxes and duties estimated at $2.2 million, which will be included in ADB finance, as requested as these are within reasonable thresholds, do not represent an excessive share of the project investment plan, and apply only to ADB-financed expenditures that are material and relevant to the project's success.
[c] Includes (i) $2.50 million for environment safeguards and (ii) $0.31 million for social safeguards, including community development support programs.
[d] Physical contingencies computed at 5% for base cost of the item 1 and 3% for other items. Price contingencies computed using ADB forecast of international and domestic inflations.
[e] Includes interest and commitment charges. Interest during construction for OCR loan has been computed during the 5-year forward London interbank offered rate plus a spread of 0.42%. Commitment charges for an ADB loan are 0.15% per year to be charged on the undisbursed loan amount.
Sources: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

Table 2: Financing Plan

Source	Amount ($ million)	Share of Total (%)
Asian Development Bank	**120.50**	**60.80**
Asian Development Fund (grant)	25.25	12.74
Asian Development Fund (loan)	25.25	12.74
Ordinary Capital Resources (loan)	70.00	35.32
Indian Commercial Banks	**58.82**	**29.68**
Druk Green Power Corporation	**18.86**	**9.52**
Total	**198.18**	**100.00**

Sources: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

9. **ADB finance**. The government and DGPC have requested ADB finance of $120.5 million to help finance the project. It will include (i) $50.5 million equivalent in various resources from Asian Development Fund (ADF), comprising a loan and a grant of $25.25 million each, and (ii) $70.0 million from ADB's ordinary capital resources (OCR). The loan from ADF will have a 32-year term, including a grace period of 8 years, an interest rate of 1.0% per annum during the

grace period and 1.5% per annum thereafter, and such other terms and conditions set forth in the draft loan and project agreements. The loan from OCR will have a 30-year term, including a grace period of 5.5 years, an annual interest rate determined in accordance with the ADB loan facility based on the London interbank offered rate (LIBOR),[4] a commitment charge of 0.15% per year, and such other terms and conditions set forth in the draft loan and guarantee agreements. Based on the straight-line method of the principal repayments, the average loan maturity is 18 years, and the maturity premium payable to ADB is 0.20% per annum.

10. The government has provided ADB with (i) the reasons for its decision to borrow under ADB's LIBOR-based lending facility on the basis of these terms and conditions, and (ii) an undertaking that these choices were its own independent decision and not made in reliance on any communication or advice from ADB.

11. **Cofinancing**. A parallel loan to THyE is proposed for up to $58.82 million equivalent in Indian rupee terms from the syndication of Indian commercial banks to be led by the State Bank of India (SBI), on a project finance approach without sovereign guarantee. The Indian commercial bank loan will carry a maturity of 15 years including grace and moratorium periods of 5 years, an interest rate, and fees to be determined by the credit committee of each bank syndicated.[5] SBI has already provided its in-principle approval for its loan portion. ADB and SBI (representing the Indian commercial banks) will enter into a separate collaborative cofinancing arrangement in the form of memorandum of understanding (MOU) to ensure to apply for ADB policies and guidelines on safeguards, procurement, and anticorruption and their related requirements.

12. **Financing Items.** Each of the major items and their major financing sources are as follows:

Table 3: Major Financing Items and Funding Sources

Item	Financier, etc.
1. Civil and hydromechanical equipment	ADB (ADF&OCR), Indian CBs
2. Electromechanical equipment	ADB (OCR)
3. Transmission line	Indian CBs
4. Project preparatory works	Indian CBs, DGPC
5 Environmental and social safeguards	Indian CBs
6. Administrative expenses	Indian CBs, DGPC
7. Contingencies	ADB (OCR), Indian CBs
8. Financing charges during implementation	ADB (OCR), Indian CBs, DGPC

ADB = Asian Development Bank, ADF = Asian Development Fund, CB = commercial bank, DGPC = Druk Green Power Corporation, OCR = ordinary capital resources.
Sources: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

13. While the taxes and duties are exempted for import of plant and equipment as direct input to the project during the construction period (including the hydromechanical and electromechanical equipment), The package of civil works will include taxes and duties (estimated at $2.2 million), which will be financed by ADB. They will meet the ADB financing requirements since they are within reasonable thresholds, do not represent an excessive share of the project investment plan, and apply only to ADB-financed expenditures that are material

[4] The interest includes a maturity premium of 20 basis points given the borrowers' choice of repayment option.
[5] SBI has already made its in-principal approval for the loan with the SBI base rate plus 225 basis points (i.e., current effective interest rate of 12.25%).

and relevant to the project's success. The package of electromechanical equipment will be tax-exempted.

14. **Relending Arrangements.** The government will relend both grant and loan from ADF to DGPC through a subsidiary loan agreement with the same terms and conditions of the loan. DGPC will use ADF finance as its anchor source of equity to THyE. Therefore, ADF's foreign risk exchange will be assumed by DGPC. The equity balance will be filled up from DGPC's internal resources. The OCR loan will be provided to THyE and the government will have a guarantee agreement with ADB. The OCR loan will be used for part of ThyE's debt portion, and the balance is expected to be financed by Indian commercial banks. THyE's debt will be raised on the market base terms. THyE's debt to equity ratio will be 65:35. The financing sources of THyE are in Table 4.

Table 4: Financing Sources for THyE

Item	Amount ($ million)
(Debt: Equity = 65:35)	
Debt (Total)	**128.82**
ADB OCR	70.00
Indian commercial banks	58.82
Equity (Total)	**69.36**
DGPC (ADB ADF)	50.50
DGPC (Internal finance sources)	18.86
Total	**198.18**

ADB = Asian Development Bank, ADF = Asian Development Fund, DGPC = Druk Green Power Corporation, OCR = ordinary capital resources.
Sources: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

A. Detailed Cost Estimates by Expenditure Category

($ million)

Item			Amount	% of Cost Category
A.	**Investment Costs**			
	1	Civil Works (including hydromechanical equipment)	79.23	40.0
	2	Electromechanical equipment	30.38	15.3
	3	Transmission lines	3.63	1.8
	4	Environment safeguards	2.50	1.3
	5	Social Safeguards	0.31	0.2
	6	Project Preparatory Works	13.29	6.7
		Subtotal (A)	**129.35**	**65.3**
B.	**Recurrent Costs**			
	1	Admin Expenses	16.56	8.4
		Subtotal (B)	**16.56**	**8.4**
		Total Base Cost	**145.90**	**73.6**
C.	**Contingencies**			
	1	Physical	5.87	3.0
	2	Price	25.87	13.1
		Subtotal (C)	**31.74**	**16.0**
D.	**Financing Charges During Implementation**			
	1	Interest During Implementation	20.04	10.1
	2	Commitment Charges	0.50	0.3
		Subtotal (D)	**20.54**	**10.4**
	Total Project Cost (A+B+C+D)		**198.18**	**100.0**

Source: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

B. Allocation and Withdrawal of Loan & Grant Proceeds

B1. Allocation and Withdrawal of ADB OCR Loan Proceeds

CATEGORY			ADB FINANCING BASIS
Number	**Item**	**Total Amount Allocated for ADB Financing ($ million)**	**Percentage and Basis for Withdrawal from the Loan Account**
1	Civil Works and Hydromechanicial Equipment	13.63	100% of total expenditure claimed to OCR
2	Electromechanical Equipment	30.38	100% of total expenditure claimed to OCR
3	Financing Charges	5.51	100% of total amount due
4	Unallocated	20.48	
	TOTAL	**70.00**	

Civil works and hydromechanical equipment will be financed by ADB OCR, ADF, and Indian commercial banks. Each request for disbursement will be delivered to either ADB OCR, ADF or Indian commercial banks.

B2. Allocation and Withdrawal of ADB ADF Loan Proceeds

CATEGORY			ADB FINANCING BASIS
Number	**Item**	**Total Amount Allocated for ADB Financing ($ million)**	**Percentage and Basis for Withdrawal from the Loan Account**
1	Civil Works and Hydromechanical Equipment	25.25	50% of total expenditure claimed to ADF
	TOTAL	**25.25**	

ADF loan and grant to be utilized on pro-rata basis to cover 100% of total expenditure claimed. Civil works and hydromechanical equipment will be financed by ADB OCR, ADF, and Indian commercial banks. Each request for disbursement will be delivered to either ADB OCR, ADF or Indian commercial banks.

B3. Allocation and Withdrawal of ADB ADF Grant Proceeds

CATEGORY			ADB FINANCING BASIS
Number	**Item**	**Total Amount Allocated for ADB Financing ($ million)**	**Percentage and Basis for Withdrawal from the Grant Account**
1	Civil Works and Hydromechanical Equipment	25.25	50% of total expenditure claimed to ADF
	TOTAL	**25.25**	

ADF loan and grant to be utilized on pro-rata basis to cover 100% of total expenditure claimed. Civil works and hydromechanical equipment will be financed by ADB OCR, ADF, and Indian commercial banks. Each request for disbursement will be delivered to either ADB OCR, ADF or Indian commercial banks.

C. Detailed Cost Estimates by Financier

($ million)

	Item	ADB OCR Loan Amount	ADB OCR Loan % of Cost Category	ADF Loan [a] Amount	ADF Loan % of Cost Category	ADF Grant Amount	ADF Grant % of Cost Category	Indian Commercial Banks Amount	Indian Commercial Banks % of Cost Category	DGPC Amount	DGPC % of Cost Category	Total Cost
		A	A/F	B	B/F	C	B/F	D	D/F	E	E/F	F
A.	**Investment Costs**											
	1 Civil Works (including hydromechanical equipment)	13.63	17.20	25.25	31.87	25.25	31.87	15.10	19.06	0.00	0.00	79.23
	2 Electromechanical equipment	30.38	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.38
	3 Transmission lines	0.00	0.00	0.00	0.00	0.00	0.00	3.63	100.00	0.00	0.00	3.63
	4 Environment safeguards	0.00	0.00	0.00	0.00	0.00	0.00	2.50	100.00	0.00	0.00	2.50
	5 Social Safeguards	0.00	0.00	0.00	0.00	0.00	0.00	0.31	100.00	0.00	0.00	0.31
	6 Project Preparatory Works	0.00	0.00	0.00	0.00	0.00	0.00	1.52	11.40	11.78	88.60	13.29
	Subtotal (A)	**44.01**	**34.03**	**25.25**	**19.52**	**25.25**	**19.52**	**23.06**	**17.83**	**11.78**	**9.11**	**129.35**
B.	**Recurrent Costs**											
	1 Admin Expenses	0.00	0.00	0.00	0.00	0.00	0.00	10.00	60.40	6.56	39.60	16.56
	Subtotal (B)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**60.40**	**6.56**	**39.60**	**16.56**
	Total Base Cost (A+B)	**44.01**	**30.17**	**25.25**	**17.31**	**25.25**	**17.31**	**33.06**	**22.66**	**18.33**	**12.57**	**145.90**
C.	**Contingencies**	20.48	64.52	0.00	0.00	0.00	0.00	11.26	35.48	0.00	0.00	31.74
D.	**Financing Charges During Implementation**	5.51	26.83	0.00	0.00	0.00	0.00	14.50	70.59	0.53	2.58	20.54
	Total Project Cost (A+B+C+D)	**70.00**	**35.32**	**25.25**	**12.74**	**25.25**	**12.74**	**58.82**	**29.68**	**18.86**	**9.52**	**198.18**

[a] Fund source for interest charges of the ADF loan is from DGPC.
Source: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

D. Detailed Cost Estimates by Outputs/Components

($ million)

	Item	Total Cost	Hydropower plant Component 1		Associated facilities Component 2		Expenses of safeguards and administration Component 3	
			Amount	% of Cost Category	Amount	% of Cost Category	Amount	% of Cost Category
A.	**Investment Costs**							
	1 Civil Works (including hydromechanical equipment)	79.23	79.23	56.7	0.00	0.0	0.00	0.0
	2 Electromechanical equipment	30.38	30.38	21.7	0.00	0.0	0.00	0.0
	3 Transmission lines	3.63	0.00	0.0	3.63	14.0	0.00	0.0
	4 Environment safeguards	2.50	0.00	0.0	0.00	0.0	2.50	7.7
	5 Social Safeguards	0.31	0.00	0.0	0.00	0.0	0.31	1.0
	6 Project Preparatory Works	13.29	0.00	0.0	13.29	51.2	0.00	0.0
	Subtotal (A)	**129.35**	**109.61**	**78.4**	**16.92**	**65.2**	**2.81**	**8.7**
B.	**Recurrent Costs**							
	1 Admin Expenses	16.56	0.00	0.0	0.00	0.0	16.56	51.1
	Subtotal (B)	**16.56**	**0.00**	**0.0**	**0.00**	**0.0**	**16.56**	**51.1**
	Total Base Cost (A+B)	**145.91**	**109.61**	**78.4**	**16.92**	**65.2**	**19.37**	**59.8**
C.	**Contingencies**							
	1 Physical	5.87	4.79	3.4	0.50	1.9	0.58	1.8
	2 Price	25.87	19.91	14.2	1.54	5.9	4.43	13.7
	Subtotal (C)	**31.74**	**24.69**	**17.7**	**2.04**	**7.9**	**5.01**	**15.5**
D.	**Financing Charges During Implementation**							
	1 Interest	20.04	5.01	3.6	7.01	27.0	8.02	24.8
	2 Commitment Charges	0.50	0.50	0.4	0.00	0.0	0.00	0.0
	Subtotal (D)	**20.54**	**5.51**	**3.9**	**7.01**	**27.0**	**8.02**	**24.8**
	Total Project Cost (A+B+C+D)	**198.18**	**139.81**	**100.0**	**25.97**	**100.0**	**32.39**	**100.0**

Source: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

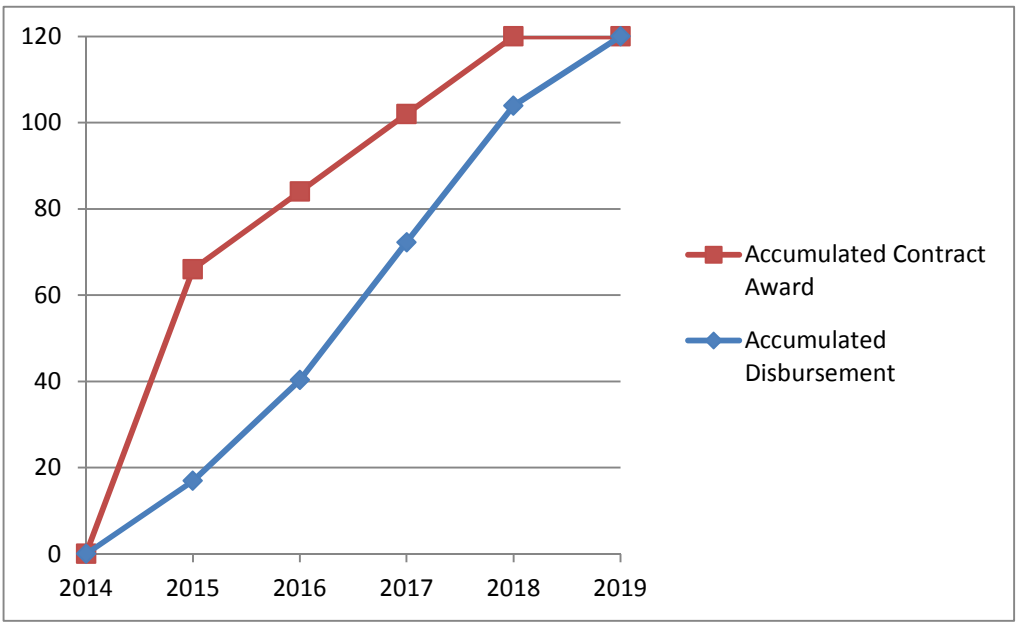
E. Detailed Cost Estimates by Year

($ million)

	Item	Total Cost	2015	2016	2017	2018	2019
A.	**Investment Costs**						
	1 Civil Works (including hydromechanical equipment)	**79.23**	9.71	27.96	25.97	13.17	2.42
	2 Electromechanical equipment	**30.38**	0.00	3.04	16.71	9.11	1.52
	3 Transmission lines	**3.63**	0.00	0.00	1.07	2.56	0.00
	4 Environment safeguards	**2.50**	0.66	0.72	0.39	0.35	0.37
	5 Social Safeguards	**0.31**	0.01	0.07	0.07	0.07	0.10
	6 Project Preparatory Works	**13.29**	11.01	2.23	0.03	0.03	0.01
	Subtotal (A)	**129.35**	**21.39**	**34.02**	**44.24**	**25.29**	**4.41**
B.	**Recurrent Costs**						
	1 Admin Expenses	**16.56**	4.86	2.59	3.84	3.76	1.51
	Subtotal (B)	**16.56**	**4.86**	**2.59**	**3.84**	**3.76**	**1.51**
	Total Base Cost (A+B)	**145.90**	**26.25**	**36.60**	**48.08**	**29.04**	**5.92**
C.	**Contingencies**	**31.74**	0.00	0.00	0.00	15.87	15.87
D.	**Financing Charges During Implementation**	**20.54**	1.64	2.03	4.79	7.39	4.71
	Total Project Cost (A+B+C+D)	**198.18**	**27.89**	**38.63**	**52.86**	**52.30**	**26.50**
	% Total Project Cost	**100**	**14.07**	**19.49**	**26.67**	**26.39**	**13.37**

Source: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

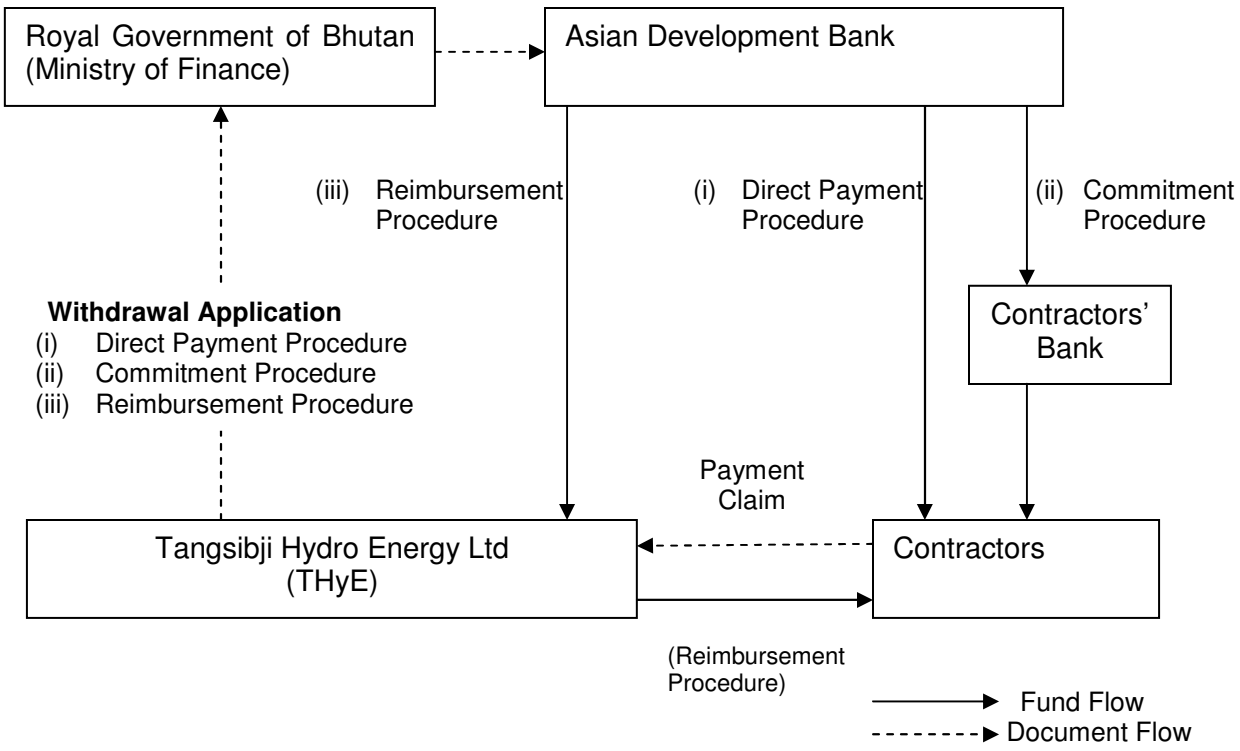
F. Contract and Disbursement S-Curve



G. Fund Flow Diagram

15. Figure 3 shows how the funds will flow from ADB, and the Borrower to implement the project.

Figure 3: Funds Flow Diagram



V. FINANCIAL MANAGEMENT

A. Financial Management Assessment

16. The financial management assessment was carried out in accordance with the Financial Management Guidelines and Financial Due Diligence Methodology Note. DGPC, incorporated in January 2008, was formed by the amalgamation of four hydropower generating companies: Chhukha Hydro Power Corporation, Basochu Hydro Power Corporation, Kurichhu Hydro Power Corporation, and Tala Hydroelectric Project Authority. Financial management assessment was undertaken to assess the current ability of DGPC to fulfill ADB's fiduciary requirements and identify areas for improvement. THyE has been incorporated on 25 April 2014 as a wholly owned subsidiary of DGPC to implement the Nikachhu hydropower project. DGPC and THyE completed a financial management assessment questionnaire to facilitate a review of their financial systems and processes. As a result, financial management of DGPC is assessed satisfactory. DGPC has adequate financial management arrangements in place and the overall fiduciary risk is rated as low.

17. THyE has been incorporated as a special purpose vehicle, presently wholly owned by the DGPC, to implement the Nikachhu hydropower project. Since the company was established, the THyE's financial management policies, systems and procedures have been followed by the DGPC's ones like the merged other companies (plants) and subsidiaries. THyE's number of staff is 80 (mostly on deputation from DGPC) during the initial phase. Further, DGPC continues to commit experienced senior officers in the fields of engineering, human resources and finance as well.

18. An internal audit manual is available to DGPC so that comprehensive risk management is in place. DGPC has proper checks and balances for all types of expenses (both operating and capital). Presently, DGPC head office and hydropower plants maintain accounting and financial systems using an Enterprise Resource Planning (ERP), i.e. System Application Product (SAP). SAP was installed in all its plants and all the corporate reporting requirements are handled through the SAP systems. A set of manuals (covering internal audit, risk management, delegation of power, etc.) clearly specify the procedures covering all routine financial management and related administrative activities. THyE will also follow the same procedures and manuals. The recent auditor's report opined that DGPC and its subsidiaries have adequate internal control systems, suitable budgetary systems, adequate competitive bidding, and sufficient organizational system control to carry out their operations in an orderly and efficient manner. While the auditor pointed out some issues, DGPC confirmed to resolve all of them in 2014 (for example, DGPC will have an independent IT audit and settle an inter-company fund arrangement with DHI).[6]

19. DGPC follows financial accounting on an accrual basis as per provisions of their governing statutes and generally accepted accounting principles. Being corporate entities and government companies, it is subject to audit under the Companies Act of the Kingdom of Bhutan, 2000 by the Royal Audit Authority. DGPC provide quarterly reports to the Bhutan Electricity Authority and submit quarterly reports to Royal Monetary Authority for foreign currency receipts and payments. DGPC come out with provisional financial statements every quarter and their financial statements are audited annually. Since DGPC is expected to be the government agency to undertake the public investment portion of new hydropower projects, it will need to leverage its balance sheet to raise commercial financing including funding from

[6] Financial Management Assessment (accessible from the list of linked documents in Appendix 2).

international sources. Thus, DGPC is taking initiatives to strengthen its systems and processes to become an international financial reporting standards compliant entity so that it is easier to raise funds in international financial markets.

B. Disbursement

20. The loan proceeds will be disbursed in accordance with ADB's Loan Disbursement Handbook (2012, as amended from time to time),[7] and detailed arrangements agreed upon between DGPC, THyE, and ADB. Reimbursement procedures will be applicable under retroactive financing in case payments are covered prior to loan effectiveness.

21. Pursuant to ADB's Safeguard Policy Statement (2009) (SPS),[8] ADB funds may not be applied to the activities described on the ADB Prohibited Investment Activities List set forth at Appendix 5 of the SPS. All financial institutions will ensure that their investments are in compliance with applicable national laws and regulations and will apply the prohibited investment activities list (Appendix 5) to subprojects financed by ADB.

22. Before the submission of the first withdrawal application, THyE should submit to ADB sufficient evidence of the authority of the person(s) who will sign the withdrawal applications on behalf of THyE, together with the authenticated specimen signatures of each authorized person. For reimbursement procedure, the minimum value per withdrawal application is $100,000, unless otherwise approved by ADB. THyE is to consolidate claims to meet this limit for the reimbursement procedure

23. Withdrawal application to ADB shall be presented based on each supporting evidence for 100% coverage by ADB, and a pro-rata disbursement principle among ADB and Indian commercial banks will not be applied accordingly. The components to be financed by ADB are as follows:

(i) Civil and hydromechanical equipment is financed by ADB (ADF and OCR) and Indian commercial banks. Each disbursement from ADF Loan and Grant is on pro-rata basis. Each request for disbursement will be delivered to either ADB OCR, ADF or Indian commercial banks at the borrower's discretion, as long as (a) the initial mobilization payment shall be financed by ADB ADF in accordance with the ADB's Loan Disbursement Handbook, and (b) the allocated funds for this package under each institution are available. 100% of subsequent claims will be disbursed in accordance with the relevant financier's disbursement guidelines and procedures. The accumulative disbursement records such as each request for disbursement and corresponding disbursement made (invoice no., dates, and amounts, etc.) shall be attached to each request for disbursement so that each financier can review the whole progress of request for disbursement and disbursement made.

(ii) Contingencies to be financed by ADB (OCR) or Indian commercial banks are according to the relevant categories.

(iii) Financing charges during implementation to be financed by ADB (OCR), Indian commercial banks, or DGPC is according to the charges by the relevant institutions.

24. DGPC/THyE will be responsible for (i) preparing disbursement projections for each year, (ii) requesting budgetary allocations for counterpart funds, (iii) collecting supporting documents, and (iv) preparing and sending withdrawal applications. Withdrawal applications and supporting

[7] Available at: http://www.adb.org/Documents/loan-disbursement-handbook.
[8] Available at: http://www.adb.org/Documents/Policies/Safeguards/Safeguard-Policy-Statement-June2009.pdf.

documents will demonstrate, among other things that the works, goods, and/or services were produced in or from ADB members, and are eligible for ADB financing.

C. Accounting

25. DGPC and THyE are required to maintain separate books and records by funding source for all expenditures incurred on the project, THyE will prepare project financial statements in accordance with the government's accounting laws and regulations which are consistent with international accounting principles and practices. Financial statements shall include all sources of funds from the loans. Since THyE has been incorporated solely for the purpose of this project, THyE's statutory entity level financial statements may be submitted in lieu of project financial statements.

D. Auditing

26. THyE will cause the detailed project financial statements to be audited in accordance with International Standards on Auditing and with the government's audit regulations, by an independent auditor acceptable to ADB. The audited project financial statements will be submitted in the English language to ADB within six months of the end of the fiscal year by DGPC/THyE. DGPC will also cause the entity-level (DGPC) financial statements to be audited in accordance with International Standards on Auditing and/or with the government's audit regulations, by an independent auditor acceptable to ADB. The audited entity-level financial statements, together with the auditors' report, will be submitted in the English language to ADB within one month after their approval by the competent authority.

27. The annual audit report for the project financial statement will include an audit management letter and audit opinions which cover (i) whether the project financial statements present a true and fair view or are presented fairly, in all material respects, in accordance with the applicable financial reporting framework; (ii) whether loan and grant proceeds were used only for the purposes of the project or not; and (iii) the level of compliance for each financial covenant contained in the legal agreements for the project.

28. Compliance with financial reporting and auditing requirements will be monitored by review missions and during normal program supervision, and followed up regularly with all concerned, including the external auditor.

29. The government, DGPC and THyE have been made aware of ADB's policy on delayed submission, and the requirements for satisfactory and acceptable quality of the audited project financial statements. ADB reserves the right to require a change in the auditor (in a manner consistent with the constitution of the borrower), or for additional support to be provided to the auditor, if the audits required are not conducted in a manner satisfactory to ADB, or if the audits are substantially delayed. ADB reserves the right to verify the project's financial accounts to confirm that the share of ADB's financing is used in accordance with ADB's policies and procedures.

30. Public disclosure of the project financial statements, including the audit report on the project financial statements, will be guided by ADB's Public Communications Policy (2011). After review, ADB will disclose the project financial statements for the project and the opinion of the auditors on the financial statements within 30 days of the date of their receipt by posting them on ADB's website. The audit management letter will not be disclosed.

VI. PROCUREMENT AND CONSULTING SERVICES

A. Advance Contracting and Retroactive Financing

31. **Advance contracting.** In order to expedite project implementation, the government has requested advance contracting actions for the all the works, goods and consulting services. The government and DGPC/THyE have been advised that approval of advance contracting does not commit ADB to finance the project.

32. **Retroactive financing**. The government, DGPC and THyE have been advised that the expenditures incurred for works are eligible for retroactive financing, provided these have been incurred before the effectiveness of the related loan agreement, but not earlier than 12 months preceding the signing of the loan and financing agreements and as long as they do not exceed an amount of 20% of the loan and financing amounts.

33. All advance contracting and retroactive financing will be undertaken in conformity with ADB's Procurement Guidelines (2013, as amended from time to time). The issuance of invitations to bid under advance contracting and retroactive financing will be subject to ADB approval.

B. Procurement of Goods, Works and Consulting Services

34. All procurement of goods and works will be undertaken in accordance with ADB's *Procurement Guidelines*. The procurement under ADB financing will follow international competitive bidding in compliance with ADB's Procurement Guidelines.

35. Even though THyE is a newly incorporated company, experienced DGPC staffs will be seconded to THyE and full DGPC experiences will be shared with THyE. However, for further strengthening, it will need external support.

36. International competitive bidding procedures will be used for civil works contracts estimated to cost $1 million or more, and supply contracts valued at $500,000 or higher. Shopping will be used for contracts for procurement of works and equipment worth less than $100,000.

37. ADB and the Government will review the public procurement laws of the central and state governments to ensure consistency with ADB's *Procurement Guidelines* before the start of any national competitive bidding (NCB) procurement.

38. An 18-month procurement plan indicating threshold and review procedures, goods, works, and consulting service contract packages and national competitive bidding guidelines is in Section C.

39. The consultants financed by ADB for the attached TA will be recruited according to ADB's *Guidelines on the Use of Consultants*.[9] The terms of reference for all consulting services are detailed in Section D. An estimated 40 person-months (25 international, 15 national) of consulting services are required to strengthen the power sector's key frameworks and systems to enhance Bhutan's hydropower development and trading by using ADB TA. Consulting firms

[9] Checklists for actions required to contract consultants by method available in e-Handbook on Project Implementation at: http://www.adb.org/documents/handbooks/project-implementation/

will be engaged using the quality– and cost–based selection (QCBS) method with a standard quality cost ratio of 90:10.[10]

C. Procurement Plan

Basic Data

Project Name	Green Power Development Project-II
Country	Bhutan
Borrower	Government of Bhutan/THyE
Loan/Grant Effectiveness	To be determined
Date of effectiveness	Target: January 2015
Executing Agency	DGPC/THyE
Financing Amount	$120,500,000
Date of First Procurement Plan	22 July 2014
Date of this Procurement Plan	16 October 2014
Period Covered by this plan	2015-2016

Process Thresholds, Review and 18 Months Procurement Plan

1. **Project Procurement Thresholds**

40. Except as the ADB may otherwise agree, the following process thresholds shall apply to the procurement of goods, works and consulting services.

Procurement of Goods, Works, and Consulting Services

Procurement Method	**Threshold**
International Competitive Bidding (ICB) for Works	At least $1,000,000
International Competitive Bidding for Goods	At least $500,000
National Competitive Bidding (NCB) for Works	Less than $ 1,000,000
National Competitive Bidding for Goods	Less than $ 500,000
Shopping for Works	Less than $100,000
Shopping for Goods	Less than $100,000

2. **ADB Prior or Post Review**

41. Except as ADB may otherwise agree, the following prior or post review requirements apply to the various procurement and consultant recruitment methods used for the Project.

Procurement Method	Prior or Post	Comments
Procurement of Works and Goods		
ICB (goods)	Prior	
ICB (works)	Prior	
ICB (Plant/Turnkey)	Prior	
NCB (works/goods)	Post	
Recruitment of Consulting Firms		
Quality and Cost Based Selection (QCBS)	Prior	
Recruitment of Individual Consultants	Prior	

[10] Attached TA (accessible from the list of linked documents in Appendix 2). Annex 4: Outlined Terms of Reference for Technical Assistance - Acceleration of Hydropower Trading Development.

3. Goods and Works Contracts Estimated to Cost More Than $1 Million

42. The following table lists goods and works for which procurement activity is ongoing or expected to commence within the next 18 months.

General Description	Contract Value (US$ million)	Procurement Method	Prequalification of Bidders (Y/N)	Advertisement Date (Quarter)	Comments
Civil works and hydro mechanical equipment	79.23	ICB (EPC) [a]	N	4th Quarter 14	Funded by ADB & Indian CB
Electromechanical Equipment	30.38	ICB (Plant)	N	4th Quarter 14	Funded by ADB
Access Road and Site Development (5 packages)	7.70	Bhutan NCB	N	3rd Quarter 14	Funded by DGPC & Indian CB
Buildings for Construction, etc. (several packages)	8.90	Bhutan NCB	N	3rd Quarter 14	Funded by DGPC & Indian CB
Permanent Buildings, etc. (several packages)	5.40	Bhutan NCB	N	2018	Funded by DGPC & Indian CB
Transmission Component	3.63	Bhutan NCB	N	3rd Quarter 16	Funded by Indian CB

ADB = Asian Development Bank, CB = commercial bank, DGPC = Druk Green Power Corporation, ICB = international competitive bidding, NCB = national competitive bidding.
[a] FIDIC Conditions of Contract for EPC/Turnkey Projects (Silver Book) will be used Section 7 (Conditions of Contract) of the Bidding Documents.

4. Consulting Services Contracts Estimated to Cost More Than $ 100,000

43. The following table lists consulting services contracts for which procurement activity is either ongoing or expected to commence within the next 18 months.

General Description	Contract Value (US$ mil)	Procurement Method	Advertisement Date (quarter/year)	International or National Assignment	Comments
Project Supervision Owner Engineer	2.50	Bhutan NCB	4th Quarter 14	International/National	Funded by DGPC
Safeguard Consultants	0.03	Bhutan NCB	4th Quarter 14	National	Funded by DGPC

DGPC = Druk Green Power Corporation, NCB = national competitive bidding.

5. Goods and Works Contracts Estimated to Cost Less than $1 Million and Consulting Services Contracts Less than $100,000

44. The following table groups smaller-value goods, works and consulting services contracts for which procurement activity is either ongoing or expected to commence within the next 18 months.

General Description	Value of Contracts (cumulative, $ mil)	Number of Contracts	Procurement / Recruitment Method	Comments
Vehicles during Construction Period	0.30	several	Bhutan NCB	Funded by DGPC
Tools and Plants	0.20	several	Bhutan NCB	Funded by DGPC

DGPC = Druk Green Power Corporation, NCB = national competitive bidding.

Indicative List of Packages Required Under the Project

45. The following table provides an indicative list of all procurement (goods, works, and consulting services) over the life of the project. Contracts financed by the Borrower and others should also be indicated, with an appropriate notation in the comments section.

Packages under this section are same as ones listed in "18 Months Procurement Plan"

D. Consultant's Terms of Reference

46. The terms of reference of the attached TA from ADB is in **Annex 4**.

VII. SAFEGUARDS

47. The project is classified as A for environment, B for involuntary resettlement, and C for indigenous peoples in accordance with ADB's *Safeguard Policy Statement* (SPS 2009). The project's draft resettlement plan (RP) and environmental impact assessments (EIA) including the environmental management plans (EMP) have been prepared. The draft RP was disclosed to the ADB website on 5 August 2014, and the EIA on 4 August 2014 as required by SPS 2009 and the Public Communications Policy (PCP) 2011. The hydropower plant and the required 18.6 km 132 kV transmission line to evacuate the power generated have separate EIA and EMP. and disclosed on the ADB website. To comply with ADB requirements, those documents include a wide range of activities for quality monitoring, and mitigation schemes.

48. For the project, DGPC and THyE will ensure the timely and adequate implementation of the RP and EIA/EMP, and will ensure that all activities continue to comply with the applicable national and local laws and regulations, in addition to ADB's safeguard requirements stipulated in SPS 2009, and the project and its loan and financing agreements. In the event the project requires modifications to its design or configuration during implementation, DGPC and THyE will ensure to prepare and update the RP, EIA, and EMP following SPS 2009,[11] and will submit these documents to ADB for approval and clearance. Updated RP and/or EIA/EMP will be disclosed to the ADB website upon receipt. While DGPC demonstrated its good performance of safeguard implementation and compliance with its subsidiary project company for the Dagachhu hydropower development financed by ADB, the technical assistance to be attached to the project will help DGPC and THyE comply with all the safeguard requirements.[12]

49. DGPC and THyE will continue to ensure that all construction-based contracts are implemented in an environmentally and socially sustainable and responsible manner. Contracts will include provisions that comply with the government's employment laws and ADB guidance

[11] In the event of unanticipated environmental impacts or additional requirements in the EMP due to any design changes or others, DGPC/THyE will take any corrective action procedures as defined in the SPS.

[12] Attached TA (accessible from the list of linked documents in Appendix 2). Annex 4: Outlined Terms of Reference for Technical Assistance - Acceleration of Hydropower Trading Development.

on labor standards, including fair wages; reasonable occupational health and safety standards in the workplace; the provision of acceptable working conditions and practices; the prohibition of forced and compulsory labor and of child labor; equal opportunity, gender inclusive and pro-poor employment targets; equal pay for equal work; the deterrence of discriminatory practices on the basis of sex, ethnicity or caste; public awareness and sensitization of the risks and prevention of the spread of HIV/AIDS; and any requirements described in the RP, EIA and EMP. DGPC and THyE will continue to be responsible to ensure these measures are implemented and monitored, with periodic reporting to ADB, indicating if there are any issues and how they have been addressed. Any safeguard monitoring reports submitted to ADB by DGPC and THyE will be disclosed in accordance with the loan, financing and project agreements, SPS 2009 and PCP 2011.

50. A grievance redress mechanism (GRM) is established to deal with complaints on environmental and social issues and resolve grievances and complaints both in the hydropower plant and in the transmission line. The structure of the GRM is described in the EIA/EMP and the RP. Effective GRM is in place in accordance with the EIA/EMP and RP to assist affected persons to resolve grievances and complaints if any in a timely manner. The panel of experts will audit, assess, and monitor the compliance with RP, EIA, and EMP.[13]

51. **Environmental safeguards**. The main adverse environmental impacts expected with the project include: loss of forest, risk of disturbance of wildlife (relating to a small section in the national park and its extended biological corridor), and influence on downstream. The project-related impacts will be mitigated: through compliance with Bhutan standards and best practice approaches at all work sites; bioengineering for slope protection and stability; replanting of cleared areas (two times the area cleared to be planted), including the small segment of the biological corridor; a wildlife/plant rescue plan, biodiversity monitoring program and support to National Park staff competencies and infrastructure that will help with future development of a biodiversity management plan for the national park; maintenance of minimum flow conditions; monitoring of flows and aquatic habitat (including fish); examination of fish stocking options for the reservoir; a flood warning system; and, a watershed management plan to maintain the integrity of the watershed and water quality. The EMP includes a wide range of these activities for monitoring, as well as physical mitigation schemes.[14] The EMP will be included in the contractors' bidding documents, and all the provisions in the EMP will be complied with.[15] All relevant environmental clearances will be secured prior to start of construction works. DGPC and THyE will continue to monitor, audit, and report to ADB on the implementation of the EMP quarterly during construction and annually during operation.

52. DGPC/THyE will contract qualified and experienced safeguard consultants/experts to develop/update and monitor the various environmental programs (however, at the moment, these are on staff in the DGPC Environmental Management Unit), with individuals, agencies and/or civil societies, as needed, co-opted to provide training, planning, supervision, and advisory services.

53. The contractors will prepare and submit monthly/quarterly progress reports in conformance with the EMP to DGPC and THyE and shall indicate when, how and at what cost the contractors plan to satisfy the requirements as per detailed design. The construction

[13] Annex 5: Outlined Terms of Reference for Panel of experts. Qualified and experienced experts will be retained on a basis of terms of reference satisfactory to ADB.
[14] Annex 6: Summary of Environment Management Plan Activities.
[15] The bidders will be requested to explain how they cost the EMP activities if applicable.

schedules shall detail the resources to be provided or utilized and any related subcontracting proposed if any.

54. **Social Safeguards**. The project will entail involuntary resettlement impacts mainly due to access roads and transmission tower footprints. A total of 119.38 hectares of land will be acquired by the project, of which the majority comprises of government land. Only 1.69 hectares of private land will be acquired as a result of this project. The 1.69 hectares of dry land is owned by 18 households including a common property resource (a government-owned community primary school), comprising 84 economic displaced persons.

55. The RP has been prepared based on detailed resettlement census and socioeconomic survey conducted in the project area. Public consultations were carried out at various locations in the project area. Additionally, separate consultations were carried out among the women group at various project locations. The RP guides the resettlement process and further elaborate on the nature of impacts, range of and eligibility for entitlements, income and livelihood restoration, rehabilitation assistance and compensation for losses incurred in accordance with the relevant Bhutanese laws and the SPS of ADB. The RP also provides details on suitable institutional arrangements for carrying out implementation, a procedure for grievance redress, a structure for periodic and regular monitoring and reporting of project activities, detailed cost/budget estimates, and a time-bound implementation schedule for completing the process. Project affected people will be duly consulted on a regular basis (as needed), in a timely, transparent and culturally sensitive manner and in the local language throughout the project cycle. The RP's entitlement matrix and relevant sections such as project impacts, compensation policies and entitlements, grievance redress mechanism, compensation and land replacement, and the implementation schedule are made available to all displaced persons in local language.

56. All displaced people should be paid compensation and assistance in accordance with the provisions in the RP. The land should be made free of encumbrances and obstructions prior to commencement of construction thereof in accordance with the work schedule under the related civil works contract.

57. DGPC/THyE, through its internal monitoring committee, will monitor and measure the progress of implementation of the RP. DGPC/THyE will submit semi-annual monitoring reports to ADB. If during implementation any modification or additional land requirement or involuntary resettlement impacts are identified either on private or government land, a related RP will be prepared or updated in accordance with the applicable laws referred to in the RP, and prior approval of the ADB will be obtained before any further implementation.

VIII. GENDER AND SOCIAL DIMENSIONS

58. Bhutan has achieved remarkable socioeconomic progress and poverty reduction as a result of government's efforts to improve the living standards of people. The project is categorized as having some gender elements with measures to benefit women incorporated in the project design in accordance with ADB's Policy on Gender and Development (1998).

59. Men and women enjoy equal status in the project area. Focus group discussions were undertaken with women from different socioeconomic groups in the project influence area. Women stated the project will benefit them especially the skills development program for women who weave as they can get into commercial weaving, rather than traditional weaving, which will supplement their household incomes. The training will be imparted by an NGO and it

will target to cover 25- 30 women. The project will include such training opportunities for women with support from a NGO. Space will be provided in the community agriculture and dairy products sales outlet for women to display and sell their weaves to customers. This sales outlet will be constructed by the project for the benefit of the community as part of the community development initiative of DGPC and THyE.

60. The bidding documents provide clauses designed to ensure that all civil works contractors comply with applicable labor laws, do not employ child labor, encourage the employment of the poor particularly women, and do not offer different wages to men and women particularly for work of equal value. Dialogue and communication (both written and verbal) with stakeholders will be carried out in a specific and culturally sensitive manner and in local languages, as required during safeguards implementation. There are special provisions for the vulnerable households including the women headed households in the RP.

61. **HIV /AIDS**. Based on the poverty and social assessment, there is no risk that the project will increase HIV/AIDS incidence. However, contractors will carry out HIV/AIDS awareness for their laborers at work sites, which will be monitored by the construction supervision consultants. DGPC/THyE with the help of public health agencies will carry out the awareness amongst the communities in the project influence area.

62. **Health**. DGPC/THyE will ensure that contractors provide adequately for the health and safety of the construction workers and further ensure that bidding documents include measures on how contractors will address this, including an information and awareness raising campaign for construction workers on sexually transmitted diseases, including HIV/AIDS and human trafficking.

63. **Labor**. DGPC/THyE will ensure that civil works contractors comply with all applicable labor laws and regulations; do not employ child labor for construction and maintenance activities; provide appropriate facilities for women and children in construction campsites; and do not differentiate wages between men and women for work of equal value. The EA will ensure that specific clauses ensuring these will be included in bidding documents.

X. PERFORMANCE MONITORING, EVALUATION, REPORTING AND COMMUNICATION

A. Project Design and Monitoring Framework

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
Impact Expanded cross-border power trading	Power trading from Bhutan to India increased by at least 16,000 GWh[a] by 2025 (baseline 2013: 5,650 GWh)	BPC's Power Data Book	**Assumptions** Power trading with, bilateral assistance and joint venture investments from India continues.
	I Investments from the public and private sectors to hydropower development for export from Bhutan increased by	The government's five year plans and economic reports	**Risks** Global or regional economic slowdown affects demand for energy.

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
	at least 4,400 MW[b] by 2025 (baseline 2013: 1,110 MW)		
Outcome Increased clean hydropower generation in Bhutan	Clean power generated and supplied increased by 491.52 GWh by 2020 (baseline 2013: 7,530 GWh) 459,734 tons CO_2 equivalent per annum of emission avoided as certified on the cross-border CDM by 2020	DGPC audited financial accounts and annual reports CDM project design document and monitoring reports	**Assumptions** The downstream Mangdechhu plant substation to supply generated power is operating before 2020.
Outputs 1.Hydropower plant constructed 2.DGPC and THyE project management and implementation capacity enhanced	118 MW run-of-river Nikachhu hydropower plant constructed through PPP by 2019 18.6 km 132 kV transmission line to evacuate to the grid system constructed by 2019 DGPC's equity financing requirement raised through PPP by 2015 THyE's and DGPC safeguard implementation and monitoring system in place by 2015. Commercial weaving training provided at least for 25 women under community development programs by 2019	DGPC quarterly project progress reports DGPC quarterly project progress reports THyE audited financial accounts and annual reports Safeguard monitoring reports Safeguard monitoring reports	**Assumptions** Cofinancing from Indian commercial banks is available on time. DGPC mobilizes its counterpart funds and private partner's equity. **Risks** Prices of construction materials increase more than provisioned. Natural disaster and geological conditions caused unexpected construction delays during implementation.

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
3.Hydropower development and trading framework Improved	Study of functional segregation of transmission and distribution, system operation, and power trading of power entities submitted to the government by 2017 Existing hydropower policy improvement and draft tariff policy finalized by the government by 2017	Assessment of unbundling of BPC distribution, transmission, and system operations Final documents of revised Sustainable Hydropower Development Policy, 2008 and Tariff Policy	

Activities with Milestones	Inputs
1. Hydropower plant constructed 1.1 Procure 118 MW hydropower plant: float bid by Q4 2014 and award contract by Q2 2015 1.2 Acquire land and develop the site, including access roads, by Q2 2015 1.3 Procure 132 kV transmission line; float bid and award contract by Q3 2016 1.4 Full commissioning of 132 kV transmission line by Q4 2018 1.5 Full commissioning of 118 MW hydropower plant by Q4 2019 **2. THyE project management and implementation capacity enhanced** 2.1 Start the selection process for a private joint venture partner by Q3 2014 2.2 Complete the selection process for a private joint venture partner and sign a shareholders agreement by Q4 2015 2.3 Conduct programs included in the EIA, EMP, and resettlement plan by 2020 and monitor thereafter **3. Hydropower development and trading framework improved** 3.1 Assess revisions of the Hydropower Development Policy (2008) by Q4 2015 3.2 Assess a draft tariff policy paper by Q4 2016 3.3 Submit an assessment report of the sector's functional unbundling of BPC's distribution, transmission, system operations, and trading by Q1 2017	**ADB Loans:** $95.25 million **ADB Grant:** $25.25 million **Cofinancier:** $58.82 million **DGPC** $18.86 million **ADB Technical Assistance Grant:** $1.00 million

ADB = Asian Development Bank, BPC = Bhutan Power Corporation, CDM = clean development mechanism, DGPC = Druk Green Power Corporation, EIA = environment impact assessment, EMP = environment management plan, GWh = gigawatt-hour, kV = kilovolt, MW = megawatt, PPP = public private partnership, RP= resettlement plan, TA = technical assistance, THyE = Tangsibji Hydro Energy.

[a] In a conservative manner, this accounts for the projects, including the Bunakha, Chamkacchu I, Kholongchhu, Mangdechhu, Nikachhu, Punatsangchhu I and II, and Wangchhu.

[b] Estimated on projected capacity and projected domestic demand in 2025.

Source: Asian Development Bank.

B. Monitoring

64. **Project performance monitoring.** DGPC/THyE will undertake overall monitoring of the project in terms of progress. ADB, the government and DGPC/THyE will conduct semiannual reviews throughout the implementation of the project. The review will monitor the (i) project output quality, (ii) implementation arrangements, (iii) implementation progress, and (iv) disbursements. Performance will also be monitored based on indicators and targets stipulated in the design and monitoring framework. Quarterly progress reports will be submitted to ADB within one month from the ends of quarters.

65. **Compliance monitoring**. In addition to the standard assurances, compliance with the specific assurances will be monitored. They will be based on the loan, grant, and project agreements as well as procurement and disbursement guidelines. The procurement of goods, related services, and works financed by ADB will follow procedures outlined in the ADB's Procurement Guidelines. The ADB financing proceeds will be disbursed in accordance with ADB's Loan Disbursement Handbook (2012, as amended from time to time).

66. **Safeguards monitoring**. Monitoring and evaluation of the implementation of the RP, EIA and EMP will be done by THyE in a transparent manner. The monitoring parameters and indicators are provided in the RP, EIA, and EMP, including the monitoring methodology. The monitoring time frame and reporting requirements are also detailed. DGPC and THyE will continue to be responsible for overall implementation of safeguard documents and its monitoring for compliance. Specifically, DGPC and THyE will be responsible for management, coordination, and execution of all activities funded under the ADB loans. DGPC and THyE will bear overall responsibility for providing regular monitoring reports to ADB as specified in these documents. THyE as the implementing agency will be responsible for pre-construction, construction and operation phases of the plant, and implementation of these safeguards. THyE will cause BPC to follow the same monitoring requirements for the transmission line component. THyE will submit to ADB the environmental monitoring reports for the EMP implementation quarterly during construction and annually during operation. For this purpose, the contractor(s) shall prepare and submit the monthly/quarterly progress reports in conformance with the EMP to THyE and shall indicate when, how and at what cost the contractors plan to satisfy the requirements as per detailed design. DGPC, through its Internal Monitoring Committee, consisting of (i) managing director, THyE; (ii) chief administrative officer, THyE and; (iii) environment officer, THyE, will also monitor and measure the progress of the RP implementation. In addition to recording the progress in compensation payment, any compliance issues, corrective actions, and other resettlement activities, THyE will prepare monitoring reports to ensure that the RP implementation has produced the desired outcomes. THyE will submit to ADB the social monitoring reports for the RP implementation semiannually. The monitoring reports for the EMP and RP will be publicly disclosed to ADB website as required by *SPS 2009* and *Public Communications Policy 2011*. DGPC/THyE will engage qualified external expert(s) for safeguards monitoring with terms of reference satisfactory to ADB.

67. **Gender and social dimensions monitoring**. EA will monitor compliance the requirements.

C. Evaluation

68. ADB will field regular review missions in general every six months at the minimum to review status of contract awards, disbursements, physical progress, and implementation of the environmental management plan and resettlement plans. Within 6 months of physical completion of the project, DGPC/THyE will submit the project completion report (PCR) to ADB. Subsequently, ADB will field a mission to finalize the PCR.[16]

Evaluation Activity	Purpose	Methodology	Who responsible and involved

[16] Project completion report format is available at: http://www.adb.org/Consulting/consultants-toolkits/PCR-Public-Sector-Landscape.rar

Review Mission	Review the progress of the project and provide guidance to facilitate implementation	Site visits and meetings with DGPC/ THyE, and/or contractors at least twice a year	ADB/ DGPC/ THyE
Project completion report	Evaluate the overall output of the project and its relevance and suitability	Site visit and meetings with DGPC/THyE, and/or contractors	ADB/ DGPC/ THyE

ADB = Asian Development Bank, DGPC = Druk Green Power Corporation, THyE = Tangsibji Hydro Energy.

D. Reporting

69. DGPC/THyE will provide ADB with (i) quarterly progress reports in a format consistent with ADB's project performance reporting system; (ii) consolidated annual reports, including (a) progress achieved by output as measured through the indicator's performance targets, (b) key implementation issues and solutions; (c) updated procurement plan and (d) updated implementation plan for next 12 months; and (iii) a project completion report within 6 months of physical completion of the Project. To ensure projects continue to be both viable and sustainable, and the DGPC's and THyE's audited financial statements, together with the associated auditor's report, should be adequately reviewed.

E. Stakeholder Communication Strategy

70. The Stakeholder Communications Strategy is described in the following table. DGPC/THyE will post all relevant information on their websites. The website will include at minimum information regarding the bidding process, bidders, contract awards, use of funds disbursed under the project and physical progress

Table 5: Stakeholder Communication Strategy

Project information to be communicated	Means of Communication	Responsibility	Audience	Frequency
Report and Recommendation of the President (RRP) with linked documents	ADB website	ADB	ADB, Government of Bhutan, Development Partners, Civil Society, Individuals	Once
Project information while planning/designing	Discussions and stakeholder consultations	DGPC/THyE	Project beneficiaries, Affected persons, and other stakeholders	Regular intervals during planning and design
Safeguards Documents (i.e., EIA and RP) and any update during implementation	Websites of ADB and DGPC/THyE	DGPC/THyE	ADB, Government of Bhutan, Development Partners, Civil	Once before implementation and as needed during implementation

Project information to be communicated	Means of Communication	Responsibility	Audience	Frequency
			Society, Individuals	
Status of implementation during construction	Boards at site	DGPC/ THyE/Contractors	Project beneficiaries, Affected communities, and other stakeholders	All the time at construction sites
Project Performance Reports and Project Information Documents	ADB website	ADB	ADB, Government of Bhutan, Development Partners, Civil Society, Individuals	Quarterly
Safeguards Monitoring During Implementation (i.e., Environmental and Social Monitoring Report)	ADB website	ADB and DGPC/ THyE	ADB, Government of Bhutan, Development Partners, Civil Society, Individuals	Quarterly for environmental and semiannually for social maters during construction, and annually during operation
Project completion report	ADB website	ADB	ADB, Government of Bhutan Development, Partners, Civil Society, Individuals	Once

ADB = Asian Development Bank, DGPC = Druk Green Power Corporation, THyE = Tangsibji Hydro Energy Ltd

XI. ANTICORRUPTION POLICY

71. ADB reserves the right to investigate, directly or through its agents, any violations of the Anticorruption Policy relating to the project.[17] All contracts financed by ADB shall include provisions specifying the right of ADB to audit and examine the records and accounts of the executing agency and all Project contractors, suppliers, consultants and other service providers. Individuals/entities on ADB's anticorruption debarment list are ineligible to participate in ADB-financed activity and may not be awarded any contracts under the project.[18]

72. The government of Bhutan and DGPC/THyE will ensure that (i) the project is carried out in compliance with all applicable Bhutan anticorruption regulations and ADB's Anticorruption Policy, including cooperating fully with any investigation by ADB directly or indirectly of any

[17] Available at: http://www.adb.org/Documents/Policies/Anticorruption-Integrity/Policies-Strategies.pdf
[18] ADB's Integrity Office web site is available at: http://www.adb.org/integrity/unit.asp

alleged corrupt, fraudulent, collusive, or coercive practices relating to the project; and (ii) all relevant staff actively participate in training in Bhutan's anticorruption regulations and ADB's Anticorruption Policy.

73. In accordance with ADB requirements, an assessment in the areas of public financial management, procurement, and anticorruption was undertaken. Certain governance, fiduciary, and anticorruption safeguards have been incorporated into the project to mitigate the risk of diversion of funds and to enhance and strengthen governance, accountability, and transparency. In particular, such transparency and accountability measures include (i) establishment of a publicly accessible project website within the existing DGPC/THyE website wherein the government will disclose key project-related information including on costs, safeguards, and procurement; and (ii) establishment of a grievance redress mechanism satisfactory to ADB for receiving and resolving stakeholder complaints.

74. The government, through DGPC/THyE, will ensure that a section of its website is dedicated to the project in the first year of project implementation, and that it will disclose details of the project, including the audited project financial accounts; project progress; and procurement activities including the publishing of short-lists, invitations for bid, and contract awards.

XII. ACCOUNTABILITY MECHANISM

75. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make a good faith effort to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[19]

Contact Details:	Secretary Compliance Review Panel Asian Development Bank 6 ADB Avenue, Mandaluyong City 1550 Metro Manila, Philippines Telephone: +63-2-632-4149 Fax: +63-2-636-2088 Email: crp@adb.org Web: www.compliance.adb.org

XIII. RECORD OF PAM CHANGES

76. To be inserted as and when any changes are necessary and agreed by both parties.

[19] For further information see: http://www.adb.org/Accountability-Mechanism/default.asp.

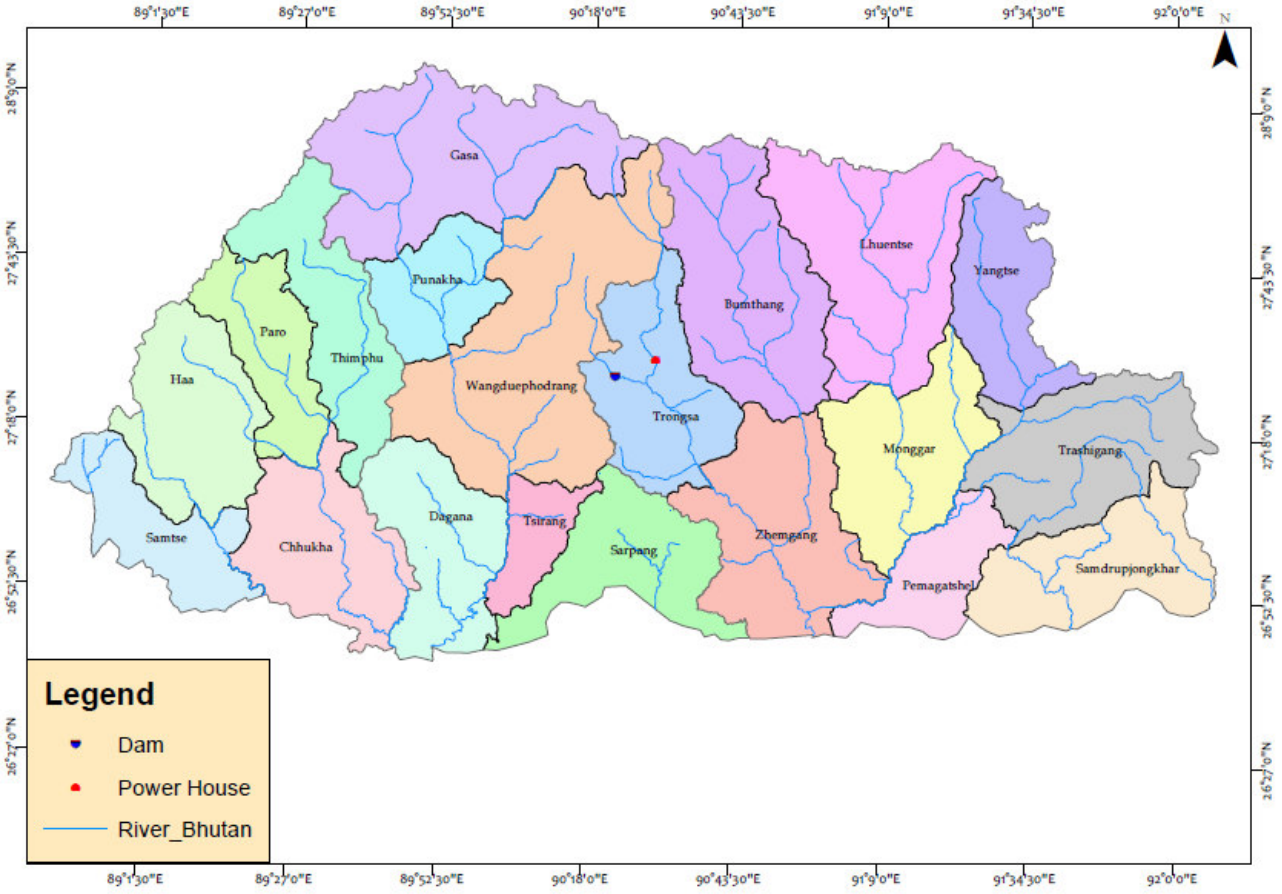
ANNEXES

1. Outline Project Technical Description
2. Detailed Implementation Schedule
3. THyE Organizational Structure
4. Outline Terms of Reference for Technical Assistance - Acceleration of Hydropower Trading Development
5. Outline Terms of Reference for Panel of experts
6. Summary of Environment Management Plan Activities

OUTLINE PROJECT TECHNICAL DESCRIPTION

1. The Second Green Power Development Project is located in the Nikachhu River, a tributary of Mangdechhu River, in the Trongsa district in central region of Bhutan. The project area is spread mainly across Tangsibji Geog (due to a hydropower plant facilities), and Drakteng and Langthel Geogs (due to a transmission line). The Nikachhu hydropower plant is a 118 MW run-of-the-river scheme with provisions for peaking operation. The annual design energy based on 90% dependable year with 95 % Plant availability works out to 491.52 GWh in a very conservative manner.

Figure 1.



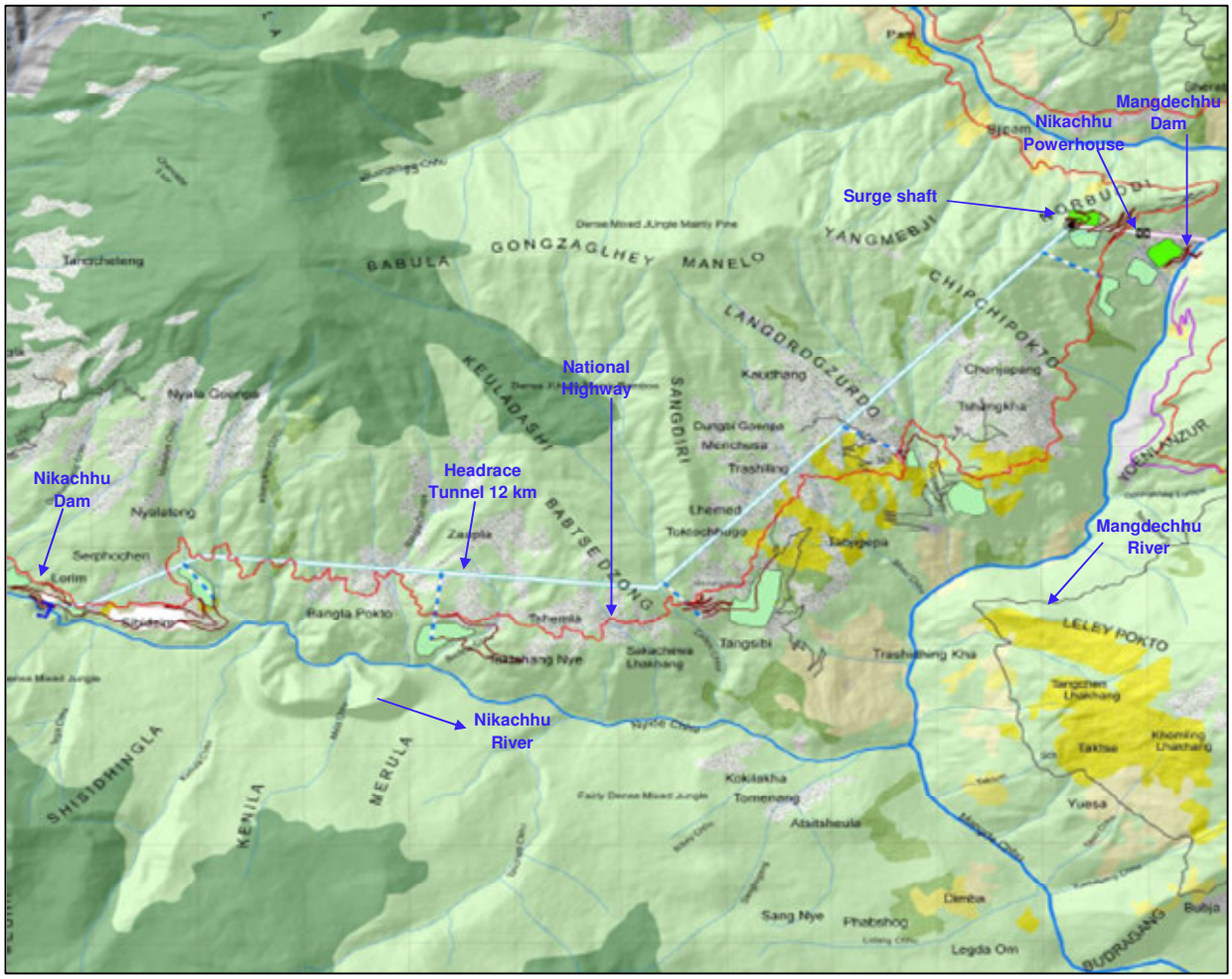
NIKACHHU HYDROPOWER PLANT

2. The project is a run-of-river hydropower project having an installed capacity of 118 MW across the Nikachhu River. The project envisages utilization of a design flow of about 25 m^3/s in Nikachhu and a head of 527 m to realize design energy of 491.52 GWh. There is a water discharge into the main river Mangdechhu for utilization of large head that becomes available for additional power generation (para.13).

3. The layout of the project comprises a 33 m high (from the riverbed) dam intended to divert river water on to the power intake and also create a limited storage for diurnal peaking of four hours. The gross reservoir capacity is relatively small with 0.537 million m^3 and 0.046 km^2 of the reservoir surface area. A 12.14 km long headrace tunnel having a finished diameter of 4

m conducts water to two nos. turbine-generator units situated inside an underground powerhouse cavern. Other appurtenant civil structures include 2 nos. de-silting chambers, surge shaft, pressure shaft, transformer cavern and a relatively short tailrace tunnel. Diversion arrangement for construction of the dam consists of a diversion tunnel with upstream and downstream coffer dams. The layout of the project is shown in Figure 2.

Figure 2: General Layout of Project



4. The major components of the Nikachhu HPP project are the diversion structure of height of 33 m (from riverbed) and 90.25 m long, head race tunnel of 4 m diameter and 12.14 km long and an underground powerhouse.

5. DGPC and THyE are planning to execute various works of the project through 2 nos. of EPC packages noted below:

- Package-1: Civil and Hydro-Mechanical (HM) Works; and
- Package-2: Electro-Mechanical Works

1. Package -1: Civil and Hydro-Mechanical (HM) Works

6. The major project components of civil and hydro-mechanical works are as follows:

Section 1: Civil Works

(i) River Diversion Works
(ii) Dam
(iii) Low Level Spillway
(iv) High Level Spillway
(v) Intake Structure
(vi) De-silting Chambers
(vii) Head Race Tunnel
(viii) Surge Shaft & Valve House
(ix) Pressure Shaft
(x) Power house (underground) & Pothead yard
(xi) Tail Race Tunnel

Section 2: Hydro-Mechanical Works

(i) High level spillway – Radial gates
(ii) Low level spillway – Radial gates
(iii) Diversion tunnel gates
(iv) Intake bulkhead gates
(v) Intake service gates
(vi) De-silting Chamber Inlet & Outlet gates
(vii) Surge shaft gate
(viii) Tailrace tunnel gates

7. The main project components under Section 1 of this package are for a 90.25 m long and 33 m high (from riverbed) concrete gravity dam, De-silting chambers 2 nos. each 175 m(L) x 7.5 m(W) x 10.95 m(H), Headrace tunnel 4 m diameter and 12.14 km long, surge shaft, pressure shaft 3 m diameter and 932 m long, powerhouse cavern 66.7 m (L) x 19 m(W) x 41 m (H) and transformer cavern 61 m(L) x 14m(W) x 27.1 m(H). The dam is equipped with 3 nos. of radial gates for passing the design flood and also for flushing the sediments deposited in the reservoir. Most of the civil works are underground as noted above and appropriate specifications have been framed for these major project components.

2. Package 2: Electro-Mechanical Works

8. The package includes the following:

- Mechanical works: Two-numbers of maximum/rated output 66,220kW/60,200kW pelton type turbines and auxiliaries along with balance of plant system such as overhead traveling crane, Fire protection system, dewatering & drainage system, AC & ventilation system, potable water system, workshop equipment, main etc.
- Electrical works: Two-numbers of maximum/rated output 72,110kVA/65,560kVA, three-phase, synchronous generator along with auxiliaries, 11 kV generator bus duct, 132 kV gas insulated switch gear, SCADA, PLCC system, grounding and lightening protection system, LT switchgear, generator step-up and other transformers, 132 kV XLPE cables, illumination system, plant communication & surveillance system, elevators, etc.

POWER TRANSMISSION

9. The power from the project is to be evacuated through a 132 kV double circuit overhead transmission line to interconnect to 400/132 kV, 200 MVA ICT station provided at the Mangdechhu hydroelectric project's pothead yard at Yurmo and further evacuation to Indian border from the Mangdechhu project shall be along the Mangdechu transmission system which connects the 400 kV Jigmeling Substation in Bhutan to the 400 kV Alipuduar Substation in West Bengal, India. The transmission line length from the project power house to Mangdechhu pothead yard is about 18.6 km.

10. Further the Mangdechhu transmission system shall be interconnected to the 400 kV transmission networks of Punatsangchhu I&II, the 220 kV system of Chhukha and the 400 kV system of the Tala hydropower plant which are/shall be connected to Alipuduar, Birpara, Siliguri and new Jalpaiguri Substations in India. Moreover, the 400 kV transmission network of Mangdechhu project shall be connected to the proposed 400 kV Yangbari Substation in eastern Bhutan which shall connect to a substation near Rangia in Assam, India. Thus, the project energy can be evacuated through multiple transmission lines from Bhutan to multiple substations in India. In spite of the planned transmission route to evacuate power from the Nikachhu hydropower plant, the Nikachhu electricity can alternatively be supplied to India through the existing 132 kV grid system.

PREPARATORY WORKS

11. Preparatory works include access roads, which will require 16.5 km in total mainly for five adit points to help excavate a tunnel. The DGPC's equity and co-finance will be used for this component. Bidding for these works will be conducted for two months from August 2014 and the preparatory works will be implemented for seven months from October 2014 to meet the main contractor's mobilization from May 2015.

MANGDECHHU HYDROELECTRIC PROJECT

12. The 720MW Mangdechhu hydroelectric project is a run-of–the river scheme, located on river Mangdechhu in Trongsa district. The Mangdechhu Project is not part of the ADB finance and has been under construction since 2010 towards the completion in 2017.[20] The project envisages construction of one concrete gravity dam (height 56 m above river bed); one diversion tunnel; 4 nos. spillway; 2 nos. intake tunnels; 2 nos. disilting chamber; one headrace tunnel (length 13.561 km); one surge shaft; 2 nos. pressure shaft; 4 nos. penstock; underground powerhouse (size 155 m x 23 m x 41 m, and 135 m x 18 m x 23 m) GIS, pelton turbine, rated head 692 m; TRT. The power evacuation of the project has been planned through 400 kV Mangdechhu – Jigmeling via. Goling transmission line. The annual energy generation from the Mangdechhu plant alone with 95% machine availability would be 2,925.25 GWh.

13. The water from the project's powerhouse discharges into the Mangdechhu's reservoir through a free flowing TRT. To utilize additional water from the project, no change in the planned Mangdechhu HPP's configuration shall be necessary given the project small size and technical assessments. As a result, additional energy generation is expected to be 323.77 GWh.

[20] The project is being financed by the government of India. In the past Indian financed projects (i.e., Chhukha, Kurichhu, and Tala hydropower plants), their ownership and operations have been transferred to DGPC some years after they were commissioned.

DETAILED IMPLEMENTATION SCHEDULE

TANGSIBJI HYDRO ENERGY LIMITED
NIKACHHU HYDROPOWER PROJECT 118 MW
PROJECT SCHEDULE

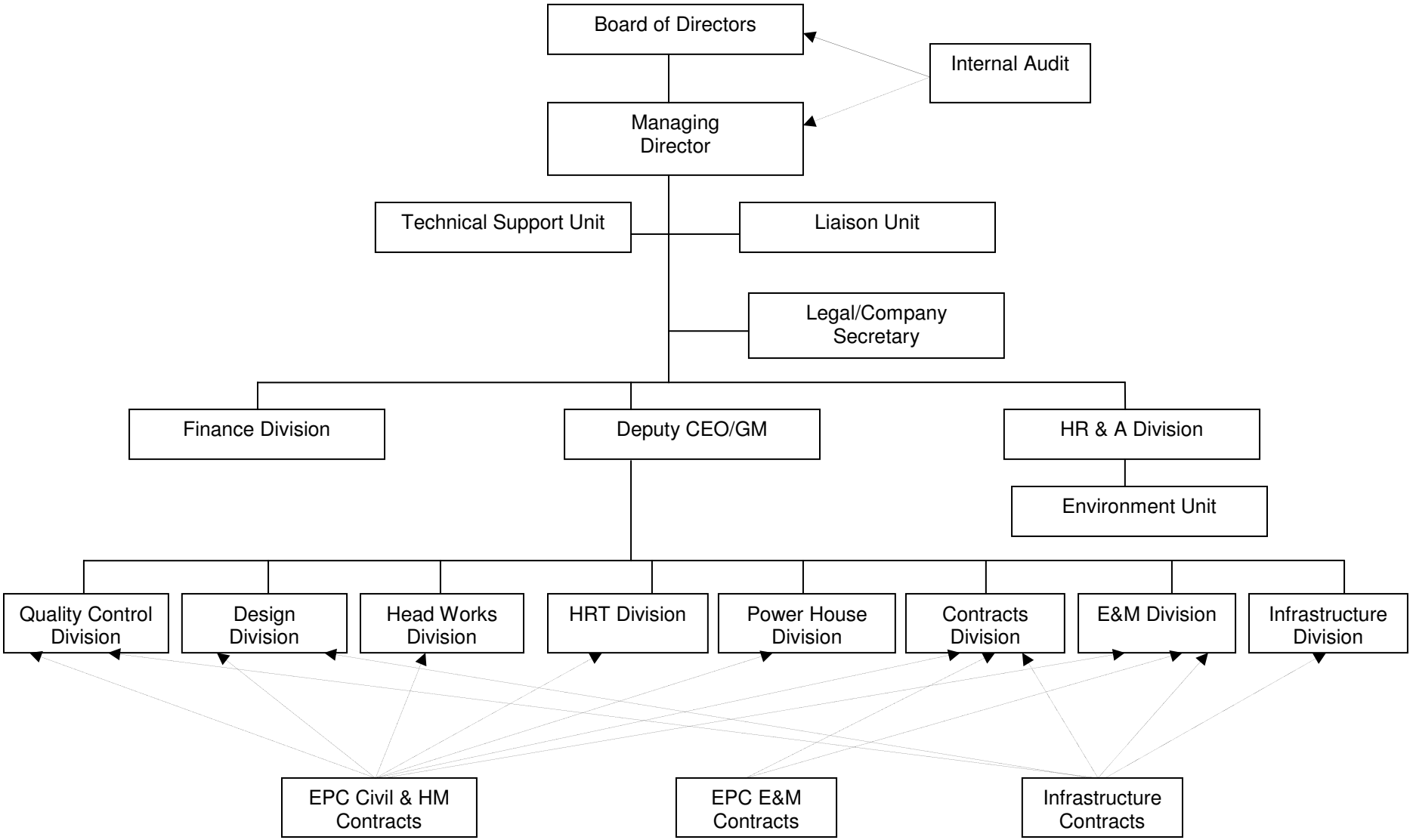
ID	Task Name	Start	Finish
1	**1 Pre-Construction Activities incl. Bailey Bridge and Approach roads**	Oct 1 '14	Apr 30 '15
2	**2 A MAIN CONSTRUCTION WORK**	**Oct 1 '14**	**Apr 30 '19**
3	**2.1 Procurement**	Oct 1 '14	May 1 '15
4	**2.2 Construction**	**May 1 '15**	**Apr 30 '19**
5	**2.2.1 Civil Works**	**May 1 '15**	**Apr 30 '19**
6	2.2.1.1 Mobilisation & Infrastructure development	May 1 '15	Oct 31 '15
7	2.2.1.2 River Diversion Works	Nov 1 '15	May 31 '16
8	2.2.1.3 Concrete Dam	Nov 1 '15	Dec 31 '18
9	2.2.1.4 Desilting Chamber	Nov 1 '15	Apr 30 '17
10	2.2.1.5 Head Race Tunnel	Nov 1 '15	Apr 30 '19
11	2.2.1.6 Surge Shaft and Valve Chamber	Jan 1 '17	Jul 31 '18
12	2.2.1.7 Pressure Shaft	Nov 1 '15	Aug 31 '18
13	2.2.1.8 Power House	Nov 1 '15	Dec 31 '18
14	**2.2.2 EM Works**	**May 1 '15**	**Apr 30 '19**
15	**2.2.2.1 Design and Manufacturing**	May 1 '15	Dec 31 '16
16	2.2.2.2 Mobilization	Dec 31 '16	May 1 '17
17	**2.2.2.3 Major Equipments**	**May 1 '17**	**Apr 30 '19**
18	2.2.2.3.1 EOT Crane	May 1 '17	Jul 30 '17
19	**2.2.2.3.2 Turbine and Generator**	**Aug 31 '17**	**Apr 30 '19**
20	2.2.2.3.2.1 Turbine Inlet valve	Sep 1 '18	Oct 31 '18
21	2.2.2.3.2.2 Turbine and Generator (TG) units	Aug 31 '17	Apr 30 '19
22	2.2.2.3.2.3 Governing System, piping and Accessories	Dec 1 '18	Apr 30 '19
23	2.2.2.3.2.4 Static Excitation System	Jan 15 '19	Feb 28 '19
24	2.2.2.3.3 Generator Transformer	Dec 1 '18	Feb 28 '19
25	2.2.2.3.4 11kV switchgear	Nov 1 '18	Jan 31 '19
26	2.2.2.3.5 415V Switchgear and auxiliary transformer	Nov 1 '18	Feb 28 '19
27	2.2.2.3.6 Control and Relay panel	Dec 31 '18	Jan 31 '19
28	**2.2.2.4 Mechanical Auxillary System**	**Oct 1 '18**	**Apr 30 '19**
29	2.2.2.4.1 Cooling Water System	Feb 1 '19	Apr 30 '19
30	2.2.2.4.2 Drainage and Dewatering	Oct 1 '18	Nov 15 '18
31	2.2.2.4.3 Fire detection and protection system	Dec 1 '18	Apr 30 '19
32	2.2.2.4.4 HVAC System	Jan 1 '19	Mar 31 '19
33	**2.2.2.5 Electrical Auxillary syatem**	**Nov 1 '18**	**Apr 30 '19**
34	2.2.2.5.1 Station service and Distribution transformers	Dec 1 '18	Jan 15 '19
35	2.2.2.5.2 Grounding System	Jan 1 '19	Feb 28 '19
36	2.2.2.5.3 Diesel generator sets	Dec 1 '18	Feb 28 '19
37	2.2.2.5.4 Cabling system	Nov 1 '18	Apr 30 '19
38	2.2.2.5.5 DC System	Dec 15 '18	Feb 28 '19
39	2.2.2.5.6 Illumination system	Jan 1 '19	Apr 30 '19
40	2.2.2.5.7 Communication system	Feb 1 '19	Mar 15 '19
41	**2.2.2.6 GIS & Outdoor Switch yard**	**Jan 1 '17**	**Dec 31 '17**
42	2.2.2.6.1 Erection	Jan 1 '17	Oct 31 '17
43	2.2.2.6.2 Testing and Commissioning	Oct 1 '17	Dec 31 '17
44	**3 Testing and Commissioning of Units**	May 1 '19	Jun 30 '19
45	**4 Misc & Remaining Works**	Jun 30 '19	Dec 30 '19
46	**5 Transmission Lines**	**Jul 1 '16**	**Jan 31 '19**
47	5.1 Procurement	Jul 1 '16	Jun 30 '17
48	5.2 Construction	Jul 1 '17	Dec 31 '18
49	5.3 Testing and Commissioning	Jan 1 '19	Jan 31 '19

CIVIL & EM WORK SCHEDULE Revision : 03
Date: Jul 23 '14

Task · Progress · Summary · External Tasks · Deadline
Split · Milestone · Project Summary · External Milestone

Page 1

THyE ORGANIZATION STRUCTURE



OUTLINE TERMS OF REFERENCE
for Technical Assistance - Acceleration of Hydropower Trading Development

1. The attached capacity development technical assistance (TA) is Acceleration of Hydropower Trading Development, which is included in the country operations business plan, 2014-2016.[21] It aims to strengthen the power sector's key frameworks and systems to enhance Bhutan's hydropower development and trading. The government of Bhutan and the Asian Development Bank (ADB) agreed to implement the TA along with the Second Green Power Development Project for the Nikachhu hydropower development. The estimated cost of the TA is $1,000,000 excluding the government's counterpart support. The TA will support activities of the Department of Hydropower and System (DHPS), and the Department of Renewable Energy (DRE), Ministry of Economic Affairs, the Bhutan Power Corporation (BPC), the Druk Green Power Corporation (DGPC), the Tangsibji Energy Hydro (THyE), and the Department of Forest and Park Services (DOFPS), Ministry of Agriculture and Forests. The detailed scope of work is described in Attached Technical Assistance.[22]

2. The consultant team will cover 13 experts, including 9 international and 4 national persons. An international expert in power sector management will be the team leader, who will coordinate the inputs of all the other consultants, provide quality control on all outputs, harmonize proposals and recommendations, and ensure that the consultation process is adequate in terms of the stakeholder's participation and ownership. Each expert will also provide training opportunities to the stakeholders. An overview of the required consulting services is summarized in Table 1.

Table 1: Summary of Consulting Services

Area of Expertise	Duration (Person-months)
A. International	
1. Power Sector Management Specialist	6
2. Financial Management Specialist	3
3. Tariff Specialist	1
4. Regulatory/Legal Specialist	1
5. Investment Specialist	2
6. Procurement Specialist	2
7. Human resource/Institutional Specialist	2
8. Environment Specialist	6
9. Communication Specialist	2
Subtotal (A)	**25**
B. National	
10. Environment Specialist	6
11. Social Development Specialist	3
12. Communication Specialist	3
13. Power System Specialist	3
Subtotal (B)	**15**
Total (A+B)	**40**

Source: Asian Development Bank.

3. The consultants' outline terms of reference will include, but not necessarily be limited to, the following tasks.

[21] ADB. 2014. *Country Operations Business Plan, Bhutan, 2014-2016.* Manila.
[22] Attached Technical Assistance (accessible from the list of linked documents in Appendix 2).

4. **Power Sector Management Specialist** (international). As the project team leader, the expert will conduct overall project management, focusing on key activities including sector reform studies, and policy reviews and setting up institutional frameworks of each entity based on the reforms. The expert will have a minimum bachelor's degree in relevant areas, such as engineering, business administration, economics, policy management, and finance, and minimum of 15 years of experience in power sector management and sector reforms.

(i) Analyze the possibility and approaches of creating a power consolidator to facilitate power trading from small/micro hydels and other renewable energy producers based on the advantages/disadvantages, and suggest different business models (state owned, franchise etc.) and market scenarios clearly outlining the pros and cons of each;
(ii) Assess concrete action plans and roadmap to facilitate such trading opportunities both in terms of export and import of power;
(iii) Review and improve the Sustainable Hydropower Development Policy to attract investments in hydropower development, and propose concrete plans.
(iv) Help DGPC set up its corporate strategies and roadmap for institutional development;
(v) Review and assess the Nikachhu implementation and the precedent Dagachhu hydropower project's results including lessons learned, with other all experts.
(vi) In coordination with the Financial Specialist, review the present institutional arrangements and functional management of BPC in terms of operational efficiency, losses, reliability, cross-subsidy, revenue allocation, economies of scale, financial management etc. in managing both distribution and transmission functions;
(vii) Help identify challenges/opportunities and come up with a business model highlighting the merits/demerits (costs/benefits) of unbundling transmission and distribution functions and a road map for creating separate transmission and distribution utilities if unbundling merits consideration;
(viii) In coordination with the Institutional Specialist, review the existing institutional and operational structure of NLDC/BPC in managing the power system operations and identify challenges/opportunities and review the requirements for and expectation of independent power system operator and its organizational placement;
(ix) Prepare time bound action plan/strategies and recommend institutional set up and technical management procedures for creation of an independent system operator for managing power system operations (as required by the Electricity Act 2001) and recommend suitable future strategy for keeping the system operator efficient and performance based.

5. **Financial Management Specialist** (international). The expert will support DGPC and THyE implement financial management practices. The expert will have a minimum bachelor's degree in relevant areas, such as engineering, business administration, economics, policy management, and finance, and minimum of 7 years of experience in financial management.

(i) Review and improve DGPC's corporate strategic plan, financing strategy and investment plan;
(ii) Help make full compliance with international financial reporting standards of DGPC's financial reporting;
(iii) Help THyE meet reporting requirements of disbursements from commercial banks on a timely manner;
(iv) Help THyE conduct financial management if any;
(v) Review the financial management of BPC and conduct a complete valuation of the assets of BPC and develop business plan and financial restructuring plan/model for

unbundling of BPC's transmission and distribution functions and creation of an independent system operator in conjunction with Power Sector management Specialist;
(vi) Develop financial projections model for creating a power consolidator;
(vii) Develop financial projections model for creating a system operator.

6. **Tariff Specialist** (international). The expert will review the tariff policy which is being drafted by DHPS to strengthen relevant sections described in the Electricity Act. The expert will have a minimum bachelor's degree in relevant areas, such as engineering, business administration, economics, policy management, and finance, and minimum of 7 years of experience in power sector's tariff management.

(i) Assess multiple requirements for tariff and regulatory systems suitable to Bhutan;
(ii) Review the draft tariff policy, and propose any room to be improved to meet the original policy initiatives;
(iii) Assess the present tariff systems and mechanisms, including the cross-subsidy systems, and energy royalty;
(iv) Interact with the Bhutan Electricity Authority where applicable.

7. **Regulatory/Legal Specialist** (international). With collaboration with other experts, Regulatory/Legal Specialist will cover all the regulatory and legal requirements for the sector reforms, tariff policy, and work contracts and financial contracts. The expert will have a minimum bachelor's degree in laws or jurisprudence, and minimum of 10 years of experience in power sector's regulatory and legal systems management.

(i) In conjunction with Power Sector Management Specialist and Financial Management Specialist, assess possibilities of the sector reforms in regulatory aspects;
(ii) In conjunction with Tariff Specialist, assess the draft tariff policy in regulatory aspects;
(iii) In conjunction with Investment Specialist, help THyE finalize the share purchase and shareholders agreement with a joint venture partner.

8. **Investment Specialist** (international). The expert will help DGPC and THyE complete equity financing for the Nikachhu hydropower development through private partner's joint venture. The expert will have a minimum bachelor's degree in relevant areas, such as engineering, business administration, economics, policy management, and finance, and minimum of 10 years of experience in investment in power sector, preferably hydropower projects.

(i) Assess possibilities of initial public offering, debt financing of loans, export credits, and/or bonds through credit enhancements for DGPC;
(ii) Support a process of initial public offering for THyE and DGPC if feasible;
(iii) Formulate any procedures for due diligence systems, risk management, and local investors' relations for THyE and DGPC;
(iv) Develop a DGPC's investment plan comprising least cost investment program and financing plan and projections for unbundling BPC's transmission and distribution functions, creation of a power consolidator and independent power system operator.
(v) Assess any financing options for the subsequent DGPC owned hydropower project(s).

9. **Procurement Specialist** (international). The expert will review and finalize standard bidding documents, and improve procedures for procurement works. The expert will have a

minimum bachelor's degree in relevant areas, such as engineering, business administration, economics, policy management, and finance, and minimum of 7 years of experience in investment in power sector, preferably hydropower projects.

(i) Assess and improve DGPC's standard bidding documents;
(ii) Assess and improve DGPC's procurement systems if any;
(iii) Help THyE evaluate any bid documents if required.

10. **Human Resources/Institutional Specialist** (international). The expert will assess and develop a human resources master plan for DGPC. The expert will have a minimum bachelor's degree in relevant areas, such as business administration, economics, policy management, and finance, and minimum of 7 years of experience in human resources and institutional assessments and management preferably power or similar sectors.

(i) Help DGPC to set up effective human resources and institutional arrangements;
(ii) Outline the proposed organization structure, manpower/staffing, skills and experience required, capital requirements, licensing and compliance requirements, prudential norms if any
(iii) Formulate business processes and risk management guidelines for unbundling of BPC's transmission and distribution functions, power consolidator and independent system operator;
(iv) Review skills availability, training needs and prepare a human resource development program for the independent system operator;
(v) Make recommendations for optimizing utilization of human resources in BPC including facilitating technology changes as required
(vi) Organize study tours for the sector to better understand the roles and functions of an independent system operator and merits of creating a power consolidator for power trading from small/micro and other renewable energy producers if feasible.

11. **Communications Specialists** (international and national). The expert will strengthen DGPC's and THyE's external relations with the communities and external stakeholders including civil society organizations and media. The expert will have a minimum bachelor's degree in relevant areas, such as engineering, business administration, economics, policy management, and finance, and minimum of 7 years of experience in communication management, particularly for sensitive areas in terms of political, social, or environmental aspects.

(i) Formulate DGPC's and THyE's communication strategies and plans;
(ii) Help DGPC and THyE set up strategic communication units when applicable;
(iii) Help environment units improve communications with external stakeholders.

12. **Environment Specialists** (international and national). The experts will help DGPC and THyE implement the Nikachhu-related all safeguard plans (EIA and EMP) in accordance with the ADB's Safeguard Policy Statement (2009). The experts will have a higher degree in relevant areas such as engineering, environmental science, forestry, ecology and/or biodiversity, environmental management, and minimum of 10 years work experience with specific experience on implementing ecological mitigation and monitoring development projects particularly hydropower, in legally protected areas.

(i) Help form the biodiversity management committee and make it functional;

(ii) Help develop and finalize the biodiversity plan, watershed and catchment management plan, and other relevant environmental management plans, and make it functional;
(iii) Coordinate with other consultants in implementing and in monitoring the safeguard requirements including the wildlife, aquatic, and forestry conservation programs and dam safety programs, and provide support to the executing agency staff and DOFPS officers in their functions;
(iv) Design a downstream ecological flow analysis along with actual monitoring data, covering both the Nikachhu and the Mangdechhu rivers in the area affected by both hydropower projects. Integrate with the initial aquatic habitat monitoring already defined in EMP so that (a) the design of this analysis will include more detailed assessment of discharge from tributaries near the confluence of the rivers, measurement of river cross-sections, water depths, and velocities at critical points, and fish sampling in different seasons to determine the specific dependencies between river discharge, aquatic habitats, and fish movements, and (b) analysis and design should be adjusted based on actual monitoring data during the project construction and operational periods.
(v) Classify the Mangdechhu river basin including the Nikachhu river sub-basin based on the guidelines of Bhutan and/or international requirements so that the output can be used for the effective catchment area management as defined in the environmental management plan of the Second Green Power Development Project in coordination with an ongoing ADB TA for integrated water resources management (IWRM);[23]
(vi) Help DGPC set up funding mechanisms or internal resources to ensure sustainable IWRM in the Mangdechhu river basin;
(vii) Help form the catchment management committee and make it functional;
(viii) Prepare format of the environmental monitoring report; verify the environmental monitoring information; provide technical support to the executing agency in identifying unanticipated impacts and necessary corrective actions for non-compliance; and in ensuring that the executing agency prepare and submit the environmental monitoring reports in an appropriate and timely manner;
(ix) Provide capacity building so that the above key activities can be continued by THyE, DGPC, and other stakeholders; and,
(x) Participate in stakeholders' consultations to provide assistance to the executing agencies in addressing environmental issues, if any.

13. **Social Development Specialist** (national). The expert will help DGPC and THyE implement the Nikachhu-related all safeguard plans in accordance with the ADB's Safeguard Policy Statement (2009). The expert will have minimum a bachelor's degree in relevant areas, such as engineering, business administration, economics, and policy management, and minimum of 10 years of experience in social development management.

(i) Help implement and monitor a resettlement plan (RP) including the community development programs;
(ii) Improve awareness of RP requirements (including understanding of the development shocks) to the local communities and any external stakeholders.

[23] ADB. 2014. *Technical Assistance Report to the Kingdom of Bhutan for Adapting to Climate Change through Integrated Water Resources Management.* Manila.

(iii) Set up compliance monitoring reporting formats and support the executing agency staff make periodic reports in an appropriate manner.
(iv) Implement and monitor three gender designs, namely (a) commercial weaving training for women, (b) employment for women, and (c) provision of space in the products sales outlets for women.

14. **Power System Specialist** (national). The expert will assist the Power System Management Specialist in undertaking sector reform assessments including technical assessment of distribution and transmission systems using appropriate power system planning tools/software and recommend the investment/expansion/replacement plans. The expert will have a minimum bachelor's degree in relevant areas such as engineering, and minimum of 10 years of experience in engineering management for the power sector.

(i) In coordination with the Power Sector Management Specialist, assess concrete action plans and roadmap to facilitate such trading opportunities both in terms of export and import of power;
(ii) In coordination with the Financial Specialist, review the present institutional arrangements and functional management of BPC in terms of operational efficiency, losses, reliability, cross-subsidy, revenue allocation, economies of scale, financial management etc. in managing both distribution and transmission functions;
(iii) Help identify challenges/opportunities and come up with a business model highlighting the merits/demerits (costs/benefits) of unbundling transmission and distribution functions and a road map for creating separate transmission and distribution utilities if unbundling merits consideration;
(iv) In coordination with the Institutional Specialist, review the existing institutional and operational structure of NLDC/BPC in managing the power system operations and identify challenges/opportunities and review the requirements for and expectation of independent power system operator and its organizational placement;
(v) Prepare time bound action plan/strategies and recommend institutional set up and technical management procedures for creation of an independent system operator for managing power system operations (as required by the Electricity Act 2001) and recommend suitable future strategy for keeping the system operator efficient and performance based.

OUTLINE TERMS OF REFERENCE
for Panel of Experts

A. Background

1. The Nikachhu Hydropower Project is located on the Nikachhu River near Tangsibji village in Trongsa Dzongkhag (District), Bhutan. The project components include the construction of a hydropower plant [118 megawatt (MW)], and an 18.6 kilometer transmission line. The executing agency for the project will be Tangsibji Hydro Energy (THyE) incorporated under the Druk Green Power Corporation (DGPC).

2. A Panel of Experts (POE) will be appointed for the project comprising experts for environmental, social development, and dam safety aspects during project implementation. The POE members generally work together when on the assignment with the exception of (i) regular meetings which may not require particular experts and (ii) special meetings which may be convened to review particular technical aspects.

B. Scope of Work for each Expert

3. **The Environmental Expert.** The expert will monitor the implementation of environmental impacts and mitigation measures. The expert should also comment on any other matters which might be perceived as important by the project authorities. These activities are outlined in the following planning instruments:

(i) Environmental and Social Impact Assessment (EIA) including Environmental Management Plan (EMP) available on the ADB website; and
(ii) Any other relevant documents available on the ADB website and THyE

4. The expert will also refer to the Project Administration Manual and the loan documents.

5. The expert's work shall include, but not limited to, the following:

(i) Review implementation plans to determine if this fully complies with ADB safeguards and to assess appropriateness of provisions in terms of mitigation measures, monitoring plan, budget, institutional arrangements and compliance mechanisms. Recommend ways to mediate with non-conformance reports and to resolve issues related to compliance;
(ii) Determine if the EMP provisions for mitigation and monitoring are being implemented properly by THyE and DGPC, all contractors, and consultants.
(iii) Conduct site visits to assess the performance of THyE and DGPC and the contractors in terms of implementation of environmental mitigation and monitoring measures specified in the EMP. Consult with relevant stakeholders during field visits; record their concerns and expectations; and develop recommendations to address valid concerns;
(iv) Determine if the EMP cost (for all project phases) is adequate and if funding sources have been identified and committed.
(v) Comment on the cumulative nature of the impacts – both impacts that result from the project and those exerted on the project from other sources.
(vi) Recommend corrective actions in case environmental mitigation measures are not sufficient and/or considered to deviate from requirements of the Bhutan's and ADB's safeguard policies.

(vii) Assess the adequacy of baseline surveys and analysis, and determine if there is a need to collect additional baseline data to be used as basis for assessing operational impacts in terms of water quality, hydrology, minimum water requirements, erosion and sedimentation, terrestrial and aquatic ecosystems, fisheries, biodiversity, and any other environmental issues.
(viii) Examine the monitoring program designed for the construction and operation phases (for water quality, forestry, biodiversity, wastewater, soil erosion and siltation, air quality, fauna, aquatic resources, solid waste, spoils) to determine if objectives and activities are appropriate in light of current and predicted project impacts. Recommend revisions and/or additional components as necessary.
(ix) Examine and recommend current institutional capacity within THyE/DGPC, particularly its environmental and social management unit to address environmental safeguards compliance issues, if any.
(x) Review the time schedule for the environmental mitigation programs and assess whether the schedule is appropriate for effective implementation and whether it is in compliance with the Bhutan's and ADB's safeguard policies, if any;
(xi) Review reports from any consultants of the environmental mitigation programs in EMP, and communicate with those consultants to determine if their advices and suggestions are fully complied by THyE and DGPC and the contractors.
(xii) Assess the operation of the grievance redress mechanism (GRM) for dispute resolution. Review GRM consultative notes, decisions and comments to ascertain its adequacy, impartiality, and timeliness. Make recommendations to redress areas that, in the consultant's view, may not conform to ADB safeguards and the government environmental regulations. Facilitate and mediate with THyE and DGPC to resolve any environmental issue which has not been resolved by GRM.
(xiii) Assess any environmental issues if questioned by THyE, DGPC, the government, and financier(s), if any.
(xiv) Facilitate, and mediate with THyE, DGPC, and financier(s) to resolve any social issue which has not been resolved by GRM.
(xv) Propose any actions in consultation with other POE member(s) and project stakeholders, on any specific environmental issues which arise before or during project implementation.
(xvi) Share findings and knowledge with THyE and DGPC and financiers, and contribute to initiate a dialogue among DGPC, government and/or financiers on environment impacts and mitigation measures if required.

6. **The Social Development Expert.** The expert will monitor the implementation of social development activities including land acquisition leasing through the consulted settlement, community development, income restoration and improvement of project-affected persons (APs). The expert should also comment on any other matter which might be perceived as important by the project authorities. These activities are outlined in the following planning instruments:

(i) RP available on the ADB website, and
(ii) Any other relevant documents available on the ADB website and THyE.

7. The expert will also refer to the Project Administration Manual and the loan documents.

8. The expert's work shall include, but not limited to the following:

(i) Review the entire process of negotiated settlement followed in land acquisition and leasing land for project activities paying special attention to the transparency and adequacy of the process and the quality of consultations with project-affected persons.
(ii) Assess the progress of implementation of RP. Determine whether the entitlements of AP are being provided on time.
(iii) Visit project sites to assess resettlement impacts, mitigation measures, and conduct consultations with AP to ascertain their views on RP implementation.
(iv) Review the time schedule for impounding, site development, land allocation, compensation, infrastructure development in the resettlement sites and assess whether the schedule is appropriate for effective implementation relocation activities of the affected people and whether it is in compliance with the Bhutan's and ADB's safeguard policies;
(v) Assess the capacity of THyE and DGPC in implementing of RP if any.
(vi) Assess the operation of the grievance redress mechanism for dispute resolution. Review grievance redress mechanism (GRM) consultative notes, decisions and comments to ascertain its adequacy, impartiality, and timeliness.
(vii) Assess any environmental issues if questioned by THyE, DGPC, the government, and financier(s) if any.
(viii) Review and assist in revising (if required) the community development program of the project if any.
(ix) Propose any actions in consultation with other POE member(s) and project stakeholders, on any specific social issues which arise during project implementation.
(x) Facilitate, and mediate with THyE, DGPC, and financier(s) to resolve any social issue which has not been resolved by GRM.
(xi) Share findings and knowledge with THyE and DGPC and financier(s), and contribute to a dialogue among THyE, DGPC, government and/or financiers on resettlement, socioeconomic development and project impacts on AP.

9. **The Dam Safety Expert.** The subjects on which the expert is expected to comment and assess can include below. The expert should also comment on any other matter which it perceives to be important to the safe and successful completion and operation of the project when applicable.

(i) **Flood Hydrology:** The extent and sufficiency of data, the methodology for derivation of extreme and design floods (including floods due to precipitation as well as due to glacial lake outburst), the procedures for routing floods through the reservoir and the impact of floods downstream of the power plant;
(ii) **Seismic Hazard Assessment:** The identification of sources of seismic activity, the assignment of earthquake magnitudes to each source, and the methodology for derivation of vibration parameters at the site for maximum credible and design basis earthquakes.
(iii) **Engineering Geology:** The quality and sufficiency of the geological investigations and the interpretation thereof; the correctness of the geological and hydrogeological models of the region, reservoir area and dam site; the engineering implications with respect to foundation design, stability of natural and excavated slopes; and support of surface and underground excavations.
(iv) **Rock Mechanics/Underground Excavations:** Review of potential slides in reservoir areas; design of surface and underground excavations, including selection of stable slopes; appropriate shapes and orientations for underground

excavations; design of temporary and permanent support systems and linings; and drainage of excavated areas.

(v) **Sedimentology:** Estimates of sediment load that will enter the reservoir; the design and operation of the sediment flushing system and the likelihood of achieving desired effects.

(vi) **Concrete Dam Design, Construction and Concrete Technology**: Issues to be considered include: the adequacy of the field and laboratory investigations and of their interpretation and application to the design; appropriateness of aggregate and cementitious materials selected; concrete mix design; design details; adequacy of the foundations and the treatment proposed; construction procedures specified in relation to the dams and foundations; instrumentation of the dams; and proposed monitoring program.

(vii) **Hydraulic Structures Design and Layout:** The hydraulic and structural design and specifications for the spillways, energy dissipation facilities, diversion facilities, sediment flushing facilities, power tunnels and tailrace facilities; the procedures for routine inspection of the dam and checking safety of structures, including organization and staffing.

(viii) **Construction of Dams and Hydropower Facilities:** The construction planning studies, temporary facilities, access to the sites, the master schedule for implementation, conditions of contract; contractors' proposals in relation to plant, construction procedures, schedule, river diversion; the organization, staffing and procedures for managing the construction of the project and quality assurance.

(ix) **Mechanical and Electrical Design of Hydroelectric Works:** Specifications and manufacturers' proposals for turbines, generators and mechanical and electrical equipment in the powerhouse and switchyard, with particular emphasis on design provisions for turbines operating in sediment laden water, and state of the art design of generators, switchgear and control systems.

10. The expert's work shall include, but not limited to, the following:

(i) Provide high level and professional independent advice and guidance to support objectivity and rigor in the dam safety assessment process;

(ii) Share technical expertise and knowledge and contribute to dialogue among project supervision consultants, THyE, DGPC, government and financiers;

(iii) Conduct site visits to assess the performance of the contractors in terms of implementation of civil works if required;

(iv) Examine the monitoring program designed for the construction and operation phases on dam safety aspects to determine if objectives and activities are appropriate in light of current and predicted project impacts. Recommend revisions and/or additional components as necessary; and

(v) Consult with relevant stakeholders during field visits; record their concerns and expectations; and develop recommendations to address valid concerns.

C. Meetings, Schedules and Output/Reporting Requirements

11. The POE will have a chairman appointed from among the members of the POE to coordinate internal and external communications of the POE, call its meetings, optimize the membership's activity and provide balance to its reviews and recommendations. The composition of the POE, and the areas of expertise which it covers may be varied during the course of the project as considered appropriate by THyE in consultation with ADB and/or the cofinanciers.

12. The POE will convene at regular intervals to review the status of project progress. The frequency of meetings and their timing will be adjusted to conform to the schedule of project works in progress, but the time between meetings may not normally exceed six months. At each meeting, the scheduled dates for the next meeting and tentative timing for the subsequent meeting will normally be fixed to enable POE members to arrange their individual schedules. Extraordinary meetings of the POE may be called on critical situations, and the services of individual members may be solicited between meetings as considered necessary or desirable by THyE with copies of their input being sent to other POE members. Besides the regular meetings, POE will also respond upon the request from THyE, DGPC, and ADB.

13. The experts will prepare and submit written proceedings of the meetings (regular or extraordinary), including observations and recommendations, within three weeks of the meetings, and in case of emergency will prepare technical memoranda or aide memoires during the meetings. A preliminary report will be prepared before the adjournment of each meeting.

14. In addition to the above, for the Environmental Expert only, in consultation with other experts if necessary, after the completion of environmental mitigation activities, the expert shall submit an evaluation report on the entire operation to THyE, DGPC, and financier(s) for review. During the construction phase the project, the expert will prepare regular monitoring reports at least on annual basis on the progress of implementation of EIA with EMP as required. During the appointment period, the expert will prepare and submit an annual assessment report and/or other report upon the request.

15. In addition to the above, for the Social Development Expert only, in consultation with other experts if necessary, after the completion of land acquisition and leasing land for each project component through negotiated settlement modality, the expert shall submit an evaluation report on the transparency, fairness and adequacy of the entire operation to THyE, DGPC, and financier(s) for review. During the construction phase the project, the expert will prepare regular monitoring reports at least on annual basis on the progress of implementation of RP. During the appointment period, the expert will prepare and submit an annual assessment report and/or other report upon the request.

16. In addition to the above, for the Dam Safety Expert only, in consultation with other experts if necessary, the expert will conduct regular reviews of project progress. The frequency of meetings and their timing will be adjusted to conform to the schedule of project works in progress, based on the requests from THyE and the DGPC's dam safety committee. The expert will prepare and submit written proceedings of the meetings, including observations and recommendations, within three weeks of the meetings, and in case of emergency will prepare technical memoranda or aide memoires during the meetings. A preliminary report will be prepared before the adjournment of each meeting if needed. One month prior to issuance of bidding documents for construction, the expert shall submit an evaluation report on dam safety aspects of the design. During construction to commissioning, the expert will prepare regular monitoring reports as required. All reports will be submitted to THyE and DGPC, and through them to ADB for review.

17. All reports will be submitted to THyE and through them to the ADB and/or financers for review.

D. Organization, Membership and Qualifications for each Expert

18. **The Environmental Expert.** The expert may have wide, specialized experience of at least 15 years in the following fields:

(i) Preparing and implementing environmental management plans, preferably on biodiversity programs;
(ii) Reviewing environmental baseline data;
(iii) Designing and/or carrying out environmental impact analysis, baseline studies, developing of detailed cost estimates and schedules for environmental management plans,
(iv) Executing environmental impact mitigation and monitoring plans; and
(v) Implementing public consultation and disclosure processes.

19. **The Social Development Expert.** The expert may have wide, specialized experience of at least 15 years in the following fields:

(i) Preparing and implementing compensation, relocation, income restoration action plans;
(ii) Reviewing social baseline data and database formulation and operation;
(iii) Designing and/or carrying out social impact analysis, socio-economic baseline studies, developing of detailed cost estimates and schedules for resettlement action plans, land acquisition plans,
(iv) Executing social impact mitigation and monitoring plans; and
(v) Implementing public consultation and disclosure processes.

20. **The Dam Safety Expert.** The expert shall have wide, specialized international experience of at least 15 years including developing countries in Asia, in the following fields:

(i) Planning and design of dams and hydropower facilities;
(ii) Design of underground works;
(iii) Embankment dam design;
(iv) Hydraulic design; and
(v) Construction of dams and hydropower facilities.

21. At appropriate times and requirements during the design and construction of the project, the expert can be enlarged by the addition of specialists in the following fields as advisable:

(i) Flood hydrology
(ii) Seismology
(iii) Sedimentology
(iv) Concrete technology
(v) Water resources management
(vi) Mechanical and electrical design of hydropower facilities

Summary of Environment Management Plan Activities

Main participants in EMP Implementation: the Tangsibji Energy Hydro (THyE) (with the Druk Green Power Corporation (DGPC), major shareholder of THyE); staff of the Jigme Singye Wangchuck National Park (JSWNP), Department of Forest and Park Services (DoPFS), Ministry of Agriculture and Forests; Contractors; Local Administrators; various other institutes and government agencies (occasional; see below); and, specific consultants to be recruited by THyE when needed (also see table below). ADB and ADB-recruited technical assistance consultants will support these parties in implementing and monitoring the EMP activities. Also, the Panel of Experts (PoE) will audit, assess, and monitor these activities. The Bhutan Power Corporation (BPC) will handle mitigation and monitoring for the transmission line alignment. All the monitoring and reporting information will be summarized in safeguard monitoring reports to be submitted by THyE to ADB.

EMP Item Reference	EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]	Monitoring Reference
1.2.1.1	1. Land acquisition management plan.	Land acquisition management plan (temporary and permanent) will be developed and implemented in accordance with detailed EMP requirements.	Plan developed and actions implemented during the pre-construction phase.	THyE[3], working with local landowners; contractors; Trongsa District Administration..	THyE Environmental Unit, Local authorities (District Land Officers – Dzongkhag Land Acquisition and Allotment Committee), and DGPC Internal Monitoring Committee, and Grievance Redress Committee (details are in the draft Resettlement Plan).	1.2.1.1 Resettle-ment Plan
1.2.1.2a	Management plan for actions related to land clearing and cuts (access roads and work sites)	Management plan for construction of adits and access roads will be developed and implemented in accordance with detailed EMP requirements.	Plan developed during pre-construction and actions implemented during pre-construction, construction, and operation phases.	THyE[3], contractors; Trongsa District Administration; Department of Roads; Social Forestry and Extension Division (DoPFS) for oversight of tree cutting.	THyE Environmental Unit for implementation compliance, and Social Forestry and Extension Division (DoPFS) for monitoring of tree cutting.	1.2.1.2a Table 4.4 Table 4.6 Table 4.9 Table 4.19
1.2.1.2b	2. Biodiversity Conservation and Wildlife Management	Establishment of a Biodiversity Management	Plan developed during pre-	THyE[3]; Wildlife Conservation Division	THyE Environmental Unit, and various	1.2.1.2b Table 4.1

EMP Item Reference	EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]	Monitoring Reference
	Plan.	Committee; rescue of flora; establishment of a botanical garden; minimal land clearing and removal of vegetation; rehabilitation of all cleared sites; wildlife conservation; anti-poaching measures; mitigation of human/wildlife conflicts; compensatory afforestation to mitigate offset of habitat loss in accordance with detailed EMP requirements (see further breakdown of details in the next table below).	construction and actions implemented during pre-construction, construction, and operation phases.	(DoPFS), , Soil Conservation, Animal Husbandry and Fisheries (Department of Agriculture); Social Forestry and Extension Division (DoFPS); National Biodiversity Centre; Ugyen Wangchuck Institute for Conservation and Environment; Technical supervisor for tree planting (consultant), and wildlife capture and removal specialists.	government agencies and institutes (in column to left) involved with specific tasks, and the Biodiversity Management Committee for overall monitoring and assessment of outputs.	Table 4.5 Table 4.6 Table 4.7 Table 4.20
1.2.1.3	3. Environmental plan for labor camps.	Housing for workers; provision of facilities for drinking water and electricity; sanitation and sewage treatment; closure and restoration of camp sites in accordance with detailed EMP requirements and World Bank EHS Guidelines	Plan developed during pre-construction and actions implemented during the construction phase.	THyE[3] and contractors.	THyE Environmental Unit for implementation compliance, and the Dzongkhag Environment Committee for monitoring environmental quality at all work sites.	1.2.1.3 Table 4.2 Table 4.14 Table 4.19
1.2.1.4	4. Solid waste management at offices, colonies, and worker camps.	Waste management in accordance with detailed EMP requirements and World Bank EHS Guidelines.	Plan developed during pre-construction and actions implemented during construction and operation phases.	THyE[3] and contractors.	THyE Environmental Unit for implementation compliance, and the Dzongkhag Environment Committee for monitoring waste management effectiveness.	1.2.1.4 Table 4.15
1.2.1.5	Project water supply system.	Water supply system; source of water and maximum water	Plan developed during pre-construction	THyE[3] and contractors.	THyE Environmental Unit for implementation	1.2.1.5 Table 4.12

EMP Item Reference	EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]	Monitoring Reference
		utilization in accordance with detailed EMP requirements and World Bank EHS Guidelines.	and actions implemented during construction and operation phases.		compliance, and the Dzongkhag Environment Committee for monitoring water use and quality.	
1.2.1.6	5. Construction equipment mobilization plan.	Construction equipment mobilization plan including National Highway Improvements in accordance with detailed EMP requirements.	Plan developed during pre-construction and actions implemented during construction phase.	THyE[3] and contractors.	THyE Environmental Unit for implementation compliance; Department of Roads for details and quality of highway repairs and improvements.	1.2.1.6 Table 4.4
1.2.1.7	Fuel storage management plan.	Fuel storage management plan in accordance with detailed EMP requirements and World Bank EHS Guidelines for Construction Works.	Plan developed during pre-construction and actions implemented during construction and operation phases.	THyE[3] and contractors.	THyE Environmental Unit for implementation compliance, and the Dzongkhag Environment Committee for monitoring environmental quality at fuel storage areas.	1.2.1.7 Table 4.8
1.2.2.1 to 1.2.2.13	6. Construction work management.	Occupational health and safety; management of blasting; quarry operation; crusher plant operation; muck disposal management plan; river diversion; transmission line tower installation (land clearing); air quality and noise management plan; water quality management plan; reservoir management and rim treatment plan (slope stabilization, fencing, etc.); greenbelt development and land management plan;	Plans developed during pre-construction and actions implemented during construction phase.	THyE[3] and contractors. DoFPS for oversight related to vegetation rehabilitation.	THyE Environmental Unit for implementation compliance, as well as routine environmental quality monitoring, and the Dzongkhag Environment Committee for environmental quality assessment; NEC can make un-announced environmental quality and compliance checks.	1.2.2.1 to 1.2.2.13 Tables 4.1 to 4.20

EMP Item Reference	EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]	Monitoring Reference
		energy conservation plan; closure plan for construction works in accordance with detailed EMP requirements and World Bank EHS Guidelines				
1.2.3.1	Operational work management.	Management of reduced worker numbers in accordance with detailed EMP requirements.	Pre-construction, construction and operation phases.	THyE[3], NGO, Ministry of Labour and Human Resources (MoLHR).	THyE Environmental Unit for implementation compliance and monitoring to be reviewed by MoLHR.	1.2.3.1 Resettlement Plan
1.2.3.2 and 1.2.3.3	7. Dam and reservoir operation/ fisheries development plan/maintenance of minimum environmental flow.	Fish stocking; fish screens; maintenance of minimum environmental flow in accordance with detailed EMP requirements (see further breakdown of details in the next table below).	Pre-construction, construction, and operation phases.	THyE[3],DGPC, Watershed Management Division (DoFPS); Fish specialist.	THyE Environmental Unit for implementation compliance and monitoring; the latter to be reviewed by DoFPS.	1.2.3.2 and 1.2.3.3 Table 4.7 Table 4.18 Table 4.20
1.2.3.4	8. Occasional sediment purging.	Sediment purging during monsoon in accordance with detailed EMP requirements.	Construction and operation phases.	THyE[3] and contractors	THyE Environmental Unit for implementation compliance and monitoring; the latter to be reviewed by DoFPS.	1.2.3.4 Table 4.20
1.2.3.5	9. Disaster Management Plan.	Design based on seismic parameters and independently checked; emergency preparedness and mitigation plan; collaboration with NEOC; forecasting and early warning system; dam inspection; dissemination of disaster preparedness plan to local community in accordance with detailed EMP and World	Pre-construction, construction and operation phases.	THyE[3]. Department of Disaster Management and National Emergency Operations Centre. Dam public safety specialist.	THyE Environmental Unit, Dzongkhag Disaster Management Committee, DGPC Dam Safety Committee.	1.2.3.5 Table 4.17

EMP Item Reference	EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]	Monitoring Reference
		Bank EHS Guidelines.				
1.2.3.6	10. Catchment Management Plan.	Identification of degraded areas in the upper catchment; development of catchment management committee; consultative development and monitoring of Catchment Management Plan in accordance with detailed EMP requirements (see further breakdown of details in the next table below).	Pre-construction, construction and operation phases.	THyE[3], DGPC, Watershed Management Division (DoFPS). Social Forestry and Extension Division (DoFPS). ADB TA consultants.[4]	THyE Environmental Unit for implementation compliance, and Catchment Management Committee for monitoring effectiveness of plan.	1.2.3.6 Table 4.13 Table 4.20
Transmission line EIA and 1.2.3.7	11. Transmission Line Alignment.[2]	Management of environmental impacts and maintaining cleared RoW in accordance with detailed EMP requirements and World Bank EHS guidelines.	Pre-construction, construction and operation phases.	BPC[3], THyE, contractors, Social Forestry and Extension Division (DoFPS) and local Forestry staff.	BPC for implementation compliance and monitoring to be reviewed by DoFPS.	Transmission line EIA 1.2.3.7 Table 4.20

[1]The panel of experts will audit, assess, and monitor the compliance of the project with the EMP requirements.
[2]Full details of the transmission line EIA and EMP have been filed separately; only the summary EMP tasks and responsibilities are shown here.
[3]Indicates the primary responsible party.
[4]Ongoing TA for Adapting to Climate Change through Integrated Water Resources Management is expected to support integrated water resources management plans in Bhutan, and another TA to be attached to the project will provide further support for specific implementation activities.

Note that the biodiversity conservation and wildlife management plan as outlined in Section 1.2.1.2b of the EMP contains a series of actions which will contribute to the JSWNP staff understanding of habitat/wildlife linkages in the project area, which will in turn help the JSWNP to develop a proper management plan over the long term. A biodiversity management committee will be constituted prior to construction for effective implementation, monitoring and evaluation of the Biodiversity Conservation and Wildlife Management Plan for the project. Along with implementation of mitigation and monitoring with respect to the environmental impacts of project construction and operation, the EMP actions will provide further insights into patrolling methods and effectiveness, actual use of the buffer area of JSWNP, and options for JSWNP interpretation and public access. Each of these actions is further detailed as follows:

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
a) Establishment of the Biodiversity Management Committee (BMC).	Committee will be constituted to ensure effective implementation, monitoring and evaluation of the Biodiversity Conservation and Wildlife Management Plan for the project in accordance with detailed EMP requirements. Committee will comprise members from the Dzongkhag and Department of Forest and Park Services, Wildlife Conservation Division, Department of Agriculture, Soil Conservation, Animal Husbandry and Fisheries (for technical advice). Committee will ensure that measures to protect the JSWNP, biological corridor, and threatened species supported by the park and aquatic habitat are implemented, will monitor and enforce regulatory and EMP provisions and ensure that the structure and functions of the natural ecosystems in the project area are not changed or subjected to any threat as a result of the project. The Committee will also propose other measures to be implemented in order to ensure the protection of the JSWNP, biological corridor, threatened species supported by the park, and aquatic habitats, whenever deemed necessary.	Pre-construction, committee to continue to operate during construction and operation phases.	To be established under the direction of the THyE. Committee members to come from Dzongkhag office, Wildlife Conservation Division (DoFPS), and Soil Conservation, Animal Husbandry and Fisheries (Department of Agriculture) for oversight and technical advice. Chairperson to be selected from committee members.	The committee will review the output from other actions within the biodiversity conservation and wildlife management plan. (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)
b) Rescue of flora.	Prior to road clearing and dam construction, a survey of the project area will be undertaken to identify pertinent shrub species, epiphytes, medicinal plants, ferns and fungi that may otherwise be damaged during brush clearance or submergence within the reservoir. Any botanical species deemed worth conserving and cultivating for scientific and educational purposes (in consultation with National Biodiversity Centre and DoFPS) will be rescued for placement in the botanical garden. The detailed TORs for the survey and botanical species to be collected will be agreed with the National Biodiversity Centre and DoFPS.	Pre-construction phase.	Overall management from THyE. National Biodiversity Centre and DoFPS to provide on-the-ground effort and technical advice. Technical supervisor for tree planting (consultant) will support planning and implementation.	Oversight and surveys by National Biodiversity Centre and DoFPS. (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
c) Establishment of a botanical garden.	The size and location for development of a Botanical Garden for placement of botanical species collected by the project will be determined in consultation with the DoFPS and Ugyen Wangchuk Institute of Conservation and Environment. Appropriate vegetative propagation methods will be adopted by the Botanical Garden. The garden will be used for scientific research, conservation of botanical species collected, education and awareness programs. The size, location and management plan for the Botanical Garden will be agreed with the Biodiversity Management Committee. Consultations to date with Zhemgang Territorial Division, DoFPS, have indicated that a Botanical Garden for rescue and conservation of rare and endangered species at Tingtibi (Zhemgang) could cater for the project. In addition, a collection of orchids may be maintained in collaboration with the National Biodiversity Centre.	Initiated in pre-construction phase. To then be continuously implemented by the Ministry of Agriculture and Forests.	Overall management from THyE. New botanical garden to be developed and maintained by DoFPS, in consultation with the experienced plant taxonomists of Ugyen Wangchuk Institute of Conservation and Environment (and/or the Royal University of Bhutan). Technical supervisor for tree planting (consultant) will support planning and implementation. The Biodiversity Management Committee to endorse the specific management plan for the Botanical Garden.	Oversight and surveys by National Biodiversity Centre and DoFPS. (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)
d) Ensure minimal land clearing and removal of vegetation	DoFPS will identify and mark trees for removal from the project area in accordance with the EMP provisions. Only those trees identified and marked by DoFPS will be felled and removed from the work sites.	Pre-construction and construction phases.	Overall management from THyE. Contractors to remove vegetation, under technical guidance of Social Forestry and Extension Division (DoFPS). Technical supervisor for tree planting (consultant) will support planning and implementation.	DoFPS to monitor the clearing and removal process. (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)
e) Rehabilitation of all cleared sites.	All temporary cleared sites will be replanted with appropriate vegetation (fast growing local species of trees and shrubs), as soon as the sites are workable as per the EMP provisions. Botanical species collected by the project and conserved at the Botanical Garden or in the orchid collection will be replanted at the cleared sites.	Construction phase.	Overall management from THyE. Contractors to re-plant vegetation under technical guidance of Social Forestry and Extension Division (DoFPS). Technical supervisor for tree planting (consultant) will support planning and implementation.	DoFPS to monitor replanting effort. (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)
f) Rescue and release program	A program for capturing, treating/rehabilitating, and releasing wild animals found in pain or distress, particularly	Pre-construction, construction, and early phase of	Under overall guidance and budget of THyE. DoFPS will handle the wildlife conservation	DoFPS to maintain logs of all activities and data. THyE to monitor the budget and

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
	as a result of human interference and project activities, will be initiated with the DoFPS as per the EMP provisions. The primary goal will be to treat and rehabilitate the wildlife and release them back to the habitat from which they were collected (or safe adjacent areas). This component includes allocation of a site, design and construction of animal accommodation/ enclosures, treatment facilities and equipment for the capture, treatment and release procedures, medicines, trained manpower/ veterinarian, and a caretaker, as well as a data management and record keeping system. The detailed rescue and release program will be agreed with the Biodiversity Management Committee. All wildlife encounters during pre-construction and construction will be logged.	project operation.	programs, and reporting. Wildlife capture and removal specialists will support planning and implementation.	implementation. (see Section 1.2.1.2b and Tables 4.5 for detailed monitoring requirements)
g) Promote Wildlife Surveys and Monitoring in the Biological Corridor as well as the Park.	Wildlife surveys and monitoring in the project areas, Biological Corridor as well as the Park (using camera traps) will be undertaken by DoFPS. Wildlife surveys will be aimed at adding to the existing knowledge base on wildlife presence and movements in the vicinity of the Nikachhu project with particular attention given to surveying for tiger, dhole, gaur, golden langur, Asiatic black bear, leopard, red panda and serow for input to later development of a full JSWNP Management Plan. The detailed TORs for the wildlife surveys will be agreed with the Biodiversity Management Committee.	Pre-construction, construction, and early phase of project operation.	Under overall guidance and budget of THyE. DoFPS will handle the wildlife conservation programs, and reporting. Wildlife capture and removal specialists will support planning and implementation. The Biodiversity Management Committee to endorse the detailed TORs for the surveys.	DoFPS to maintain logs of all activities and data. THyE to monitor the budget and implementation, to report them to The Biodiversity Management Committee. (see Section 1.2.1.2b and Tables 4.5for detailed monitoring requirements)
h) Anti-poaching measures.	Awareness raising in accordance with a plan to be agreed with the Biodiversity Management Committee will be conducted for construction workers and contractors to reduce the risk of poaching. Copies of the Forest and Nature Conservation Act, Rules and Regulations	Pre-construction, construction, and early phase of project operation.	Under overall guidance and budget of THyE. DoFPS will design and handle all anti-poaching measures, as these are currently within the daily responsibilities of Park staff. The Biodiversity Management	DoFPS to maintain logs of all activities and data. THyE to monitor the budget and implementation, to report them to The Biodiversity Management Committee (see Section 1.2.1.2b and

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
	will be made available to construction workers and contractors. Workers will be made aware of the fines and penalties for poaching, as well as the risk of job loss, if caught in these illegal activities. Increased patrols in the project area (with equipment provided by the project) will be undertaken by local forestry staff, level of patrolling required will be agreed with Biodiversity Management Committee. THyE will fund a community neighborhood program, through hire of 'risups' or village guards to alert forestry officials of any illegal activities in the worker camps or at project sites, level and management of fund required will be agreed with Biodiversity Management Committee.		Committee to endorse the level of patrolling and fund management.	Table 4.5 for detailed monitoring requirements)
i) Build up scientific database	THyE will provide computers and provide funds for park staff to develop research and survey proposals for general biodiversity surveys, or specie-specific surveys; level and management of fund will be agreed with Biodiversity Management Committee.	Construction and operation phases.	Under overall guidance and budget of THyE. DoFPS will handle the biodiversity survey designs and management of the database The Biodiversity Management Committee to endorse the database design and the level of fund management.	DoFPS to maintain the database with new survey data; the Biodiversity Management Committee will review the relevance and quality of the database; THyE to monitor the budget and implementation. (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)
j) Mitigation of human/wildlife conflicts.	THyE will provide funds for the Dzongkhag office, DoFPS, or concerned villages (whichever is most relevant) to develop and implement a plan for piloting in one village to mitigate animal-crop conflicts (loss of farm production, due to wildlife). Level of fund required and implementation plan will be agreed with Biodiversity Management Committee.	Project construction and early phase of operation.	Under overall guidance and budget of THyE. The Dzongkhag office will log interactions between people and animals. DoFPS will handle the wildlife conflict mitigation programs, and reporting. Wildlife capture and removal specialists will support planning and implementation. The Biodiversity Management Committee to endorse the proposed pilot activities to mitigate animal-crop conflicts.	Dzongkhag office and THyE to monitor effectiveness of any pilot activities. THyE to monitor the budget and implementation, to report them to The Biodiversity Management Committee (see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)
k) Compensatory	Bhutan Guidelines on Compensatory	During late phase	Overall management from THyE.	DoFPS to monitor quality

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
afforestation to mitigate/offset habitat loss.	Afforestation will be followed to ensure a systematic approach to rehabilitation and afforestation in collaboration with DoFPS. Suitable sites for replanting trees, covering an area 2 times larger than the areas cleared for the project will be identified in accordance with EMP provisions and agreed with the Biodiversity Management Committee. Memorandum of Understanding (MoU) with DoFPS will be drawn up covering project activities for financing and execution. Suitable species for replanting will be agreed with the Biodiversity Management Committee and stocking will be obtained from the nursery at Tingtibi. Replanting will be undertaken as sites are made available.	project construction and early operation.	Social Forestry and Extension Division (DoFPS) will provide technical advice. Individuals contracted to undertake planting. Technical supervisor for tree planting (consultant) will support planning and implementation. The Biodiversity Management Committee to endorse the species composition and locations for tree planting to ensure quality habitat for wildlife.	and success of replanting. (see Tables 4.1, 4.6,and 4.7 for detailed monitoring requirements)
l) Wildlife monitoring	Nested within the overall proposal for wildlife monitoring, at a minimum, baseline surveys (camera traps) will be undertaken across the project area at the very beginning of the project and during pre-construction and construction/early operation, with particular attention given to surveying for tiger, dhole, gaur, golden langur, Asiatic black bear, leopard, red panda and serow. At a minimum, all incidental sightings of wildlife will be recorded during construction and the early phase of project operation. The detailed TORs for the monitoring surveys will be agreed with the Biodiversity Management Committee, and will have an approach consistent with the surveys noted in “g” above.	Pre-construction, construction, and early phase of project operation.	Under overall guidance and budget of THyE. DoFPS will handle the design and implementation of wildlife monitoring/surveys The Biodiversity Management Committee to endorse the detailed TORs for the surveys, as well as the review of survey outputs.	DoFPS to maintain logs of all activities and data. THyE to monitor the budget and implementation, to report them to The Biodiversity Management Committee see Section 1.2.1.2b and Table 4.5 for detailed monitoring requirements)

Note also that the EMP sections (1.2.3.2 and 1.2.3.3) on the fisheries development plan/maintenance of minimum environmental flow(contains several actions, which will in turn help the project develop a proper management plan for fisheries and minimum water flows over the long term. Along with implementation of mitigation and monitoring with respect to the environmental impacts of project construction and operation, downstream monitoring of aquatic habitats and the fish population during operation will provide further insights into the acceptability of the proposed environmental flow for maintenance of aquatic biodiversity. If, as a result of

monitoring, the proposed environmental flow is deemed inadequate by the Biodiversity Management Committee, THyE and DGPC, with the agreement of the Biodiversity Management Committee, will need to alter environmental flows from the Nikachhu and/or Mangdechhu dams to ensure that no net loss of downstream aquatic biodiversity (arising from the operation of hydropower facilities in the Mangdechhu river basin, including from the project facility and the Mangdechhu Hydroelectric project) is achieved. Each action is further detailed as follows:

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
a) Aquatic habitats and fish monitoring.	THyE will conduct construction site management to avoid sediment loss and other pollution to watercourses as per EMP provisions. THyE will undertake baseline and routine water quality monitoring (as per Table 4.20) during all project phases to determine turbidity and other water quality parameters that could be affected by the project (in reservoir, immediately below dam, in Nikachhu at confluence with Mangdechhu, about 1 km upstream of the Mangdechhu tailrace and about 1km and 5km downstream of the Mangdechhu tailrace, where access is possible). ThyE will undertake baseline and routine fish monitoring (trap, identify, measure, count)(as per Table 4.20) during all project phases including in reservoir, immediately below dam, in Nikachhu at confluence with Mangdechhu, about 1km upstream of the Mangdechhu tailrace and about 1km and 5km downstream of the Mangdechhu tailrace. ThyE will undertake baseline and routine macro-invertebrate and aquatic plant monitoring at the same time fish monitoring is undertaken during all project phases including in reservoir, immediately below dam, in Nikachhu at confluence with Mangdechhu, about 1km upstream of the Mangdechhu tailrace and about 1km and 5km downstream of the Mangdechhu tailrace. The detailed TORs for the aquatic habitat and fish surveys will be agreed with the	Pre-construction, construction, and operation phases (2-3 times per year).Monitoring will continue for at least the first two years of operation, but at the discretion of the Biodiversity Management Committee may be extended for a further period of 5 years. Baseline monitoring will be obtained before and after operation of the Mangdechhu hydropower plant	Overall management from THyE. Watershed Management Division (DoFPS) for water quality and visual aquatic habitat checks; fish specialist for all fish sampling. The Biodiversity Management Committee to endorse the detailed TORs for the surveys and review all data.	THyE for implementation compliance and environmental effects monitoring and reporting to be reviewed by DoFPS and the Biodiversity Management Committee (see Section 1.2.3.2, 1.2.3.3 and Table 4.18 for detailed monitoring requirements).

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
	Biodiversity Management Committee. During project operation, THyE will continue visual checks of reservoir water quality and aquatic habitat development.			
b) Reservoir operation and fish stocking	Park interpretation facilities will be installed on the left bank of the reservoir (for visitor education and development of ecotourism) as agreed with the Biodiversity Management Committee The National Park side of the reservoir will be completely fenced, to prevent any public access in that area. The left bank of the reservoir will be fenced as necessary to keep cattle and people out of the reservoir. Fencing plans will be agreed with the Biodiversity Management Committee. Rim treatment plan as outlined in the EMP will be implemented so that all slopes (other than bare rock) are properly vegetated and secured. Stocking of reservoir (possibly with snow trout) will be undertaken in accordance with a fisheries management plan to be agreed with the Biodiversity Management Committee.	During project operation.	Overall management from THyE. Watershed Management Division (DoFPS) for water quality and visual aquatic habitat checks; fish specialist for all fish sampling. The Biodiversity Management Committee to endorse the management plan for the reservoir area.	THyE for implementation compliance and environmental effects monitoring and reporting, to be reviewed by DoFPS and the Biodiversity Management Committee (see Section 1.2.3.2, 1.2.3.3 and Table 4.18 for detailed monitoring requirements).
c) Fish screening	THyE's screening of intakes will be designed to prevent fish loss as per the EMP provisions.	Pre-construction, construction, and early phase of project operation.	Overall management from THyE, in consultation with Watershed Management Division (DoFPS). Fish specialist will support planning and implementation.	THyE for routine monitoring of fish population in reservoir to be reviewed by DoFPS. (see Section 1.2.3.2, 1.2.3.3 and Table 4.18 for detailed monitoring requirements).
d) Minimum environmental flow and hydrological monitoring.	Minimum environmental flow of at least 0.554m^3/s, 10% of the average annual lean season flow or as stipulated by the Biodiversity Monitoring Committee (whichever is higher) will be maintained from the Nikachhu dam throughout construction and operation. Discharge of environmental flow from the dam will be continually monitored with an in-situ gauge during construction and operation in the both the Nikachhu and	Pre-construction, construction, and operation phases. Monitoring will continue for at least the first two years of operation, but at the discretion of the Biodiversity Management	Overall management from THyE and DGPC (for both Nikachhu and Mangdechhu project operations), in consultation with Watershed Management Division (DoFPS). Fish specialist will support planning and implementation. The Biodiversity Management Committee to endorse the detailed TORs for this action.	THyE for implementation compliance and environmental effects monitoring and reporting to be reviewed by DoFPSand the Biodiversity Management Committee. (see Section 1.2.3.2, 1.2.3.3 and Table 4.18 for detailed monitoring requirements).

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
	the Mangdechhu rivers. Flows, the wetted perimeter and water depths above the reservoir, immediately below the dam, at the confluence of Nikachhu with the Mangdechhu, about 1km upstream of the Mangdechhu tailrace and about 1km and 5km downstream of the Mangdechhu tailrace will be continuously monitored on a monthly basis during construction and operation, baseline flows will also be obtained. These flow surveys will be undertaken over a sufficient time period to ensure that the diurnal flow pattern, particularly due to operation of the Mangdechhu tailrace, is picked up. The detailed TORs for the hydrological surveys will be agreed with the Biodiversity Management Committee. The results of aquatic habitat and fish monitoring (noted above) will be correlated to the results of the flow surveys (ideally both types of surveys will be undertaken at the same time to aid correlation) and the results provided to the Biodiversity Management Committee. If, as a result of monitoring, the proposed environmental flow is deemed inadequate by the Biodiversity Management Committee, the technical/ financial/ecological implications of a higher e-flow from the Nikachhu and/or Mangdechhu dams and/or change in the Mangdechhu's tailrace operation will then be examined by THyE and DGPC. Taking these investigations into account, the Biodiversity Management Committee will then determine if a higher environmental flow from one or both dams or a change in the Mangdechhu's tailrace operation must be adopted by THyE and DGPC in order to ensure that no net loss	Committee may be extended for a further period of 5 years. Baseline monitoring will be obtained before and after operation of the Mangdechhu hydropower plant		

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
	of downstream aquatic biodiversity is achieved.			

The catchment management plan as outlined in the EMP (Section 1.2.3.6) contains a series of actions, which will in turn help the project develop a proper plan for watershed management over the long term. The purpose of the Catchment Management Plan is to encourage coordinated planning and management by all concerned stakeholders so as to balance hydropower development with sustainable water use and protection and conservation of the catchment area. Further details are provided below:

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
a) Identification of degraded areas.	Survey of degraded areas in the upper catchment which may be subject to erosion will be undertaken in accordance with TORs to be agreed by the Catchment Management Committee. Number and size of areas for reforestation will be identified as per EMP provisions for inclusion in the Catchment Management Plan. Rapid classification of watersheds along the Nikachhu catchment will be initiated to identify critical micro-watersheds, with detailed assessment of any identified. Remedial (engineering) measures will be identified as per EMP provisions for inclusion in the Catchment Management Plan.	Construction and operation phases.	Overall management from THyE" in consultation with Watershed Management Division (DoFPS), and Social Forestry and Extension Division (DoFPS).Technical supervisor for tree planting (consultant) will support planning and implementation. The Catchment Management Committee to endorse the detailed TORs.	THyE for implementation compliance and environmental effects monitoring and reporting to be reviewed by DoFPS. Catchment Management Committee for monitoring effectiveness of the Catchment Management Plan.
b) Development of committee.	A catchment management committee comprising Local District Officers such as Land Record, Forestry Officer, Agriculture Officer, Park staff, Territorial Forestry staff and Geog representative/Gup and	Construction and operation phases.	Under overall direction of THyE and DGPC, the following committee members will be activated and coordinated: Local District Officers such as Land Record, Forestry Officer, Agriculture Officer, Park staff,	THyE and DoFPS for logging activities of the committee.

EMP Item	Summary of Actions	Duration	Responsibilities	Associated Monitoring[1]
	members of the local community will be organized.		Territorial Forestry staff and Geog representative/Gup and members of the local community.	
c) Conduct consultative meetings and awareness workshops, development and monitoring of Catchment Management Plan	Under guidance of the committee, a consultative process including workshops will be implemented. The main objective of the workshops will be to identify priority issues related to water use, conservation, and their impacts, and formalize these actions through a Catchment Management Plan that reflects local views and specific conservation needs specific to the watershed. Catchment Management Plan will be developed and agreed with the committee. Areas falling under severe erosion must be treated with high priority and management measures must include both biological and engineering measures. Tree planting and structure building will be implemented in accordance with the Catchment Management Plan, the effectiveness of these measures to be monitored as per the EMP provisions.	Construction and operation phases.	Under overall management from THyE and DGPC, in consultation with DoFPS. The ADB TA consultants will help develop the Catchment Management Plan and facilitate its implementation, with inputs from local communities. The Catchment Management Committee to endorse the Catchment Management Plan.	DoFPS, and the catchment management committee will monitor development and implementation of the Catchment Management Plan.