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The World Bank

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Report No: 50298-IN

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US\$ 648 MILLION

TO

THDC INDIA LIMITED

WITH THE GUARANTEE OF THE REPUBLIC OF INDIA

FOR THE

VISHNUGAD PIPALKOTI HYDRO ELECTRIC PROJECT

June 10, 2011

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CURRENCY EQUIVALENTS

(Exchange Rate Effective June 6, 2011)

Currency Unit = Indian Rupee
Rs. 44.75 = US\$1
US\$ 0.022 = Rs. 1

FISCAL YEAR
April 1 – March 31

ABBREVIATIONS AND ACRONYMS

CAS	Country Strategy	MoEF	Ministry of Environment and Forests
CAT	Catchment Area Treatment	MOP	Ministry of Power
CBIS	Capacity Building and Institutional Strengthening	MW, MWh	Megawatt, Megawatt-hour
CEA	Central Electricity Authority	NAPCC	National Action Plan on Climate Change
CERC	Central Electricity Regulatory Commission	NDBR	Nanda Devi Biosphere Reserve
DRC	Design Review Consultant	NEP	National Electricity Policy
EIA	Environmental Impact Assessment	NGO	Non-Governmental Organization
EIRR	Economic Internal Rate of Return	NRRP	National Resettlement & Rehabilitation Policy (2007)
EMP	Environmental Management Plan	OP	Operational Policy
EPC	Engineering, Procurement and Construction	PAF	Project-Affected Family
FIRR	Financial Internal Rate of Return	PAP	Project-Affected Persons
GAAP	Governance and Accountability Action Plan	PHRD	Policy and Human Resources Development Grant
GBR	Geo-technical Baseline Report	PIC	Project Information Center
GOI	Government of India	PWD	Public Works Department
GOuk	Government of Uttarakhand	R&R	Resettlement and Rehabilitation
GW, GWh	Gigawatt, Gigawatt-hour	RAP	Resettlement Action Plan
HEP	Hydro Electric Project	SBD	Standard Bidding Documents
IBRD	International Bank of Reconstruction and Development	SIA	Social Impact Assessment
ICB	International Competitive Bidding	TBM	Tunnel boring machine
IDA	International Development Association	THDC	THDC India Limited
IEP	Integrated Energy Policy	UNESCO	United Nations Educational, Scientific and Cultural Organization
kW, kWh	kilowatt, kilowatt-hour	VPHEP	Vishnugad Pipalkoti Hydro Electric Project

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Sector Manager:	Jyoti Shukla
Task Team Leader:	Michael Haney

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Vishnugad Pipalkoti Hydroelectric Project**

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INDIA

VISHNUGAD PIPALKOTI HYDROELECTRIC PROJECT

PROJECT APPRAISAL DOCUMENT

SOUTH ASIA

SASDE

Date: June 10, 2011	Team Leader: Michael Haney
Country Director: N. Roberto Zagha	Sectors: Power (50%); Renewable energy (50%)
Sector Manager: Jyoti Shukla	
Project ID: P096124	
Environmental Assessment: Full Assessment	
Lending Instrument: Specific Investment Loan	

	Project Financing Data:	
	Proposed terms:	
	[X] Loan [] Credit [] Grant [] Guarantee [] Other:	
	Source	Total Amount (US\$M)
	Total Project Cost:	922.0
	Borrower:	274.0
	IBRD:	648.0

Borrower: THDC India Limited

Responsible Agency: THDC India Limited

Contact person: Mr. R.S.T. Sai, Chairman and Managing Director

Ganga Bhawan

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India

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FY	2012	2013	2014	2015	2016	2017
Annual	25	80	200	180	125	38
Cumulative	25	105	305	485	610	648

Project implementation period: Start: September 1, 2011 End: August 31, 2017

Expected effectiveness date: September 1, 2011

Expected closing date: December 31, 2017

Does the project depart from the CAS in content or other significant respects? [] Yes [X] No
Ref. PAD I.C.

Does the project require any exceptions from Bank policies? <i>Ref. PAD IV.G.</i>	[] Yes [X] No
Have these been approved by Bank management?	[] Yes [] No
Is approval for any policy exception sought from the Board?	[] Yes [X] No
Does the project include any critical risks rated “substantial” or “high”? <i>Ref. PAD III.D.</i>	[X] Yes [] No
Does the project meet the Regional criteria for readiness for implementation? <i>Ref. PAD IV.G.</i>	[X] Yes [] No
<p>Project development objective</p> <p>The objectives of the Project are: (a) to increase the supply of electricity to India’s national grid through the addition of renewable, low-carbon energy; and (b) strengthen the institutional capacity of the Borrower with respect to the preparation and implementation of economically, environmentally and socially sustainable hydropower projects.</p>	
<p>Project description</p> <p>Component 1: Construction of the 444 MW Vishnugad Pipalkoti Hydro Electric Project in Chamoli District, Uttarakhand, India</p> <p>Component 2: Support to capacity-building and institutional strengthening at THDC India Limited, the developer of the Vishnugad Pipalkoti Hydro Electric Project</p>	
<p>Which safeguard policies are triggered, if any?</p> <p>Environmental Assessment (OP 4.01)</p> <p>Natural Habitats (OP 4.04)</p> <p>Physical Cultural Resources (OP 4.11)</p> <p>Involuntary Resettlement (OP 4.12)</p> <p>Forests (OP 4.36)</p> <p>Safety of Dams (OP 4.37)</p> <p>Projects on International Waterways (OP 7.5)</p>	
<p>Significant, non-standard conditions, if any, for:</p> <p>Board presentation:</p> <p><i>None.</i></p>	
<p>Covenants applicable to project implementation:</p> <ul style="list-style-type: none"> • Standard Bank legal requirements. 	

I. STRATEGIC CONTEXT AND RATIONALE

A. Challenges in the power sector

1. Limited access to electricity and inadequate power supply have long constrained human and economic development in India. An estimated more than 400 million people in the country do not have access to electricity. The average annual per capita consumption of electricity of those who have access was 734 kWh in 2008-09, far below the world average of 2,429 kWh. The system's average peak time deficit of about 10.3 percent (2011) and average energy deficit of about 8.5 percent (2011) have resulted in high coping costs for industry and households: 60 percent of businesses and most households rely on back-up generation or alternate means of electricity. Insufficient power generation and inadequate electricity service delivery mechanisms¹ thus remain a critical constraint to India's sustained growth; its national economic competitiveness; private investment in industry; and poverty alleviation efforts.

2. The power sector is also responsible for almost 50 percent of India's carbon emissions and environmental pollution, the result of the heavy reliance on coal-based generation (70-80 percent of the power generated comes from coal-fired plants) and on small, inefficient and polluting back-up generators.

3. While recent years have seen progress in addressing these constraints², robust economic growth in India has meant that the demand for electricity has continued to outpace its supply, complicating the efforts of sector authorities to deliver on the Government's target of universal access to electricity by 2012. Furthermore, an adequate and reliable supply of electricity will be critical to sustaining robust economic growth and the Government's poverty alleviation efforts.

4. To achieve its goal of universal access to electricity, the Government of India (GOI) has embarked on an ambitious investment program to add generation capacity (almost doubling it by the end of the 12th Five-Year Plan, i.e. 2017, from 132 Gigawatts (GW; 1,000 Megawatts) at the beginning of current 11th Five-Year Plan), expand and strengthen transmission and distribution networks, and improve the technical and commercial efficiency of power utilities. GOI's 11th Five-Year Plan (2007-2012), the Integrated Energy Policy (2006) and the National Action Plan on Climate Change (NAPCC) (2008) aim to maximize the development of renewable and other cleaner energy options. Even with aggressive efforts³ by GOI to increase the share of renewable energy, large hydro and nuclear plants in the generation mix, given the large domestic coal resources and the absence of any other significant domestic energy sources, coal-fired generation will continue to dominate electricity generation in India at least for the next few decades. India

¹ Average transmission and distribution losses currently stand at 28 percent.

² Generation capacity added through conventional sources of energy during the 9th and 10th Plans was 19,119 MW and 21,180 MW respectively. Furthermore, even though there are significant tariff distortions and governance challenges at the distribution level, the improving policy framework, underpinned by the Electricity Act (2003), has resulted in consistently good payment discipline for electricity supply over the last 6 years.

³ The share of installed capacity from renewable energy (including small hydropower, wind, biomass gasifier, urban and industrial waste and solar) was 5.9% at the end of the 10th Plan (2002-07) and has increased to 10.6% as of March 31, 2011. NAPCC aims to increase the share of renewable energy generation by 1 percent annually. NAPCC includes eight missions including the Jawaharlal Nehru National Solar Mission (JNNSM) that targets to add 20 GW of solar capacity by 2022.

has embarked upon a low-carbon growth path based on developing all domestically available energy resources and adequately addressing safety and environmental concerns.

5. ***The special role of hydropower.*** India has an estimated 96,800 MW of undeveloped hydropower potential. If developed in accordance with good practices, this untapped potential can provide a clean energy source which is well-suited to the country's energy needs, particularly its daily peak demand which is driven by the large number of households, their rising connectivity, and the growth in commercial demand. Hydropower can also enhance energy and water security, contribute to a lower-carbon economy, and bring development benefits to the more remote regions of the country where most of the undeveloped hydropower potential is located. During the 12th Plan (2012-17), GOI aims to develop about 20,000 MW of hydropower capacity and to increase hydro's share in the country's total installed generation capacity to 40 percent from the current 22 percent.

6. However, its significant potential notwithstanding, the hydropower sector in India continues to face significant challenges.⁴ These include:

- ***High risks:*** Hydropower projects face high risks related to construction, geology and hydrology. The remote areas of the Himalayas, where most of India's hydropower development is taking place, pose significant access challenges for site investigation and construction.
- ***Technical:*** The Himalayas are young and geologically unstable mountains, which poses unique challenges for hydropower development in this region. Inadequate geological and geo-technical investigations and outmoded tunneling methods hamper project development and construction. "Geological surprises" in the Himalayas have led to significant cost- and time-overruns and to frequent disputes with contractors; in the operations stage, sediment management has proven to be a significant technical challenge, as seen in the case of the World Bank-funded Nathpa Jhakri HEP.
- ***Professional/managerial:*** The relative dearth of new hydropower projects in recent decades led to a contraction of the number of professionals active in the sector and to an under-representation of core skills in certain specialized technical areas, contract management, etc. This is slowly changing as more hydropower projects are taken up for development and companies are recruiting young engineers and other specialists.
- ***Social aspects of development:*** The changing legal and regulatory framework for land acquisition and resettlement and the evolving socio-political dynamic of infrastructure development in India have raised the bar for all large infrastructure projects; developers have been slow to build up the skills required to respond to the greater expectations of project-affected people, leading to delays in project preparation.

⁴ According to the re-assessment studies carried out by CEA, the country's hydroelectric potential is 145,320 MW. Of this, 173 schemes (37,367 MW) are under operation; 46 schemes (13,785 MW) are under construction; CEA concurrence has been granted to feasibility studies for another 31 schemes (16,088 MW); feasibility studies of another 44 schemes (15,441 MW) are in various stages of preparation; and another 108 schemes (41,945 MW) are in various stages of survey and investigation related to preparation of feasibility studies. In all, 402 schemes with an aggregate capacity of 124,626 MW have been identified or developed or are under development.

- *River basin planning and environmental aspects of development:* Hydropower projects in India are usually developed in the context of a cascade of several projects, sometimes owned by different developers. For this reason, coordination in the design and operation of plants in the cascade is essential to maximize efficiency and to deal adequately with adverse environmental impacts, particularly those that affect the river flows and aquatic life. Generally, hydro projects under development today reflect basin-level planning as it was practiced some decades ago, which did not take into account factors that today are considered essential to sustainable development, such as ensuring adequate environmental flows. Recent efforts by GOI to gain a more comprehensive understanding of the cumulative impacts of cascaded hydropower development are bringing about important changes in this aspect. In the course of the preparation of the proposed project, the environmental flow regime was increased by a factor of five following the completion of a comprehensive cumulative impact assessment that was commissioned by MOEF.
- *Financial:* Hydropower projects are capital-intensive, risky and have long pay-back periods; development has been constrained by limited availability of long-term financing and a slow emergence of tariff incentives to stimulate hydropower development.

7. ***A robust and evolving policy environment.*** In recent years, important legislative and policy reforms have been enacted in India with respect to the power sector in general and hydropower in particular. The groundbreaking Electricity Act (2003) seeks to improve the efficiency and accountability of the sector and to increase access to electricity through a variety of measures.⁵ The National Electricity Policy (2005) and the Integrated Energy Policy (2006) are intended to facilitate the goals established by the Electricity Act (2003) by detailing policy on specific issues. Both stress the need for maximizing development of clean and renewable energy options including hydropower.⁶ The National Water Policy (2005) calls for the planning, development and management of India's water resources to be governed from the national perspective, and assigns hydropower third place in the priority of use of water resources, after drinking water and irrigation.

8. The National Hydropower Policy (2008) has introduced important reforms to further the Government of India's objective of accelerating the pace of hydropower development. These include: measures to increase private sector investment in hydropower; reforming the practice of resettlement and rehabilitation to move beyond the paradigm of compensation for losses on project-affected people to sharing the benefits of development with project-affected people; and introducing reforms to improve the financial viability of projects. The salient features of the policy are:

- transparent selection criteria for awarding sites to private developers (to be decided by the regulator);

⁵ For example, introduction of competition in the sector; expansion of private sector participation; measures to improve sector governance and to commercialize services; support to rural electrification.

⁶ The NEP also commits the Central Government to supporting the efforts of state governments to develop state-level hydropower projects expeditiously by offering the services of the Central hydropower companies.

- developers allowed to recover additional costs through merchant sale up to 40% of saleable energy, with the balance to be drawn from long-term power purchase agreements (PPAs);
- project developers to provide all project-affected families 100 kWh of electricity per month for 10 years from the project date of commissioning;
- project developers to assist in implementing rural electrification in the vicinity of the project;
- an additional 1% free power from the project to be earmarked for a Local Area Development Fund, which will ensure a regular revenue stream for welfare schemes, creation of additional infrastructure and common facilities; and
- State governments also expected to contribute a matching 1% from the 12% free power that is provided to the home state.

9. ***Private participation in the hydropower sector.*** To supplement the available public finance and help meet the significant capital requirements of the planned hydropower generation capacity expansion, the Government of India and individual state governments have encouraged private sector investment in the hydropower sector. While private companies have shown a strong initial interest in the hydropower sector, their experience to date of developing and operating hydropower plants in India is limited and mixed. Private ownership of the installed hydro capacity in India is currently only 4 percent of the total compared to 18 percent private ownership of the installed capacity of other generation sources. It is expected that the Central government hydropower companies will continue to dominate the growth in new hydropower capacity, accounting for 55 percent in the current Plan, and that there will be only limited growth of the private sector's share of hydropower generation.

10. ***Hydropower in India's federal system.*** The Indian Constitution accords states primary authority over waterways that pass through their territories. However, national laws, policies and procedures have a significant influence over how states exercise this authority. In addition to the National Hydropower Policy, hydropower development in the states is guided by the Central Electricity Authority (which originally prioritized hydropower sites based on national assessments, and clears feasibility studies); the Ministry of Environment and Forests (MOEF) (which provides environmental and forest land clearances); the Central Electricity Regulatory Commission (which sets the generation tariff for Central generating companies); and the National Resettlement and Rehabilitation (R&R) Policy (which defines the process and compensation for people affected by development projects). National policies of relevance to hydro are typically implemented by state institutions (such as the Revenue Department which is responsible for facilitating land acquisition and R&R; the State Pollution Control Board which is responsible for regulating environmental obligations of hydropower developers; and the Forest Department, which is responsible for the implementation of catchment area treatment plans). The Central government also influences hydropower development through its ownership of the public sector hydropower companies which dominate the industry.

11. The acceleration of hydropower development has posed challenges for the states, which generally have more limited financial and technical capacity than the Central government. These challenges include: the need to develop state-level policies and mechanisms to implement national policy guidelines (such as for the use of hydropower royalties for local area development); oversight and coordination of the activities of numerous public and private developers of several river basins; and execution of the state's functions with respect to land acquisition and mediation of grievances. The pressing development imperative together with the common practice of allocating projects to multiple developers on the same river basin in order to maximize the available investment funds has led to a disproportionate focus on individual projects and insufficient regard for coordination in project design, development and operation.

12. Uttarakhand, a young state created in 2000 from the hill regions of Uttar Pradesh, faces its own unique challenges in advancing hydropower development. Of its estimated hydropower potential of 18,000 MW, the state has developed only about 18 percent, most of which was developed before the state was created.⁷ The state is in the process of forming the institutions and capacity needed to manage its complex hydropower development program. The development that was launched in the early 2000s, when the state issued licenses for dozens of projects on several rivers, has strained the state's capacity to supervise environmental management and pollution control and to implement catchment area treatment plans.

13. As more projects advance to the construction stage in Uttarakhand, there is an increasing awareness, in government and in the public at large, of the extent of the challenge of coordinated development and of the need for a more informed understanding of the likely cumulative and induced impacts of large-scale hydro development. In the public discourse over hydropower development in Uttarakhand and, more generally on the national level in India, the question of ensuring adequate river flows downstream of dams has emerged as a particular concern.

14. GOI has taken the lead in assessing these aspects of river development. In April 2011, the first comprehensive cumulative impact assessment of hydropower development on the Bhagirathi and Alaknanda rivers, which together form the Ganges, was completed. MOEF, which commissioned the cumulative impact assessment, is in the process of formulating guidelines and recommendations which are expected to include revisions to the environmental flow requirements and possibly other conditions that will apply to all projects. Generally, GOI has assumed a more prominent role in the development and management of the Ganges river system following its decision to grant the Ganges the status of a "national river" and to create the National Ganga River Basin Authority (NGRBA) which was notified in February 2009.⁸ The NGRBA has launched a River Basin Planning Study for the entire Gangetic basin; once completed this is expected to provide some guidance to the river planning and coordination on the tributaries of the Ganga, including the Alaknanda on which the proposed project is located.

⁷ The comparable statistic for Himachal Pradesh, which has approximately 19,000 MW of hydropower potential, is about 33 percent. Himachal Pradesh is the leader among India's hydro states, with more developed institutions and policies pertaining to hydropower.

⁸ The modalities of the functioning of this high-level institution are currently being worked out. In May 2011, the Bank's Board approved the National Ganga River Basin Project which will help operationalize NGRBA's Central and state-level institutions needed to plan and manage the Ganga clean-up program; the project will also finance demonstration investments to reduce point-source pollution in a sustainable manner.

15. **THDC India Limited (THDC)**⁹. Created in 1988 to develop, operate and maintain the Tehri Hydro Power Complex¹⁰ on the Bhagirathi River in Uttarakhand, THDC is now a company in transition towards becoming a major hydropower developer in India. Since commissioning the Tehri Dam and Hydropower Project in 2006, the company has embarked on an ambitious expansion program that will double its present operating capacity of 1400 MW by 2016-17, with another 4,700 MW to follow in later years. The proposed project would be the Bank's first operation with THDC.

16. In addition to the internal impetus to strengthen its institutional capacity emanating from its expansion plans, THDC's transition is being shaped by the increasingly demanding business and regulatory environment in which the company operates. . The company recognizes the need to strengthen its capacity in some technical areas and to meet evolving requirements in such areas as benefits-sharing, local area development, resettlement and rehabilitation, and cost and contract management.

17. THDC's management recognizes that in order to adapt and thrive in the increasingly competitive power market, the company must acquire new skills and areas of expertise, and enhance its existing core competencies. The company has prepared a *Corporate Plan to 2017* and a *Strategy for Capacity-building and Institutional Strengthening* that is based on significant recruitment in the coming years, reform of operating policies and procedures including human resources policy, and a program of training and capacity-building. THDC has commissioned year-long training programs in rock mechanics, environmental management and social management from leading institutions in India and the first batch of trainees will soon be graduated from these programs.

18. In October 2009, GOI granted "Mini-Ratna Category I" status to THDC which allows it broader autonomy over investment decisions, establishment of joint ventures, human resources issues, etc. The Mini-Ratna status is granted to public corporations that satisfy certain management and performance and profitability criteria.

B. Rationale for Bank involvement

19. The project is consistent with the overarching CAS objective to help India achieve the long-term vision (encapsulated in the 11th Five-Year Plan) of a country free of poverty and exclusion and with the role of the equitable provision of basic services in achieving this vision.

20. The proposed project was identified in the Country Strategy (CAS) for FY 2005-08, which called for a role for the Bank in financing investments in hydroelectric generation that can be developed with limited social and environmental impacts. It is also included in the lending program identified in the current CAS (FY 2009-12), which reiterates the Bank's commitment to helping improve the performance and sustainability of hydropower and other infrastructure

⁹ Before November 6, 2009, the company was known as the Tehri Hydro Development Corporation Limited.

¹⁰ The Tehri Hydro Power Complex consists of the 1000 MW Tehri Dam and Hydropower Project, a multi-purpose storage project (in operation); the 400 MW Koteshwar HEP (two units commissioned, two units to be commissioned by March 2012); and the 1000 MW Tehri Pumped Storage Plant (under development), which will utilize the Tehri and Koteshwar reservoirs as the upstream and downstream reservoirs.

projects. Given the limited scope for participation of the private sector in hydropower development, Bank support to public hydro projects is particularly important.

21. The 2005-08 CAS also gave a central emphasis to enhancing government effectiveness. In the context of India's hydropower sector, this emphasis finds expression in the Ministry of Power's (MOP) desire to build the capacity of the public sector hydro companies, to bring them to the level of top-performing public companies in the power sector, like POWERGRID and NTPC Limited. MOP requested the Bank to partner with THDC to strengthen its capacity and systems to become a leading hydropower company. The objectives for Bank involvement in this project are thus to: (i) help increase generating capacity in tandem with support to GOI programs to improve performance of the distribution and transmission sectors; and (ii) help the hydropower sector to move towards international best practice with respect to technical, environmental and social practice.

22. The Bank's proposed support of Vishnugad Pipalkoti HEP (VPHEP) on the Alaknanda river in Uttarakhand, together with its support of the Rampur HEP (approved by the Board in September 2007) on the Sutlej river in neighboring Himachal Pradesh¹¹, provide an opportunity for informing the hydro policy dialogue and practice in hydro development in the two states slated to host a significant share of India's hydropower development in coming years. Cascaded hydropower systems will be developed on the two river basins in question, which will create a need for effective project execution capacity in the broad context of a holistic, coordinated approach to river basin planning and development.

23. The Bank's engagement in this important infrastructure program is enhanced by technical assistance that has been provided in parallel with project finance. The River Basin Development Optimization Study (requested jointly by the Government of Uttarakhand and the Government of Himachal Pradesh) was completed in 2007 with a grant from the Public-Private Infrastructure Advisory Facility. Ongoing activities include studies of good practice in the implementation of hydropower projects in India, Nepal and Bhutan, and of private sector participation in hydropower development in India. In addition, at the request of the Government of Uttarakhand, the Bank is preparing a state economic report which is providing an opportunity to deepen the policy dialogue in areas of central relevance to Uttarakhand's economy, including hydropower.

C. Higher level objectives to which the project contributes

24. The proposed project contributes to several higher level objectives: (i) inclusive economic growth and human development; (ii) demonstration of a model of large-scale infrastructure project development that incorporates recent advances in the understanding of sustainable development; and (iii) providing support to the Government's low-carbon growth strategy, which has to some extent been hampered by the implementation problems of large hydro projects.

¹¹ The Rampur HEP is being developed by Sutlej Jal Vidyut Nigam Ltd. (SJVNL), with which the Bank originally partnered on the 1500 MW Nathpa Jhakri Hydro Electric Project.

II. PROJECT DESCRIPTION

25. Vishnugad Pipalkoti Hydro Electric Project is designed as a 444 MW run-of-river hydropower generation scheme on the Alaknanda River in Uttarakhand, India. The major features of the VPHEP project infrastructure are: a 65-meter-high diversion dam; a 13.4-km headrace tunnel; an underground power house; and a 3-km tailrace tunnel that will return the diverted water to the Alaknanda River. The major project infrastructure will be located on the right bank of the Alaknanda River (opposite National Highway 58) in Chamoli District of Uttarakhand. VPHEP is expected to reduce greenhouse gas (GHG) emissions by approximately 1.6 million tons per year over the plant operation period.

A. Lending instrument

26. THDC has chosen to denominate the loan in USD. THDC has opted for the variable spread option for this loan.

B. Project development objective and key indicators

27. The objectives of the Project are: (a) to increase the supply of electricity to India's national grid through the addition of renewable, low-carbon energy; and (b) strengthen the institutional capacity of THDC with respect to the preparation and implementation of economically, environmentally and socially sustainable hydropower projects. The key performance indicators cover technical, social and environmental aspects of project implementation and are detailed in Annex 3.

C. Project components

28. The total estimated project costs are USD 922 million, as detailed in Table 1 (below). The Bank-funded components are: (i) construction of the Vishnugad Pipalkoti Hydro Electric Project (US\$ 638 million, Bank-funded portion); and (ii) technical assistance for capacity building and institutional strengthening at THDC (US\$ 10 million, Bank-funded portion).

29. With respect to the construction of VPHEP, IBRD funds will be used to finance the two main contracts under which the project will be built, the Engineering-Procurement-Construction (EPC or "turnkey") contract for civil works and hydro-mechanical equipment, and the electro-mechanical contract. In addition, IBRD funds will finance the Design Review Consultant who, in addition to design review functions, will advise and assist THDC in the execution of its project management functions and provide associated training to THDC officers during implementation of the project. Other project components typically associated with hydropower projects (land acquisition, environmental management, small-scale infrastructure works; etc.) will be financed by THDC. Project costs are detailed below and in Annex 5.

30. Technical assistance will be based on THDC's *Corporate Plan to 2017* and its strategy for capacity-building and institutional strengthening (CBIS), and will build on THDC's on-going human resources development program and specific training initiatives that were launched under the Policy and Human Resources Development (PHRD) grant for project preparation that was provided by the Government of Japan. The CBIS component will be based on an initial

benchmarking and capacity-gap analysis that will be carried out by a consulting firm, and a CBIS Plan developed on the basis of the initial diagnostic.

D. Project Costs and Financing

Table 1. Project Costs

Project Cost By Component	Total (USD mln)
Component 1: Vishnugad Pipalkoti Hydro Electric Project	
Major civil works including hydro-mechanical equipment	417.00
Electro-mechanical equipment	156.00
Rehabilitation & Resettlement	34.00
Environmental Mitigation Plan	22.00
Establishment and other enabling work	110.00
Total Baseline Cost excluding IDC	<u>739.00</u>
Physical and price contingencies	86.00
Interest During Construction	87.00
Total Component 1	<u>912.00</u>
Component 2: Capacity-building and Institutional Strengthening	10.00
Total Project Costs	<u>922.00</u>

Table 2. Financing

	Total (USD mln)
THDC (equity contribution)*	274.00
IBRD	648.00
Total	<u>922.00</u>

* To be financed 50% through THDC internal resources and 50% from GoI and GoUP.

E. Lessons learned and reflected in the project design

31. The project design reflects the experiences and lessons learned from hydropower projects worldwide as well as in India, including the Bank-funded Nathpa Jhakri and Rampur HEPs. These lessons have in common the objectives of avoiding costly delays in project preparation and implementation, improving social and environmental practice in hydropower development and enhancing the long-term sustainability of the projects.

- (a) **Procurement strategy:** On the basis of its experience in constructing the Tehri Dam, which required the management of dozens of contracts, THDC was originally inclined to construct VPHEP under a single EPC contract. Upon consideration of the poor international experience with the application of this model to hydropower projects, and the unwillingness of reputable contractors to assume joint and several liability for all

project components under a single joint-venture, THDC decided to construct the main part of project on the basis of two EPC contracts, one for civil works and hydro-mechanical equipment, and one for electro-mechanical works, with suitable arrangements for the interface between the two contractors and for the allocation of risks. This procurement packaging has made it possible to reduce the number of packages to the minimum practicable level while encouraging international competition.

- (b) **Pre-qualification of bidders:** In the past the Bank tended to enter projects when the pre-qualification process was well underway or completed, sometimes leading to the need to eliminate contractors who had been pre-qualified. In this case the Bank was involved from the beginning of the process, and was able to work with THDC to ensure that rigorous technical and financial pre-qualification criteria were employed. This helped avoid the risk of an applicant claiming the experience of a parent or subsidiary company for complex works that the applicant does not in fact possess.
- (c) **Risk allocation:** Suboptimal allocation of risks between owners and contractors has been at the core of contract disputes that have plagued hydropower projects in the past, leading to significant cost and time overruns. For VPHEP, a detailed Risk Register has been prepared that appropriately allocates risk to the parties to the contract who will be best able to assess, cost and manage that risk. An essential component in this has been the preparation of a Geo-technical Baseline Report (GBR), the first of its kind for a hydropower project in India. The GBR provides a baseline of information, as distinct from the past practice of forcing bidders to make their own interpretations of the data provided, thus reducing the potential for disputes.
- (d) **Contract management:** Good contract management is critical to managing project implementation and avoiding time-consuming and costly delays. During the course of project preparation, more than 80 THDC officers received training in project management from an accredited institution in this field, and the Bank provided a workshop on aspects of contract management. Using loan proceeds, THDC will engage a Design Review Consultant (DRC) who, in addition to design review functions, will assist THDC in the execution of its project management functions including assisting with coordination between the EPC contractors and helping to resolve interface issues that may arise during implementation of the project.
- (e) **Sediment handling:** High sediment load is one of the most intractable operational problems of hydropower plants on Himalayan rivers. The sediment erodes the turbine runners and other mechanical parts, greatly reducing generation efficiency. A *Sediment Handling Optimization Study* which was carried out for VPHEP allowed THDC to optimize its design of this crucial feature. . Further studies will be carried out during the implementation phase to define optimal operating procedures.
- (f) **Environmental management.** The experience in environmental management gained from the Bank's engagement in hydropower in India and in other countries has been incorporated in the project. A plan for strengthening THDC's environmental management capacity has been incorporated into the EMP and is already under

implementation. The strong emphasis during project preparation on coordinating the technical, environmental and social aspects of the project led to a number of design revisions to mitigate the negative environmental and social impacts of the project, including relocating major project infrastructure. During the course of project preparation, the project design was significantly revised to incorporate a higher downstream flow requirement that was imposed by the Government of India¹². During implementation, THDC will monitor river flows on a monthly basis, and will carry out a study of aquatic sustainability and downstream flow requirements.

- (g) **Need for adequate resettlement planning, consultation and monitoring.** While project-related land acquisition is not extensive and the project will cause only a low level of involuntary displacement of people, considerable emphasis has been placed on the assessment and mitigation of social impacts in the courses of project preparation. THDC has strengthened its capacity to assess and manage social impacts through creation of a dedicated social unit and hiring of professional social workers who are posted at site. THDC has also engaged a reputed NGO whose staff speaks the local language, Garhwali, to facilitate the implementation of the Resettlement Action Plan.
- (h) **Need for effective, ongoing communications with stakeholders:** One of the most important lessons from past Inspection Panel cases is that infrastructure projects in general and hydropower projects in particular require early and continuous communication between the implementing authorities and all other stakeholders. In this way the benefits of the project can be widely understood and both real and perceived concerns of stakeholders can be taken into account. This in turn contributes to better design and sequencing of the project, greater stakeholder support for it, and smoother implementation. THDC and the Bank have taken cognizance of this factor, and have worked together to ensure that effective and credible two-way channels of communications are set up between the VPHEP project authorities and stakeholders, especially focusing on project-affected people. Over the last three years, THDC has conducted wide-ranging and detailed consultations with project-affected communities as part of its project preparation process. As of March 2011, some 109 formal consultation sessions; five project-wide public meetings; 11 meetings focused on environment issues; and innumerable informal meetings with project-affected persons have been held during project preparation.

F. Alternatives considered and reasons for rejection

32. As described above, the Government of India has identified the development of the power sector as a national priority and has placed an emphasis on the accelerated development of the country's unexploited hydropower potential while ensuring the sustainability of this development. In the context of a chronic power deficit and India's development imperative, the "no project" alternative would yield negative results. Given these development priorities, and given the physical and technical attributes of cascaded hydropower development, the appropriate

¹² The revised flow requirement represents a more than 5-fold increase, from 3 to 15.65 cubic meters per second (cumecs).

level of analysis of alternatives thus pertains to site selection and the location of the major components of the project infrastructure.

33. The Vishnugad Pipalkoti HEP was originally identified in 1984 in a national exercise to reassess the country's hydro potential¹³ and an Identification Report was prepared in this year by the Uttar Pradesh Irrigation Department. At that time, various alternatives for the development of the project were considered.

34. The Identification Report (1984) considered the construction of a 202-meter-high concrete gravity dam at Pipalkoti. This location and dam height were rejected for the following reasons: (i) realignment of 20-30 km of National Highway 58 would have been required; (ii) Pipalkoti town as well as five to six villages would have been submerged; (iii) a major fault line is located nearby; (iv) the presence of two rock formations in the dam foundation through which leakage was anticipated, and the presence of a significant landslide-prone area on the left bank in the proposed reservoir which would have been activated after being filled with water; (v) concern over the possibility of significant submergence of forest land and damage to flora and fauna in the area. The Identification Report also considered an alternative location of the barrage; an alternative location for the power house; and a surface power house at the village Haat (compared to the underground power house of the final design).

35. After the project was allocated to THDC in 2003, THDC investigated other options for the location of the barrage and the dam (detailed in Annex 10). More recently, an important design revision has been made in consideration of social concerns that emerged at the village Haat, the site of the power house, resulting in the relocation of project infrastructure.

III. IMPLEMENTATION

A. Institutional and implementation arrangements

36. As the developer and operator of the Tehri Dam Project, which is a larger and technically more complex project than the proposed project, THDC has acquired the technical and managerial capacity needed to implement and operate VPHEP. THDC will be responsible for project implementation and operation, with support in some areas (catchment area treatment, land acquisition and R&R compensation) by the relevant agencies of GOUK on the basis of a Memorandum of Understanding signed in 2003 and an Implementation Agreement signed in 2006. THDC has prepared a comprehensive Operations Manual that details project implementation procedures and arrangements. A dedicated General Manager based at site has overall authority for the project and heads a team at site that includes technical, procurement, financial and safeguards specialists. THDC corporate units support the project as required. Land acquisition will be completed before the commencement of civil works in a given area and the Catchment Area Treatment Plan will be implemented in the context of the state's reforestation program. The project team at site will be responsible for implementation of the Resettlement

¹³ The first comprehensive study to assess India's hydropower potential was undertaken over 1953-59. This study placed the economically viable hydropower potential of the country at 42,100 MW at 60 percent load factor. Reassessment studies carried out over 1978-87 placed the hydropower potential at 84,000 MW at 60 percent load factor.

Action Plan (RAP) and those parts of the Environmental Management Plan (EMP) not covered by the state government. THDC has engaged a reputed NGO to facilitate the implementation of the RAP. A Design Review Consultant that will be engaged with project proceeds will assist the VPHEP team in the implementation of the project.

B. Monitoring and evaluation of outcomes/results

37. THDC has prepared a comprehensive monitoring, evaluation and reporting system for VPHEP that is described in the Operations Manual. Annex 3 sets out the key performance indicators for the project. THDC will provide to the Bank quarterly progress reports, quarterly information on the progress of key performance indicators, billing and collections, quarterly unaudited financial reports and annual audited financial statements (within six months of the end of each financial year), and other information as the Bank may reasonably require. THDC will also carry out a mid-term review and report its findings and conclusions to the Bank, and will review these with the Bank. The Bank's implementation support will be based on an anticipated two to three supervision missions annually, supplemented by visits in specific areas as needed. As part of the agreed Governance and Accountability Action Plan (GAAP), independent parties will be engaged for third-party monitoring of the implementation of the RAP and the EMP.

C. Sustainability

38. The sustainability of investments and technical assistance to be financed under the project is expected to be high, given the likelihood of continuing high demand for reliable power supply in the northern region of India. It is expected that the power generated by VPHEP will be fully dispatched as PPAs have already been signed for the project's output and the value to the power system of hydropower capacity will remain high (due to the ability of hydropower projects to respond rapidly to fluctuations in demand). THDC has developed good expertise during the operation of the Tehri Dam, and has been running the power plant profitably for more than four years.

39. A challenge for THDC will be to ensure that it has the necessary manpower and skills to implement and operate VPHEP while it is simultaneously undergoing rapid transition and growth, and developing several other projects. The company is responding to this challenge by recruiting new staff and embarking on a comprehensive capacity-building and institutional strengthening program.

40. The threat to the project's sustainability that could be posed by the failure of its state utility customers to pay their bills in full and on time has been effectively mitigated by the securitization mechanism introduced by GOI which has brought about a substantial improvement in payment discipline in the sector. In addition, as per the recent Rebate Policy (2011-2014), the purchasing entities have to deposit a Letter of Credit (LC) equivalent to 105 percent of average billing over the previous 12-month period. This ensures timely payment by the purchasers of the power.

D. Critical risks and possible controversial aspects

41. Hydropower projects are generally associated with significant geological, hydrological, contractual, social and environmental risks. Relative to other hydropower projects of this size, VPHEP is a relatively low-risk project from a social and environmental perspective, involving a low level of involuntary displacement and no submergence of significance. The project's small daily pondage will submerge a small amount of unused government land. Geological and contractual risks will remain high even after the mitigation efforts incorporated into the project design. The constraints in the capacity of the state government of Uttarakhand to plan and regulate hydro development in the state also represent a risk, although most activities that depend directly on the state will have been completed before the commencement of the main construction activities. The Catchment Area Treatment Plan, which is carried out by the State Forest Department, will remain as a risk during the course of project implementation.

42. A possibly controversial aspect of VPHEP is the project's location in the Alaknanda Valley, through which a major pilgrimage route leads to shrines at the top of the valley (no religious sites of significance are located in the project area). The cumulative impact assessment recently completed by GOI considered this aspect and concluded that religious and related aesthetic needs can be addressed through the imposition a higher minimum flow requirement. Moreover, one large project is already in operation and two other large projects are under construction in the Alaknanda Valley, and these have faced no opposition of this nature. Table 3 below gives an overview of the risks faced by VPHEP and the mitigation measures undertaken and planned by THDC and, as appropriate, the Bank team.

43. In addition to the risks of engagement, there are significant risks of non-engagement. India needs electricity to support its aspirations for economic and human development. Alternative fuel supply options are relatively limited and all involve difficult trade-offs. A decision not to develop the Alaknanda River for hydropower would necessitate development of another fuel source for electricity generation; India's options in this respect are dominated by coal. In addition, a decision against hydropower development would also mean foregoing the benefits of regional and local development offered by hydropower.

Table 3. Vishnugad Pipalkoti HEP: Risks and Mitigation Measures

<i>Risk factors</i>	<i>Description of risk</i>	<i>Rating of risk</i>	<i>Mitigation measures</i>	<i>Rating of residual risk</i>
Sector Governance, Policies and Institutions				
Sector Specific Risks (Hydropower)	Sector governance, policy and institutional risks	Low (technical / economic regulator functional, GOI hydro policy exists)	In the course of its normal support to the Government of India/Ministry of Power, the Bank will continue to support the development of sector policy and sector institutions.	Low
State Government of Uttarakhand Implementation Risk	Limited capacity of the State Government to plan and coordinate hydropower development could impact project implementation. Certain aspects of project implementation for which the State Government is responsible will remain risks during course of project implementation.	Significant	(i) Completion prior to Board presentation of major areas of project implementation where State Government plays a role (e.g. land acquisition); (ii) Bank has provided TA to State Government on coordinated river basin development and cumulative impact assessment; (iii) Ongoing engagement with State Government through Uttarakhand Economic Report and hydropower dialogue.	Moderate
Entity-level risks				
General – Project management capacity	THDC's overall project management capacity may be stretched as a result of the company's significant expansion program reflected in its growing pipeline of projects.	Substantial	(i) Training in priority areas funded by PHRD grant for project preparation, including project management (ii) Continued implementation of THDC's capacity-building and institutional strengthening program, including social, environment, technical (completed) and with support from the Bank loan. (iii) On-going recruitment of new technical and other professional staff. (iv) Outsourcing skills not well represented in company, e.g. engaging NGO to facilitate RAP implementation.	Moderate
Financial risk	Risk to THDC's financial position arising from significant capital expansion program. Disaggregated, this risk includes implementation (new projects may be delayed, operational projects may not deliver as planned) and regulatory risks (possible change in regulatory regime).	Substantial	(i) Continued implementation of capacity-building program; (ii) Continued induction of new staff; (iii) Training in financial modeling to understand company's financial position under different project mix and regulatory scenarios.	Substantial
Operation-specific Risks				
A. Technical				
Sedimentation	High sediment load of Alaknanda will erode the	High	THDC carried out a sediment handling study to optimize the configuration of the sediment handling	Substantial

<i>Risk factors</i>	<i>Description of risk</i>	<i>Rating of risk</i>	<i>Mitigation measures</i>	<i>Rating of residual risk</i>
	turbine runners and other mechanical parts, reducing generation efficiency. There may also be sudden increase in sediment load due to release from upstream HEPs.		arrangements. During the implementation phase additional studies will further define optimal operating procedures, taking into account the sediment flushing schedule of upstream HEPs.	
Geological	Geological risks (inherent in any hydro project and of particular concern given the geological variability of the Himalayas)	High	Under guidance of an international expert, THDC prepared a Geo-technical Baseline Report (GBR) which provides a baseline of information, as distinct from the past practice of forcing bidders to make their own interpretations of the data provided, thus reducing the potential for disputes.	Substantial
Seismic	The project is located in an area of high seismicity.	High	Detailed seismic analysis was carried out in the course of project preparation. The project design has been cleared by the Indian National Committee on Seismic Design Parameters and has been reviewed by the international Panel of Experts/Dam Safety who gave additional guidance on aspects of the design.	Substantial
Tunnel Boring Machine	TBM may fail to advance / get stuck	Substantial	THDC has prepared a contingency plan based on advice from Panel of Experts in case TBM gets stuck. (D&B equipment will be mobilized quickly, access roads to contingency adits being constructed as fallback option, etc.)	Moderate
Hydrology	Changes in assessed hydrological flows could impact the project economics	Substantial	THDC conducted additional analysis based on hourly flow data made available by the upstream operator which confirmed the estimates of the power generation expected from the project.	Moderate
Climate change N.B. Given the paucity of reliable data there are great limitations to understanding the possible impacts of climate change on hydropower projects.	Three credible possible impacts of climate change appear to be (i) increased hydrological variability; (ii) increased occurrence of extreme weather events, such as flooding; (iii) increased or changed patterns of sediment load in the river.	High	The limitations in the understanding of the likely impacts of climate change have concomitant effects on the measures to mitigate the possible risks (e.g. there is no credible basis for re-optimizing project size in anticipation of secular changes in hydrology). In general, those impacts that can be credibly postulated are in effect manifestations of known risks; these have been taken into account in project preparation including in the economic analysis.	High
B. Implementation capacity				
Contract management	Risk of disputes with contractors leading to cost- and time-overruns	High	(i) Detailed Risk Register prepared (first of its kind in hydropower in India); (ii) Bid documents' design reflects equitable allocation of risks; (iii) GBR prepared that provides baseline of geological information common all to bidders; (iv) 80 THDC officers trained in project management and more training planned.	Substantial
Financial management	Certain aspects of corporate governance and financial	High	An action plan for improvement of corporate governance and financial accountability has been agreed	Substantial

<i>Risk factors</i>	<i>Description of risk</i>	<i>Rating of risk</i>	<i>Mitigation measures</i>	<i>Rating of residual risk</i>
	accountability require upgrading to bring functioning in line with the size and operations of the company.		for implementation during supervision. Some actions have already been completed and others initiated and further action is required to reduce residual risks; internal financial reporting systems of THDC will be enhanced.	
Procurement	Limited knowledge of Bank procurement procedures as this is THDC's first Bank loan; consequent risk of procurement delays or other shortcomings.	Substantial	(i) Close supervision by the Bank; (ii) THDC contracts officers have received training in Bank procurement procedures; (iii) Bid documents for main EPC contract issued to pre-qualified bidders.	Moderate
Social and Environmental Safeguards Management Capacity	Limited capacity to manage social and environmental aspects of project implementation, with attendant risks of complaints, protests, delays	Substantial	(i) Professional social workers and environmental specialists have been hired for project team and in corporate safeguards unit. (ii) Reputed regional NGO has been hired to facilitate RAP implementation. (iii) Training in social and environmental management has been provided and will be provided. (iv) Grievance redress mechanism has been established. (v) 3 rd party monitoring agreed for social and environmental management. (vi) Meetings of Environmental and Social Panel of Experts coordinated with technical Panel of Experts.	Moderate
C. Broad reputational risks				
Cultural-religious sensitivities associated with Ganga (Alaknanda is tributary)	As a tributary of the Ganga, the Alaknanda has a special significance. The project area contains no religious sites of significance but pilgrims travel through the Alaknanda Valley en route to important shrines at the Valley's head.	Significant	One project in operation and two projects currently under construction on Alaknanda have faced no issues of this nature, and broad consultations with stakeholders have indicated a shared understanding of the need for hydropower. Efforts to reduce this risk include: (i) Priority emphasis on good social and environmental management practices; (ii) Strong emphasis on consultations and on communications with stakeholders in project area, in state capital, etc. ; (iii) Sensitivity to the cultural concerns of the local community vis-à-vis the river, e.g. ensuring adequate river flow to allow rituals to be conducted at ghats/cremation ghats in project area.	Moderate
Negative attention from activists/ NGOs opposed to hydropower development in general	This remains a persistent risk for all hydropower projects	High	A well-prepared and sensitively implemented project remains the most effective risk-management measure in this context. Measures include: (i) Priority emphasis on good social and environmental management practices; (ii) Strong emphasis on consultations and on communications with stakeholders (PAPs, NGOs, civil society organizations, media etc) in the project area as well as in the state capital (iii) Emphasis on enhancing transparency and disclosure around the project, including the setting up of Project	Moderate

<i>Risk factors</i>	<i>Description of risk</i>	<i>Rating of risk</i>	<i>Mitigation measures</i>	<i>Rating of residual risk</i>
			Information Center at site; widespread sharing of project information and documentation; upgrading of website etc. (iv) Third party monitoring of implementation social and environmental activities.	

E. Loan/credit conditions and covenants

44. In addition to the standard Bank covenants on project and financial management, audit and reporting requirements, and procurement, the following are the key covenants under the project:

- i. **Financial**, except as the Bank shall otherwise agree, THDC shall:
 - a. furnish to the Bank, not later than six months after the end of each fiscal year, certified copies of its audited financial statements and Special Account Audit, and its auditors' reports of such scope and in such detail as the Bank may reasonably request;
 - b. not incur any debt, if after the incurrence of such debt, the ratio of debt to equity shall be greater than 4 to 1;
 - c. take all necessary steps to maintain its accounts receivable at a level not exceeding an amount equivalent to its billing for energy generation for the preceding three months;
 - d. furnish to the Bank, not later than December 31 of each year, its ten-year financial projections, including its investment program and financing plan;
 - e. furnish to the Bank, every three months, interim unaudited financial reports (IUFRs) in the format agreed with the Bank;
 - f. The Borrower shall continue to implement an action plan satisfactory to the Bank to improve corporate governance and financial accountability, which may be revised from time to time and, in addition, each Fiscal Year will prepare an internal audit report for the Bank-financed project and furnish this report to the Bank, together with details of actions taken to address the issues identified in such report, not later than four (4) months after the end of such Fiscal Year.
- ii. **Implementation**, THDC shall:
 - a. report on progress in project implementation with the key performance indicators and including an updated milestone plan for construction of the VPHEP, with any necessary measures to keep to the commissioning targets, according to the reporting schedule agreed with the Bank;
 - b. carry out the Governance and Accountability Action Plan as agreed with the Bank;

- c. retain a panel of dam safety experts throughout the project construction period in accordance with terms of reference acceptable to the Bank;
 - d. implement the Resettlement Action Plan and Environmental Management Plan as agreed with the Bank;
 - e. every month throughout Project implementation, undertake water flow measurements in the Alaknanda river at the following points: (i) upstream of the diversion dam; (ii) between 5-10 km downstream of the diversion dam; and (iii) 50-100 meters downstream of the outlet of the tail race tunnel; and shall report such information to the Bank;
 - f. carry out during Project implementation, a study aimed at enhancing the Borrower's adaptive management capacity for implementation of minimum flow requirements and mitigating impacts on aquatic ecology and wildlife in the stretch of the Alaknanda River under the Project;
 - g. carry out a Resettlement Impact Assessment study to assess the changes in the living standards of resident project-affected people before the mid-term review and in the fifth year of implementation. Agree with the Bank, and take action to address any issues raised by the impact assessment studies;
 - h. provide all the entitlements available in the resettlement action plan to the PAPs, as applicable, before beginning any construction activities on such land required for the project.
 - i. maintain and staff the Project Information Centre at Siyaisin and ensure that a trained PR professional is always posted at the project site.
- iii. **Mid-term review** - The mid-term review of the project is planned for September 30, 2014, assuming award of the main civil works contract by November 2011. In preparation for the mid-term report, THDC shall prepare a report on the status of the project.
- iv. **Completion** - THDC shall prepare as at the closing date: a project completion report; and a plan for the future operation of the project.

State of Uttarakhand - Project Agreement

45. Uttarakhand shall:
- i) Provide support as needed to facilitate the implementation of the Project, including timely provision of all required consents and approvals for implementing the project; and implement its part of the environmental, land acquisition, resettlement and rehabilitation, and community development activities.
 - ii) Notify the Bank and THDC of any decision by any regulatory body or agency of Uttarakhand that may have a material impact on the volume of water of the Alaknanda River that is available for electricity generation and, consequently, may materially impact the Vishnugad Pipalkoti Hydro Electric Scheme, no less than sixty (60) days before it is to take effect.

IV. APPRAISAL SUMMARY

A. Economic and financial analyses

46. ***Least cost development plan:*** VPHEP has been identified as a priority project for completion during the 12th Five-Year Plan (2012-2017). In 2001, the Central Electricity Authority (CEA) carried out a comprehensive study in which 399 hydropower schemes were prioritized based on ten proxy indicators for environmental impact, political risk, construction risk, and development lead time. Of 75 hydro schemes considered on the Ganga Basin in this study, 20 schemes including VPHEP were ranked under Category A (the most attractive ranking), with VPHEP appearing at the eighth position. In the course of project preparation, the estimated project costs increased as a result of additional investigations; THDC's decisions to mandate the use of a TBM and add a small HEP at the toe of the dam to utilize increased environmental flows; and increase the budgets for the EMP and the RAP; and price escalation. The increased environmental flow requirement that was issued by Government of India during the course of project preparation led to an increased cost per kilowatt-hour which is expected to be passed to consumers. The project remains attractive due to the peaking value and environmental benefits of hydro. The tariff in the first year of operation is expected to be about Rs. 4.61/kWh (10.5 US cents per unit), with a levelized tariff (assuming a discount factor of 12 percent) over the life of the project expected to be about Rs 4.38/kWh (9.9 US cents per unit).

47. ***Economic and financial rate of return:*** As estimated by the Bank, the financial internal rate of return (FIRR) for the project is 9.5 percent and the economic internal rate of return (EIRR) is estimated at 28 percent. The project remains attractive even in the event of considerably lower availability of water in the dry season. (For details, see Annex 9.)

48. ***Financial health of the implementing agency:*** The current financial performance of THDC is satisfactory. THDC started earning revenues in FY2007 when the first unit of the Tehri Dam Project started commercial production. Profitability during FY2009 (measured by return on equity after tax) stood at 10 percent. This was lower than the then regulated return of 14 percent allowed by the CERC due to the expansion program being undertaken by THDC. As per the revised tariff norms of CERC, the base rate of the regulated pre-tax return on equity has been increased to 15.5 percent with an incentive of an additional 0.5 percent if the project is completed on time. As a result of THDC's capital expansion program (several projects will be under development in the coming years), the return on equity is expected to drop to 11 percent in FY2015 and FY2016 and then to rise once the new projects, including VPHEP, start earning revenue. Financial projections (see Annex 9) demonstrate that, subject to tariff adjustments in line with CERC's current regulatory framework, THDC's financial performance will likely continue to remain satisfactory. The Tehri Dam Project achieved a capacity index of 86 percent during its first year of operation, which was above the normative 80 percent for storage schemes. Since then, THDC has outperformed the targets agreed with MOP for the availability of the plant. This is also the case with the targets for revenue realization. In FY2010, revenue realization was 100 percent against the agreed target of 95 percent. The possible financial risks are of THDC financially over-extending itself with too many new projects in the near future. There is also a (minor) risk of partial disallowance of capital expenditure of Tehri HPP from the project cost to be considered for tariff calculations by CERC. In addition, the company also faces the risk of change in the regulatory framework. Although the tariff for all new generation

projects, including public sector projects, is to be determined on the basis of competitive bidding as per the National Tariff Policy (2006), marking a shift away from the cost-plus regime, the specific application of this policy to hydropower plants is not yet clear. In any case, this change is unlikely to impact VPHEP as the PPAs have already been signed, but it could impact other projects in THDC's pipeline.

B. Technical

49. The project has been designed and will be implemented according to internationally accepted technical criteria and standards. The starting base of geological knowledge on the project has been greatly enhanced by additional investigations that were carried out in the course of project preparation, including the Geotechnical Baseline Report, which is the first of its kind in a hydropower project in India. In keeping with OP 4.37 "Safety of Dams", a Project Review Panel consisting of Indian and international experts has been formed and has reviewed the project design and has offered guidance on a number of points. In the course of project preparation, in response to concerns over possible impacts of blasting voiced by people in the project area, THDC decided to mandate the use of a TBM to drive most of the headrace tunnel. A contingency plan has been prepared in the event that the TBM should experience difficulties.

50. Pre-qualification has been completed for the civil works and hydro-mechanical equipment contract and bids were received from pre-qualified applicants on May 30, 2011. As of June 2011, evaluation of the applications for pre-qualification for the electro-mechanical equipment contract is underway.

C. Fiduciary

51. THDC has a financial management system which is adequate to account for and report on the project resources and expenditures accurately. During project preparation, an action plan for strengthening financial management, corporate governance and accountability has been agreed upon, of which some actions have already been completed such as induction of independent directors in the Board; constitution of an audit committee with independent directors with defined scope and coverage; actions initiated for further strengthening of internal audit function and developing capabilities for in-year financial reporting (details in Annex 7).

52. Project funds will be disbursed on the basis of interim un-audited financial reports (IUFs). THDC's systems are well equipped to generate IUFs which will report on the full project costs in the agreed formats. To meet the fiduciary requirements, the Bank will receive (i) a project audit report; and (ii) the entity audit report of THDC within six months of the end of the fiscal year. The project will be audited by an independent firm of chartered accountants, acceptable to the Bank, under terms of reference that have been agreed. An internal audit of the project will also be undertaken with the objective of ensuring that agreed operational, accounting, payment and procurement procedures are followed in the implementation of the project.

53. Procurement for the project will be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, revised

October 2006 and May 2010 and “Guidelines: Selection and Employment of Consultants by World Bank Borrowers” dated May 2004, revised October 2006 and May 2010.

54. The main project component, construction of VPHEP, will be completed through two EPC contracts, one for civil works and hydro-mechanical equipment, and the other for electro-mechanical equipment. The Bank’s latest SBD for “Procurement of Works under ICB” and “Procurement of Plant Design, Supply, and Installation” using ICB will be used for procurement of these contract packages. The Bank’s Standard RFP will be used as the basis for procurement of all consultancies under the project, including the Design Review Consultancy, which is under procurement, and the contracts under the Capacity Building and Institutional Strengthening Component.

D. Social

55. A Social Impact Assessment (SIA) for the project area was completed in April 2008. It included consultations with stakeholders, information on socio-economic and cultural features of the population, and baseline data on land acquisition impacts. These data were subsequently verified and updated through further consultations and have informed the development of measures to ensure that negative impacts are mitigated and that people receive benefits from the project.

56. OP 4.12 on Involuntary Resettlement was found to be triggered. THDC has developed a project-specific Resettlement and Rehabilitation (R&R) Policy which goes beyond the requirements of the National Resettlement and Rehabilitation Policy (NRRP) of 2007 and which together with the Resettlement Action Plan (RAP) establishes compliance with OP 4.12. The cut-off date for entitlements for losses caused by land acquisition was established as December 31, 2008, when data collection was completed for all affected villages, with the exception of Hatsari hamlet of Haat village where impacts were fully determined only in December 2009, following modifications to the project’s technical design. THDC has deployed a social mitigation team (a Senior Manager, Manager and two social workers), and has contracted a reputed regional NGO to assist with communication with the villagers, preparation and implementation of the RAP, and preparation of local development activities. In line with the NRRP, 2007, the state government has appointed the District Magistrate of Chamoli district as the Administrator and Commissioner for R&R, and established grievance redress arrangements.

57. As a run-of-river project, VPHEP has comparatively limited land acquisition impacts which affect a total of 1,481 families (5,294 persons) in 18 villages. The project will require a total of 141.5 ha of land comprising 31.6 ha of private land, 90.1 ha of government forest/grazing land, 10.3 ha of *van panchayat* land (community held grazing and forest land), and 9.5 ha of state land owned by the Public Works Department. The acquisition of private land affects 773 families in seven villages, while 708 families in the remaining 11 project-affected villages will lose access only to government forest/grazing and/or *van panchayat* land. Of the private land required, 60 percent is being acquired from willing owners in the village Haat, one of the seven affected villages, who expressed a desire to be relocated in light of the disproportional impacts of construction in their village, the site of the proposed powerhouse. The transfer of land and houses in Haat is based on land acquisition procedures to ensure complete recording of

ownership and on the compensation and assistance provisions in THDC's Resettlement and Rehabilitation Policy. A total of 265 families will have to resettle, and 92 percent of these are families from Haat who requested THDC to acquire their land.

58. A total of 242 families from Haat offered their land (amounting to 18.67 ha) and houses to THDC for acquisition. Of the 136 households whose houses are acquired, 95 reside in the village and are entitled to the grant of INR 1 million that THDC provides to households that chose to resettle on their own. Eight households (11 families) in the hamlet of Hatsari opted not to relocate. In view of this, in order to limit the land acquisition impacts on Hatsari, THDC shifted the location of the switchyard from land in the hamlet to already acquired government forest land, and also realigned an access road. The land acquisition impacts on the 8 households were reduced to 1.36 ha as a result of which the total amount of private land to be acquired in Haat is 20.03 ha.

59. A total of 11 villages lose access to an average of 2.5 percent of the government forest land that they use at present for grass collection and grazing, and a total of eight villages lose access to an average of 0.9 percent of the *van panchayat* land they use for collection of grass and firewood. Of these villages, three lose access to both government forest and *van panchayat* land. About 90 percent of village households use *van panchayat* and/or government forest land for collection of grass for livestock fodder or for collection of firewood. All households in the affected villages will receive compensation equivalent to 100 days of minimum agricultural wages (INR 100/day) for a 5-year period, which would provide supplementary income until re-plantation of fodder and trees on vacant government forest and *van panchayat* land have matured.

60. **OP 4.10 on Indigenous Peoples** was not found to be triggered, as there is no village with a Scheduled Tribe community in the project-affected area. The population in the project affected villages is predominantly Hindu general castes (about two-thirds) and scheduled castes (one third). Twelve Bhotia families living in the project area migrated from the upper reaches of the Alaknanda Valley 15 years ago. The Bhotia families are Hindus, do not speak a separate language from that of the majority population (Garhwali and Hindi), nor do they have political institutions that separate them from the majority population. They do not have a historically based collective attachment to the land in Haat or any customary rights to forest and grazing land, and some continue to own land in their home area.

61. **Non-land acquisition impacts:** People in the project-affected villages as well as those in the non-affected villages situated on the mountain above the head- and tailrace tunnels have expressed concern over the possible impacts on their houses and property of blasting or blasting-induced landslides during construction and/or soil subsidence after construction of the tunnel. To address these concerns, THDC: (i) has commissioned a study by the Department of Earth Sciences, IIT Roorkee (which was disseminated to the concerned villagers in local language in December 2009); (ii) has mapped and measured all water sources to enable assessment and mitigation of any future decrease in water availability caused by project construction activities; (iii) will insure houses along the alignment of the HRT to cover such impacts (which are not anticipated); and (iv) will establish a baseline of the current condition of all habitations against

which damage assessments can be made. The decision to use a tunnel boring machine has significantly reduced the need for blasting to drive the headrace tunnel.

62. **Development impacts:** Although the project causes adverse impacts, it will also bring positive benefits to the local population. Two categories of local development funds will be available: (i) dedicated funds of INR 310 million that will be used for the 18 affected villages over five years during the construction period; and (ii) as recommended by the National Hydro Policy, one percent of the power generated by the project (or the monetary equivalent) will be made available for local development activities in a wider area comprising both directly and indirectly affected communities after the commissioning of the project. For the first category, investment plans will be prepared by the communities. Civil works will be carried out by contractors or by the *gram panchayats* with monitoring by the beneficiary community. In addition, during the construction period, contracts for small civil works will to the extent possible be given to eligible PAPs. THDC will also provide 100 kWh of free electricity per month from VPHEP for a period of 10 years to affected households. In addition to the project-specific R&R Policy and RAP, THDC has adopted a Corporate Social Responsibility Policy for the implementation of Community Development scheme. The scheme will finance community development in the vicinity of operating stations where construction has been completed and rehabilitation and resettlement issues addressed. Meanwhile, THDC, in consultation with the project-affected communities in the VPHEP area, has identified certain community development activities and is implementing them through separate corporate funding. In order to implement the activities, THDC has established an NGO which is responsible for finalization of activities, funding and monitoring of the utilization of funds and creation of community assets.

E. Environment

63. Prior to the Bank's engagement in the project, THDC commissioned an environmental impact assessment and environmental management plan, with base line surveys covering the period from October 2005 to April 2006. Subsequently, THDC commissioned additional studies in the area of terrestrial biodiversity, managed river flows and archeology in order to enhance the original analysis. The supplementary studies involved additional detailed field investigations and community consultations over the period April 2008-May 2009. The original environmental assessment and the additional environmental studies have been integrated into a consolidated Environmental Assessment and Environmental Management Plan (EA/EMP).

64. **Environmental Impacts.** Primary and secondary source data collection was conducted to understand the present status of the environmental resources in the project area. The study was conducted in the project-affected area (where land is to be acquired), in the immediate project-affected area (500 meters on either side of project infrastructure), and in the project influence area (7 kilometers around the project infrastructure). The EA analyzed the impacts of the project on (a) forests, due to felling of trees and diversion of forest land for the project; (b) terrestrial biodiversity, due to impact of the project activities on flora, fauna, aquatic, fish and other wildlife; (c) water quality, availability and river flow changes; (d) muck generation and disposal; (e) river bed utilization and downstream impacts; (f) health and safety of community, labor and staff; (g) archeological, cultural and religious properties; and (h) construction-related

impacts. The identified impacts can be fully managed by implementation of the environmental management plan, which is included in the EA. Details are provided in Annex 10.

65. **Impacts on protected areas:** The project lies in the vicinity of, but outside, two protected areas. The eastern boundary of the Kedarnath Wildlife Sanctuary, which was established primarily as a sanctuary for the Himalayan Musk Deer, falls in the valley adjacent to the Alaknanda River Valley. The distance from this boundary to the nearest surface project infrastructure, the diversion dam, is approximately 5.2 kilometers “as the crow flies”; the terrestrial distance is somewhat greater as a result of the steep valleys that are characteristic of this region. It is expected that the impact on wildlife from the sanctuary will not be significant given that: (i) movement of wildlife from the adjacent valley to the Alaknanda Valley is limited by the sheer walls of the valleys; (ii) there is no acquisition of land within the Sanctuary; (iii) major project infrastructure such as the powerhouse and the headrace tunnel are underground; and (iv) the use of a tunnel boring machine will mean that there is minimal disturbance to geological and soil strata. Mitigation measures for impacts on wildlife have been incorporated in the EMP and will be revised as needed on the basis of monitoring.

66. The project dam site touches on the boundary of the transition zone of the Nanda Devi Biosphere Reserve, a UNESCO World Natural Heritage Site. The core zone of NDBR has an area of 712 sq. km and includes two national parks. The buffer zone has an area of 5,148 sq. km. and surrounds the core zone. The buffer zone, in turn, is surrounded by the transition zone with an area of 584 sq. km. The core zone is at a distance of 37 km from the VPHEP dam site. Impacts on NDBR are expected to be insignificant. The only impacts on the transition zone are likely to occur during the construction of the dam, when the dust and noise levels in the area are likely to increase. However, as noted in the EA, this impact will be intermittent, temporary and localized. A budget of Rs. 44 million has been allocated to benefit catchment area treatment and afforestation in the NDBR.

67. **Environmental Management.** The EMP was developed based on the EA including the additional studies undertaken during the preparation of the project. The EMP addresses the various issues identified in the consolidated EA through various action plans to be carried out during the pre-construction, construction and operation stages. These plans include: a Biodiversity Management Plan, Catchment Area Treatment Plan, Muck Disposal Management Plan, Fishery Management Plan, Greenbelt Development Plan, Soil Erosion and Sediment Control, Quarry and Borrow Area Management, Solid Waste Management, Management Measures for Road Construction, Construction Camp & Construction Workers, Public Health Delivery System, Environmental Monitoring Plan, ISO 14001 Management System. The implementation and monitoring arrangements required for environmental management in the project are detailed in Annex 10.

68. **Disclosure.** The original EIA report (based on which regulatory clearance for the project was granted) was disclosed in 2006 before the formal public hearing, with assistance from the State Pollution Control Board. The revised updated EA/EMP and the RAP (including translation of the Executive Summaries in Hindi) is available in the Project Information Center at Siyasain, the offices of the affected *panchayats*, the office of the District Magistrate and in THDC’s corporate office in Rishikesh. These documents are also available on THDC’s website

www.thdc.gov.in. The availability of these documents was announced in local newspapers (both English and Hindi newspapers) on July 27, 2009. These draft documents were also disclosed in the Bank's InfoShop on September 14, 2009, and the final versions disclosed on 27 November 2009. THDC has undertaken extensive consultations on environmental issues. There were eleven focused consultations on environmental issues during the EA consolidation process alone; these are recorded in the EA. In addition, a project-wide stakeholders' public meeting was held on September 13, 2009, at Pipalkoti, where EA/EMP, RAP and project details were shared with project-affected communities and other interested parties. During the project preparation period THDC operated two PICs at Haat and Pipalkoti to allow the local community and other stakeholders full access to project information and a place to register their queries and concerns. With the construction of THDC's permanent project office, the two PICs were consolidated into one which is functioning at Siyasain; a detailed schematic project model is also placed for public display at this PIC.

69. MOEF commissioned a study of the possible cumulative impacts of the development of the Bhagirathi and Alaknanda River basins for hydropower that was completed in April 2011. On the basis of this study, MOEF raised the downstream flow requirement of the project from the 3 cubic meters per second (cumecs) that was stipulated in MOEF's environmental clearance of August 2007, to 15.65 cumecs. Additional environmental protection measures are under consideration based on the recommendations of the cumulative impact assessment and related wildlife study and will be conveyed to THDC before the project comes online.

F. Safeguard policies

70. The environmental screening category of the project is "A", requiring a full environmental impact assessment. The project triggers seven of the ten Bank safeguard policies.

71. The project does not trigger OP 4.09, "Pest Management", as the project has no direct or indirect linkages to irrigation and agricultural water use, and does not promote use of any chemical or synthetic pesticide. The project does not trigger OP 4.10, "Indigenous Peoples" (as detailed in paragraph 61). The project and the project influence area lie entirely within the Indian state of Uttarakhand; consequently, the OP 7.60, "Disputed Areas" is not triggered.

72. The project triggers OP 4.04 "Natural Habitats" in view of the indirect impact of construction activities on the NDBR. The EMP adequately addresses the expected impacts.

73. While the archaeological study that was completed as part of the additional environmental studies revealed no physical cultural resources of significance that would be impacted by the project, it is considered that the OP 4.11, "Physical Cultural Resources" is triggered in view of the possibility of chance cultural finds of importance. A chance find procedure is included in the EMP.

74. In keeping with the requirements of OP 7.50, "Projects on International Waterways", riparian notification was served to China, Nepal and Bangladesh on December 4, 2006. In response to concerns over the project impact expressed by the Government of Bangladesh, an expert hydrologist was commissioned to carry out an analysis of the project on water quantity

and quality in Bangladesh. The analysis concluded that the project would have no non-trivial impacts on Bangladesh. A summary of the results of the analysis was shared with the Government of Bangladesh (September 8, 2009).

75. The application of the Bank's safeguard policies and measures taken to ensure compliance with applicable safeguard policies are detailed in Annex 10.

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP 4.01)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pest Management (OP 4.09)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Physical Cultural Resources (OP/BP 4.11)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Involuntary Resettlement (OP/BP 4.12)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Indigenous Peoples (OP/BP 4.10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Forests (OP/BP 4.36)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety of Dams (OP/BP 4.37)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Projects in Disputed Areas (OP/BP 7.60)*	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP 7.50)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

G. Policy exceptions and readiness

76. No policy exception is sought for this project. The project meets the requirements of standard readiness filters.

* *By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*

Annex 1: Country and Sector or Program Background

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. This annex presents an overview of India's hydropower development program against the backdrop of economic development and the need to provide sustainable energy solutions to sustain this growth. A brief discussion is presented on India's ambitions for increased electricity generation and the role of hydropower. The advantages and challenges of hydropower are also described. Finally a brief overview of Uttarakhand's hydropower development program is presented.

2. **Economic growth and the need for a reliable power system:** India's high economic growth of recent years has slowed following the global economic downturn but remains relatively robust. An improvement in the quantum and quality power supplied to the economy is essential to ensuring that the power system supports, rather than impedes, the country's continued economic development. Moreover, an increase in the power supply is needed to bring access to power to the estimated 400 million people of India who are still without access to electricity.

3. **The power sector – a top priority of the Government of India:** In the estimate of the Ministry of Power, over the next decade, generation capacity addition on the order of 150,000 MW—or a doubling of India's current installed capacity—will be required to meet the demand for electricity from existing consumers as well as to support the Government's target of providing universal access.

4. **India's hydropower resources:** The plans to meet India's need for electricity assign a significant role to the exploitation of the country's undeveloped hydropower potential, which is estimated at about 120,000 MW. Plans to develop about 30,000 MW of hydropower capacity over the coming decade represent a development program on a scale that has never before been attempted in India: today's existing installed hydropower generation capacity of about 36,000 MW was developed over more than 50 years. Under the Constitution of India, the states have primary responsibility for the use and development of the rivers on their territories, and it is the right of the states to award development rights for hydropower projects. To meet the significant capital requirements of this capacity expansion, state governments are attempting to attract private sector capital to supplement the available public finance. While private Indian companies have shown a strong initial interest in the hydropower sector, their actual experience to date of developing and operating hydropower plants in India is limited. Because of the hydropower sector's unique risk profile that is not easily managed by the private sector, it is expected that the public sector will continue to play the dominant role in the expansion of large hydropower generating capacity.

5. **Ranking of hydropower projects:** In October 2001, a comprehensive study by the Central Electricity Authority (CEA) ranked 399 candidate hydropower schemes (with an aggregate capacity of an estimated 106,910 MW) into priority development categories according to the following criteria: (i) rehabilitation and resettlement impacts; (ii) whether projects are in areas subject to international water treaties; (iii) likelihood of delay due to complexities of inter-state co-ordination; (iv) project size; (v) type of scheme, preference being given to projects that

do not involve large storage; (vi) height of dam, preference being given to projects with lower dams; (vii) length of tunnel/channel, preference being given to projects with shorter tunnels; (viii) status of upstream and downstream hydroelectric project development, preference given to projects on rivers where there are already other projects; (ix) accessibility of site; and (x) status of project development, preference being given to projects for which site investigations and feasibility studies are ready. This approach, therefore, screened a large universe of candidate projects using proxy indicators for: (i) environmental impact; (ii) political risk; (iii) construction risk; (iv) project cost; and (v) development lead time. The Vishnugad Pipalkoti HEP project has been identified by CEA as a project which is high in the development portfolio priority.

6. The public sector participation in hydropower development: Contrary to previous expectations, private finance was not readily available to support the government's hydropower development plans. Traditionally, there has been limited incentive for private sector investment in large hydropower projects in India. In comparison to the development of thermal power generation, hydropower development involves risks and benefit profiles, which act as a disincentive to private sector investors. While the government is making efforts to improve the market conditions, the situation is still not conducive to private sector investment in medium and large hydropower projects. Besides, the complexity of these projects and known risks (See below), the payment risk from state-level electricity entities remains significant. Additionally, the justification for multi-purpose hydro schemes usually involves economic considerations, emanating from flood control and water supply benefits, for which it is difficult to ensure a reliable revenue stream and private sector funding. It will therefore be hard to motivate private sector participation in these schemes. Thus public sector funding will remain the key source of funding for large hydropower projects for some time to come.

Advantages of hydropower: The advantages of hydropower include:

- (a) *hydropower is a renewable source of energy* and it uses the energy of flowing water, without depleting it, to produce electricity. Other sources of energy such as natural gas, coal and oil have to be constantly imported into Uttarakhand.
- (b) *hydropower fosters energy security and price stability* as river water is a domestic resource and, unlike fuel or natural gas, it is not subject to market fluctuations; moreover, hydropower is the only major renewable source of electricity, and its cost-effectiveness, efficiency, flexibility and reliability help optimize the operation of thermal plants. For the Indian grid stability the ideal hydro-thermal mix ratio is 40:60. It is therefore, necessary to correct the hydro-thermal mix to meet the grid requirements and peak power shortage.
- (c) *hydropower improves electricity grid stability and reliability.* The management of electricity grids depends upon fast, flexible generation sources to meet peak power demands, maintain level system voltages and quickly restore service after a blackout. Electricity generated from hydropower can be placed on the grid faster than any other energy source. Hydropower's ability to go from zero power to maximum output rapidly and to vary its output to follow the load makes it exceptionally good at meeting changing loads and providing ancillary electrical services that maintain the balance between electricity supply and demand.

- (d) *hydropower helps fight climate change.* The life cycle of hydropower produces very small amounts of greenhouse gases (GHGs). By offsetting GHG emissions from gas, coal and oil fired power plants hydropower can help slow global warming.
- (e) *hydropower can reduce pollution.* Hydropower plants produce no air pollutants. Very often, they replace fossil-fuelled generation, thereby reducing acid rain and smog. Moreover, hydropower projects do not generate any toxic by-products. The high ash content in India's coal deposits cause high CO₂ emissions and air pollution with suspended particulate matter.
- (f) *hydropower makes a significant contribution to development.* Hydropower facilities bring electricity, roads, industry and commerce to communities, thereby developing the economy, improving access to health and education, and enhancing the quality of life. Hydropower is a technology that has been known and proven for over a century. Its impacts are well understood and manageable through mitigation and enhancement measures. It offers vast potential and is available where development is most needed. The areas where India is rich in hydro-resources are largely among the poorest in the country, and therefore, the backward linkages offer huge possibilities for regional development and poverty alleviation.
- (g) *hydropower means clean, affordable power.* With an average life span of 50 to 100 years, hydropower projects are long-term investments that can benefit several generations. They can easily be upgraded to incorporate the latest technologies and have very low operation and maintenance costs.

7. **Managing risks in hydropower development:** Hydropower projects like other large infrastructure projects face its own challenges. These include various technical, financial, social and environmental risks. Managing these risks is of paramount importance in delivering successful projects and identification of these risks early in the project cycle will help the situation. Some of the issues are briefly discussed below:

Technical risks

Some of the non-anthropogenic risks include geology, hydrology and sediments.

Geological risks. The young Himalayan geology can pose serious challenges in constructing various civil works in a hydropower project. Engineers have always struggled to cope with slope stability, poor tunneling conditions and underground excavations. A comprehensive geotechnical baseline report helps better understand and manage these risks.

Hydrological risks. A good estimate of river flows available for diversion during construction and power generation during operations are significant challenges when dealing with *hydrology* of a hydropower project. Experienced hydrologists are required to estimate both high and low flows. In the Himalayas *sediments* can be a serious risk as the rivers can carry high concentration of sediments dominated by hard particles such as quartz that can cause damage to the turbines and valves. A sediment handling optimization study is important in the management of the project operation.

GLOFs. Unique situation prevalent in the Himalayas such as Glacial Lake Outburst Floods (GLOFs) poses further challenges. Early warning systems and flood defense systems are employed to solve extreme events like GLOFs.

Non technical risks

Social risks. Hydropower projects with large reservoirs are likely to require significant land acquisition and sometimes resettlement. Experience shows that the best approach to these challenges is adopting transparent policy for compensation and benefit sharing and making the local communities partners in project development.

Environmental risks. The best defense against such risks is well prepared environmental studies and a developer committed to best practice environmental management practices.

Political risks. Ensuring that the regulatory process through which the process is approved is well followed often addresses this problem.

Financial risks. Although hydropower projects are fairly capital intensive projects, once the capital expenditure on the project has been amortized, the running costs are very low. The risks include cost escalation during implementation, interest rate risks, market risks and power price risks. The best defense against inflation is to receive bids for main works and equipment before final decision to proceed is made.

8. **GoI's hydropower development initiatives:** The key GoI policy statements that guide hydropower development are the National Policy for Hydropower Development (1998) and the 50,000 MW Hydroelectric Initiative (2003). The latter sets a long- term target for hydroelectric power to meet 40 percent national generation mix (the starting point being 25 percent in 2003). The policy statements describe the policy objectives of hydropower development as: (i) environmental benefits and, in particular, avoidance of pollution and emissions from thermal plants; (ii) benefits for power system operation, especially for meeting peak demand; (iii) energy security - reducing exposure to fuel price and supply risks. The policy statements also propose several policy actions to promote hydropower, including the concept of planning for the development of a “shelf” (portfolio) of hydroelectric projects given: (i) the scale of projected demand increases relative to individual project size; and (ii) the benefits of having a portfolio of projects in terms of diversifying project development and timing risks.

The government intends to more than double the rate of investment in the power sector to support economic growth and provide reliable electricity services to all by 2012. Under the Eleventh Five Year Plan (2007-12), it expects to facilitate the addition of 60,000-70,000 MW of generation capacity (including 16,000 MW of hydropower), expand interstate transmission capacity from 10,000 MW to 37,000 MW, assist states to expand and modernize their distribution networks, and improve sector governance and finances. The Bank's analysis also shows that in the short term, the gap between supply and demand in physical terms (after considering the impact of price elasticity on demand) will continue to grow, even with a significant pace in loss reduction and enhanced efficiency gains.

9. **Hydropower development program in Uttarakhand:** Uttarakhand is a young state, created in 2000. Uttarakhand is rich in water resources and hydropower potential. The Government of Uttarakhand (GoUk) is keen to develop these resources. The hydropower potential of Uttarakhand is estimated to be around 18,000 MW. The Uttarakhand government has a strategy to develop about 10,000 MW in the next 25 years. The GoUk has introduced separate policy guidelines for development of hydropower projects of capacity up to 25 MW and in the range of 25-100 MW.

Annex 2: THDC Capacity-Building and Institutional Strengthening Program

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. THDC was incorporated in 1988 to develop, operate, and maintain the Tehri Hydro Power Complex and other hydro projects. Following the successful commissioning of Tehri Dam in 2006 and the Koteswar Dam Project in 2011, the company has embarked on an ambitious growth plan which includes three projects under construction, six projects under various stages of DPR preparation, survey and investigation¹⁴, and numerous projects under consideration in other states of India as well as in neighboring Bhutan and Nepal. The company is undergoing a significant transition as it gears up to meet its new challenges. In addition to its own strategic growth plans, THDC, like all electric power generation companies in India, faces a changing regulatory and business environment. In order to prepare the company for the major challenges that lie on its development trajectory, THDC management has prepared a strategy for capacity-building and institutional strengthening. The Capacity Building and Institutional Strengthening (CBIS) plan for THDC is included as one of the project components to be financed under the proposed project.

A. CBIS Plan and its Relevance for THDC

2. *Changing Profile of THDC:* With the commissioning of Tehri Dam, THDC became a profit-making company with a sound financial base. The company has acquired strong technical expertise in the implementation of the technically challenging Tehri Hydro Power Complex that involved construction of the highest earth and rockfill dam (260.5 metres) in Asia and the fourth highest in the world. It has also gained expertise in developing large multipurpose reservoir-based storage schemes. THDC is implementing the first pumped storage schemes in the Central Sector. THDC is expanding its portfolio by utilizing the experience gained so far in other states as well as in other countries and also plans to diversify into other forms of renewable generation as well as the thermal generation subsector. It has recently been allotted the Khurja Super Thermal Plan (2x660 MW) by the Government of Uttar Pradesh. It is also foraying into the engineering consultancy business with a significant commission to stabilize the Varuna Vat Parvat in Uttarakhand.

3. Gradually, as the new projects are commissioned, the operational focus of the company will change from construction to construction with operations, and the company will undergo a major transition from a single-project company to a company with projects in multiple locations.

4. *Higher Autonomy in Decision Making:* While THDC's operating assets are currently limited to hydropower, the company plans to diversity into non-conventional energy sources such as wind energy and solar energy. The business environment in which THDC is operating has undergone a sea change since the company's inception as well as since commissioning of the Tehri Dam. Not only has competition in the hydropower sector grown dramatically (including from the private sector) but the operating legislative and social environment has also experienced

¹⁴ Koteswar HEP (400 MW), Tehri PSP (1000 MW), and Vishnugad Pipalkoti HEP (444 MW). Projects under DPR preparation are: Jhelum Tamak HPP (126 MW) and Malari Jhelum HPP (114 MW). Projects under survey and investigation that are subject to MoEF clearance are: Karmoli HPP (140 MW), Jadhganga HPP (50 MW), and Bokang Bailing HPP (330 MW).

significant changes. Such developments require higher empowerment of the Board of Directors regarding the investment decisions of the company. The Government of India has granted the Company ‘mini-ratna’ status which empowers the Board for capital investments and formation of JVs up to the financial limits stipulated by the Government from time to time, and has upgraded it from a Schedule ‘B’ to Schedule ‘A’ company, which allows for more autonomous decision-making. The company is also considering launching its first Initial Public Offer (IPO) for which it will have to adhere to financial management and corporate governance norms as stipulated by Securities and Exchange Board of India. This ambitious agenda requires professional staff that is capable of taking sound decisions and adopting innovative measures in an evolving and competitive business climate.

5. *Changing Regulatory Environment:* As of now, Central Public Sector Undertakings (CPSUs) in power sector are operating under a cost-plus regime set by the Central Electricity Regulatory Commission (CERC). Most of the risks including interest on loans and foreign exchange rate variations remain as pass-throughs in the regulated tariff of the company. However, as per the Tariff Policy (2006) of Government of India, distribution utilities in India will gradually be required to procure power through a competitive bidding process and no longer through direct negotiations with generators. This will expose CPSUs to greater competition. THDC recognizes that this will necessitate changes in the way the company manages its risks and finances its projects.

6. In addition, the company is facing a number of other challenges. A hydropower company inherently faces challenges in retaining talent due to the remoteness of its projects. Adequate incentives for employees can contribute towards overcoming this problem to some extent.

7. Recognizing the scale of existing and expected future challenges, and the imperative for the company to evolve in order to remain competitive in the dynamic environment in which its functions, THDC management has embarked upon a program of capacity-building and institutional strengthening.

B. Initiatives Already Taken by THDC

8. Recognizing that these factors demand a new approach to how it does its business, THDC has initiated a series of programs consistent with the focus described above. It has recently prepared a corporate plan up to 2017. The company has undertaken a competency mapping of middle management; reformed its promotion policy; introduced training policies on the basis of a comprehensive training needs analysis; and is currently developing a proposal for deploying information technology throughout the organization, including at remote project sites. The preparations undertaken to acquire Schedule “A” status and ISO 9001 certification have introduced rigor into the definition of roles and responsibilities. THDC is also taking measures to enhance the qualifications of its employees by enrolling them for various technical and project management trainings and courses. To facilitate this, the company has entered into agreements with some of the premier institutes in India. With the goal of augmenting its capacity for social and environmental management, THDC has identified staff with an interest and aptitude for these areas and has sent them for 12-month training programs at leading institutes. THDC is also setting up a Hydropower Institute at Tehri. The CBIS Plan included under the proposed project

seeks to consolidate, expand and accelerate these efforts.

C. PHRD Program (2007-2010)

9. In 2007, the Government of Japan extended a Policy and Human Resources Development (PHRD) grant in the amount of \$1,000,000 to assist THDC in the preparation of VPHEP as well as to promote training on the corporate level in technical as well as social and environment aspects of project development and management.¹⁵ The table below shows the various activities financed under the grant, which closed in March 2010. As may be seen, THDC made effective use of the grant for the preparation of the Project as well as to complement efforts to build capacity at the corporate level.

<p><i>Technical Studies</i> Dynamic Analysis/Seismology Sedimentation Study – Sediment handling optimization study Stress strain analysis for major underground caverns i.e. machine hall, transformer hall, surge shafts, de-silting chambers, etc Geological, Geophysical, and Geo-mechanical studies (strength parameters, in-situ stresses, etc) for the project Construction material survey Preparation of Geo-technical Baseline Report Feasibility of Tunnel Boring Machine (TBM)</p>	<p><i>Social and Environmental Studies</i> Social Impact Assessment and Census Survey of the project Consultancy service to NGO to act as an interface between THDC and local communities Environmental studies including: Downstream flow needs/riverine fish and ecology Terrestrial Biodiversity Consolidation Studies</p> <p><i>Public Communications</i> Communication Needs Assessment</p>
<p><i>External Expert Review</i> Project Review Panel Environment and Social Panel Senior Research Fellow</p>	<p><i>Training</i> Numerical modeling in Geo-technical engineering Numerical modeling analysis through software Rock Mechanics and Rock Engineering Certificate in project management Environment and Social Training</p>

D. Framework for CBIS Plan

10. Following extensive discussions across various units of the company, THDC identified the main objectives of its CBIS Plan as helping the company to:

- Develop a dynamic workforce that combines the strengths of THDC's experienced staff and new recruits (e.g., through training and incentive systems)
- Address current gaps in skills and management systems (e.g., environment and social management)
- Build new capacity to meet the demands of expanded business horizons in a cost-effective manner (e.g., elements of technical design).

11. The CBIS plan, which will cover the entire organization, will be implemented in a phased manner over a five-year period, with Phase I addressing the immediate needs of the company over the next two years. Towards the end of the first phase, needs and progress will be reviewed and then the second phase will be designed. The details of Phase I of the Plan will be developed

¹⁵ US\$90,000 was allocated for the training component under PHRD grant

and finalized in the due course of time after extensive consultations with the management of THDC. The agreed focus of the Plan will be on the development of human resources and management systems.

- *Human resources* cover staffing, training, incentives and retention, and succession planning.
- *Management systems* address tools and mechanisms to strengthen company functions, policies and procedures, organization structure, information management, risk assessment and performance management.

12. The envisaged scope of the Plan is as follows.

D.1 Human Resources

- ***Manpower Planning:*** An assessment of THDC's manpower needs will be carried out to understand the current and expected staffing requirements in various units at various levels at both corporate headquarters as well as at regional and project offices. This will include redeployment, retraining, and recruitment of manpower. In addition, the Plan will support the development of new competencies for tasks that are currently outsourced but could be developed into competitive advantages for the company (e.g., seismic analysis, pumped storage technology). THDC has undertaken an internal diagnostic exercise to evaluate available in-house capacities and compared them to the organization's goals to arrive at an idea of the competencies THDC needs to either augment or acquire, either through additional recruitment or training, or via the outsourcing route.

One of the initial tasks to be undertaken under the CBIS Plan will be a benchmarking exercise that will look at international practice in the hydropower sector to identify (i) skill requirements in various functions; (ii) examples of good practice HR and systems; (iii) staffing loads; and (iv) sustainability reporting.

- ***Training and Skill Development:*** Training will be central to upgrading skills of existing staff and bringing practical experience to new recruits. Supporting existing programs, the Plan will recommend specific areas of technical training at the departmental level as well as programs to increase cross-disciplinary learning given the evolving business environment of the company. Already, partly as a consequence of sustained Bank engagement over the last four years, THDC has undertaken some significant steps to enhance inhouse capacity in certain critical areas, including a one-year social management program at the Xavier Institute of Social Sciences, Bangalore; an environment science program at the Garhwal University in Srinagar; a training program for field staff in Public Communications and Community Relations with the Indian Institute of Mass Communications, Delhi; and training in rock-mechanics with the National Institute of Rock Mechanics, Bangalore.
- ***Retention of Manpower:*** THDC plans to strengthen incentive schemes to retain existing manpower and to attract new talent as it competes with public and private sector firms that can offer more attractive pay packages, have greater flexibility in promotions, and may have the advantage of a reputation for a more dynamic working environment.

D.2 Management Systems

- ***Plans, Policies, and Procedures:*** Efficient utilization of human resources requires well-defined and transparent plans and policies to be in place. In addition to its core technical functions, THDC will also consider such functions as public communications, environment and social aspects of hydropower. The Plan will address outstanding priority policies such as an Environment Policy, as well as procedures needed for implementing the new policies (including monitoring systems).
- ***Information Flows and Risk Management:*** THDC is taking measures to enhance information flows through improving its communications technology. One of the challenges in this is to address the needs of a growing number of project locations and increasingly diverse activities. The company has drafted an IT Roadmap that is currently under discussion with the expectation that it will be made operational soon. The CBIS Plan will take this effort forward and advise the company on evaluating its existing information flows both internally as well as externally, keeping in mind the company's intention to launch an IPO in the near future, and improve upon these existing processes to ensure adequate risk management across the company.
- ***Organizational Restructuring:*** Given growing business needs and expanding portfolio of the organization (construction to operations, hydro to non-conventional energy resources, consultancy, wind, etc), it will be important to assess the organizational structure in the short, medium and long terms to realign the organization as per growing needs. Roles across corporate office and regional offices should be clearly defined with adequate responsibility structure in place. The Plan will advise the company on this.
- ***Performance Management:*** Performance targets for some departments need strengthening and/or clarification. The new staff performance management system is commendable and warrants monitoring for effectiveness and timeliness so that initial "bugs" are addressed and training supports managers' obligations. This also requires strong and effective monitoring and evaluation mechanism.

Annex 3: Results Framework and Monitoring
INDIA: Vishnugad Pipalkoti Hydroelectric Project

Results Framework

PDO	Project Outcome Indicators	Use of Project Outcome Information
The development objectives of the Project are: (a) to increase the supply of electricity to India's national grid through the addition of renewable, low-carbon energy; and (b) to support capacity-building at THDC India Limited with respect to the preparation and implementation of economically, environmentally and socially sustainable hydropower projects. .	Generation capacity of renewable energy constructed under the project (MW) in the Alaknanda river in Uttarakhand	To review, monitor and verify achievement of the PDOs
Intermediate Outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
Component 1: construction of the 444 MW Vishnugad Pipalkoti HEP.	Desilting chamber (% completion) Headrace Tunnel (% completion) Power house: Civil excavation (% completion) Power house: Electro-mechanical (equipment installation) Financial Disbursement (% of projected cost to completion) Cost overruns within physical contingency allowance EMP implementation Number of environmental staff posted at site Funds utilization on CAT plan activities (excluding maintenance) RAP implementation All entitlements for property losses and restrictions on access fully delivered Completion of scheduled resettlement as agreed with the PAPs Amount spent on small infrastructure under CSR and Peripheral Development in project affected villages	Indicative of progress towards PDO outcome target of increased electricity supply in keeping with World Bank safeguards policies. PAPs invested compensation and assistance in productive assets EMP Implemented –visualized through regular six monthly project reports and validated by third party monitoring reporting once a year. Interventions and implementation arrangements to achieve income restoration will be assessed against monitoring data on results, and will be adjusted as needed to support sustainable livelihoods that correspond to or exceed pre-project conditions.
Component 2: technical assistance for institutional strengthening and capacity-building at THDC.	Satisfactory progress toward delivery of Component 2 outputs, as planned, including specific measures and milestones from the agreed action plans.	Cadre based social and environment cell with a defined growth path

Arrangements for results monitoring

	Data Collection and Reporting					
Outcome Indicators	Baseline	MTR	ICR	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Increased power supply: <ul style="list-style-type: none"> Generation capacity of Renewable Energy constructed under the project (MW) in the Alaknanda river in Uttarakhand 	0 MW	0 MW	444 MW	Semi-annual project reporting (some outcomes indicators will be available only after the contributing project components are completed)	Reports from THDC and Bank implementation support visits	THDC
Output indicators by component						
Component A: Construction of VPHEP (444 MW): <ul style="list-style-type: none"> Desilting chamber (% completion) Headrace Tunnel (% completion) Power house: Civil excavation (% completion) Power house: Electro-mechanical (equipment installation) Financial Disbursement (% of projected cost to completion) Cost overruns within physical contingency allowance EMP implementation <ul style="list-style-type: none"> Number of environmental staff posted at site Funds utilization on CAT plan activities (excluding maintenance) RAP and community development plan implementation <ul style="list-style-type: none"> All entitlements for property losses and restrictions on access fully delivered Completion of scheduled resettlement including Haat village as agreed with the PAPs Amount spent on small infrastructure under CSR and Peripheral Development in project affected villages 	0% 0% 0% No equipment delivered 0% No overrun 1 0% 0% 0% Rs. 5 million	45% 30% 45% Equipment for Unit 1 delivered to site 30% On track for not exceeding allowance 3 25% 90% 100% 100% Rs. 45 million	100% 100% 100% Equipment for all four units installed 95% Achieved 3 90% 100% 100% Rs. 90 million	Quarterly report on implementation progress (all indicators)	Reports from THDC and Bank implementation support visits	THDC

	Data Collection and Reporting					
Outcome Indicators	Baseline	MTR	ICR	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Component B: TA for Capacity Building and Institutional Strengthening				Quarterly / annual report on implementation progress	Reports from THDC and Bank implementation support visits	THDC
<ul style="list-style-type: none"> Development of Capacity Building and Institutional Strengthening (CBIS) plan 						
<ul style="list-style-type: none"> Initial skills gap analysis (resulting in preparation of CBIS Plan) 	RFP for skills gap analysis launched by project effectiveness	Contract completed and CBIS Plan under implementation	-			
<ul style="list-style-type: none"> Review of THDC institutional arrangements and current capacity building plans in consultation with THDC management and staff. 	-	Completed	-			
<ul style="list-style-type: none"> Development of framework institutional capacity plan 	-	Completed	-			
<ul style="list-style-type: none"> Development of detailed institutional capacity plan 	-	Completed	-			
<ul style="list-style-type: none"> Implementation of Capacity Building and Institutional Strengthening Plan 	-	Progressing as planned	Completed as planned			
<ul style="list-style-type: none"> Social and Environmental Capacity Training 						
<ul style="list-style-type: none"> Recruitment/deployment of new environmental staff for corporate and project 	2+1	50% of staff as proposed in EMP	100% of staff as proposed in the EMP			
<ul style="list-style-type: none"> Social staff in Corporate Social and Environment Cell (number of staff) 	2	4	4			

Project Management

1. A review of THDC's project management capacity and expected future needs shows a strong demand for an integrated Project Management approach, which will allow project managers to plan and regularly monitor project performance to ensure that all activities are being completed with quality and in accordance with the established program and allocated budget. Large-scale, multi-stakeholder projects require extensive planning, effective communications, and streamlined processes, which are intrinsic in a Project Management approach. THDC has been gradually shifting to an integrated Project Management approach, and training courses have been offered to THDC staff on various levels.
2. Arrangements for monitoring the results framework are in place and the project outcome and output indicators have been agreed with the Borrower. The outcome indicators reflect the main project development objective of increasing the supply of energy to India's national grid through the addition of low-carbon renewable hydropower energy with a secondary objective focused on supporting capacity-building and institutional strengthening at THDC. Similarly, output indicators are developed to monitoring the construction and execution of VPHEP as well as the implementation of environmental and social plans. The Monitoring and Project Services (MPS) department within THDC will bear primary responsibility for monitoring project implementation, in close coordination with the VPHEP project team.
3. The MPS Department is primarily responsible for coordinating the project schedule and monitoring daily and monthly progress. The MPS Department will also track financial achievements against monthly targets and cost overruns (due to change in scope, variations, etc.). It will also monitor the monthly quality control reports along with exception reports, if any, forwarded by project site.
4. A Project Review Team composed of concerned department heads at the Corporate level holds monthly meetings chaired by the Director (Technical) for review of the status of project implementation. Once the main contracts are under implementation, this mechanism will allow for early resolution of critical issues and address potential delays (including cost overruns) that may arise. The representatives of the Design Review Consultant and the contractor(s) may also be included in the meeting as required for speedier resolution of any issues that may arise. In addition, Management Review Meetings will be convened by the MPS Department at fixed intervals or as decided by Management for detailed reviews of project implementation. Minutes of meetings will be circulated to all concerned for time-bound action.
5. The main task of data collection will be borne by THDC with appropriate input from the Bank team during supervision missions as required. Technical output indicators will be derived from statistics on project performance collected for design and construction activities. The same arrangement is expected for the environmental and social indicators.

Social and Environmental Safeguards

6. In addition to internal data collection and monitoring carried out between MPS and the project site team, THDC plans to retain the services of a local NGO which will assist with data collection and monitoring of the social indicators. This NGO has been actively engaged

throughout the preparation phase to facilitate relations with project-affected communities and the implementation of the Resettlement Action Plan (RAP). In addition, third-party monitoring will be carried out to verify the results of RAP implementation and benefits-sharing programs supported by THDC.

7. The VPHEP project team at site will be responsible for monitoring the implementation of the Environmental Management Plan (EM). In addition, THDC plans to engage a third party for independent monitoring of the EMP.

Operations Manual

8. The M&E process is laid out in the Operations Manual which has been developed by THDC for VPHEP. The Operations Manual serves as a guideline to project implementation, identifying the roles and responsibilities within THDC and detailing internal interactions between each functional department within THDC as well external relations. The Operations Manual describes the systematic flow of activities and documentation that are being followed to support implementation, monitoring and evaluation of project deliverables and milestones, social and environmental safeguards, financial management and procurement plans.

9. The results framework for measuring the outcome indicators will rely on data collected at the state / grid level relative to the amount of electricity supplied to off-takers from the energy generated by VPHEP. It should be noted that measurement of electricity supplied to the network/grids is not feasible at the MTR as these are tied to the commissioning and operations of the installed generation units, which will signal the completion of project implementation. The balance of the data will be supplied by THDC in accordance with the planned schedule of activities.

Annex 4: Detailed Project Description

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. The Vishnugad Pipalkoti Hydro Electric Project (444 MW) located in Chamoli district in Uttarakhand, envisages utilization of water of river Alaknanda, a major tributary of river Ganga, for power generation as a run-of-river type development harnessing a gross head of 237 meters. The original environmental clearance issued by MoEF in August 2007 stipulated an environmental flow of 3 cumecs. At this level of environmental flow, the approved design energy was 1,797 GWh. Following the increase of the environmental flow requirement to 15.65 cumecs in May 2011, the project annual energy generation in a 90% dependable year is 1,636 GWh, corresponding to the gross head of 237 meters. The project also plans to utilize the environmental flows by installing a small hydro plant with a capacity of 4.44 MW at the base of the diversion dam, which will have annual energy generation of 29 GWh. Thus, the total annual energy to be generated by the project will be 1665 GWh in a 90% dependable year.

2. The diversion site is located at E 79°29'31" N 30° 30' 50" near village Helong. The dam site at about 225 km from Rishikesh approachable by an all-weather road. The nearest rail head is located at Rishikesh and nearest domestic airport is at Dehradun and International airport is at New Delhi.

3. The project will consist of two components: (i) construction of the 444 MW Vishnugad Pipalkoti Hydro Electric Project; and (ii) technical assistance for institutional strengthening and capacity-building to assist the Borrower, THDC, in addressing the needs of its expansion program.

4. The Vishnugad Pipalkoti Hydro Electric Project is planned to be built through the following packages:

- Infrastructural works to be constructed by THDC
- Contract for civil works & hydro-mechanical equipment (Bank-financed)
- Contract for electro-mechanical equipment (Bank-financed)
- Contract for Design Review Consultancy (Bank-financed)
- Contract for Architectural & Finishing works of buildings

A. Infrastructure works to be constructed by THDC

Roads and Bridges:

(A) Details of permanent roads where cutting of formation and retaining walls etc. shall be constructed by THDC is as below:

- Approach road from NH-58 to Dam site up to Bailey bridge near dam site.
- Approach road from NH-58 to Birahi Bridge.
- Approach road from NH-58 to Tunly Bridge
- Approach road from Tunly Bridge to Maina Nadi.
- Approach road from NH-58 to Haat Bridge.
- Approach road from Haat Bridge to Power House main access tunnel.

- Approach road from Bailey bridge near dam site to muck disposal yard near Gulabkoti village.

(B) Bridges to be constructed by THDC on the river Alaknanda include:

- Bailey bridge on the d/s of dam.
- Bailey bridge on approach road from NH-58 to Tunly.
- Steel girder bridge at Haat on approach road from NH-58 to Main Access Tunnel to Powerhouse cavern.
- Steel girder bridge at Birahi (near TRT outlet) on approach road from NH-58 to Project colony, Main Access Tunnel to Powerhouse cavern and u/s surge shaft.

These bridges shall be handed over to the Contractor for use during construction of the project. Running and maintenance of these bridges during the entire construction period shall be done by the Contractor. After the completion of the works, the Contractor shall hand over the bridges to the Employer in good condition.

Construction Power. For the first year of construction, power of 1 MVA each will be provided at one point each at dam site area and powerhouse area only and Contractor shall arrange power supply by D.G. sets of adequate capacity as required. Subsequently, construction Power of 5 MVA each will be provided at one point at each of the following locations: Dam site area, Powerhouse area. The Contractor shall make his own arrangements for further distribution of power up to various construction sites.

In addition, the Contractor shall have his own captive power plant of adequate capacity for the entire operation of TBM.

B. Civil Works & Hydro-Mechanical Equipment Contract

This contract includes the following works of the project (excluding the electro-mechanical works):

- Dam Complex
- Water Conductor System
- Power House Complex

Dam Complex: Civil Works & Hydro-mechanical equipment

- a) River flow diversion arrangements, dam site excavation, foundation and abutment treatment, concrete gravity dam, gated sluice spillway, energy dissipation arrangement, spillway tunnel, diversion-cum-spillway tunnel, dam instrumentation, elevators, galleries and upstream and downstream cofferdams etc.
- b) Intake structure excavation, treatment of rock and soil slopes in the vicinity of intake structures, intake structures, three nos. concrete lined intake tunnels.
- c) Desilting chambers (three nos.) with flushing arrangements and adits to desilting chambers.
- d) Silt flushing tunnels (three nos.) with inlets and outlets below intake structures.

- e) A Small HEP (approximately 4.4 MW) on the right bank of river Alaknanda at the d/s of the dam to harness the potential of mandatory release of water, along with appurtenant structures.
- f) Overflow weirs (six nos.) across river Alaknanda up to its confluence with Patal Ganga, on the d/s of dam, to provide pondage of mandatory release of water for social and environmental purposes.
- g) Hydro-mechanical works (Gates and stoplogs, etc.) for ogee spillway, sluice spillways, diversion tunnel, spillway tunnel, diversion-cum-spillway tunnel, silt flushing tunnels, intakes for headrace tunnels, trash racks, automatic trash removal / cleaning arrangement, desilting chamber outlets, flushing ducts, tailrace tunnel of small HEP etc. along with their handling arrangement and permanent type enclosures, and access to them.

Water Conductor System:

- a) A headrace tunnel beyond desilting chambers.
- b) Upstream surge shaft.
- c) Butterfly valve chambers and penstock assembly chambers.
- d) Penstock tunnel & pressure shafts two / four nos. with penstock steel liner.
- e) D/S surge chamber
- f) Tailrace tunnel & outfall structures
- g) Adits to water conductor system
- h) Hydro mechanical works

Power House Complex:

- a) Complete underground machine hall with RCC structure to house four generating units including control room, administrative rooms, service bay, providing lift well, crane beams, draft tube, valves etc.
- b) Underground transformer hall and GIS hall with RCC structures for housing transformers and GIS equipment
- c) Hydro-mechanical works (gates) for draft tubes along with their handling arrangement
- d) Main access tunnel to powerhouse complex and other associated works
- e) Drainage galleries around powerhouse & transformer caverns, cable tunnel, ventilation tunnel, bus duct gallery tunnel etc.,
- f) Switchyard structures

C. Electro-Mechanical Works Contract

The electro-mechanical package shall include mainly the following:

- **Hydro Turbine** - 4 sets of 111 MW + 10% continuous overload capacity, 250 rpm, vertical Francis turbine along with, Main Inlet Valve (Nominal dia 3000mm), Digital Electro hydraulic governor and all associated equipments, Butterfly valve (one no. for two units) with oil pumping units and associated equipments, cooling water system for generator, turbine and generator transformers, oil and air coolers, unit control boards for turbine, and Unit & Station Auxiliaries.
- Model testing of turbine

- **Hydro Generator** - 4 sets of 111 MW + 10% continuous overload capacity, 13.8 KV hydro generators to match the hydro turbine along with static excitation system, voltage regulating equipment, auxiliary system/equipment for generating units viz fire fighting system, brake dust collection equipment, unit control board, etc.

- **TRANSFORMERS**

- **Generator-Transformers** – 13 nos. of 46 MVA, 13.8/420/ $\sqrt{3}$ kV, single phase, oil immersed, ODWF/OFWF cooled indoor type generator-transformer including all parts, accessories, auxiliaries, mountings, including oil to SF6 bushing.

- **Other Transformers** - Station Auxiliary & unit transformers as per requirement.

- **420 kV Switchyard Equipment**

- 420 kV underground GIS system having 1 set of 420 kV, 2000A, SCC 40 KA for I sec, SF6 Gas insulated switchgear of Double bus bar system comprising of 04 Nos. Incoming bays, 02 nos. of outgoing lines bays and 01 no. of Bus coupler complete with circuit breakers, disconnectors, earthing switches, current transformers, voltage transformers, Surge arrestors, SF6 to Air bushing, etc.

- XLPE cable for connection between 420kV underground indoor GIS system and Pothead yard equipments.

- Pothead yard equipments for two number outgoing feeders consisting of disconnector with earthing switches at both end, current transformers, capacitive voltage transformers, Surge arrestors, support structure, etc.

- PLCC equipment with all accessories viz. line trap, coupling device, protection couplers, Remote Terminal Units etc.

Electrical and mechanical auxiliaries and service equipment

Electrical and mechanical auxiliaries as listed below but not limited to shall be in the scope of supply of the bidder

Electrical Auxiliaries and Service Equipment

- **Isolated Phase Bus Duct** - 4 sets of 17.5 kV, 7000 A, SCC 120 KA for 1 sec isolated phase bus duct and associated phase bus duct and associated equipments viz disconnectors, current transformers, voltage transformers, lighting arrestors etc. for connecting generator to generator-transformer including LAVT cubicle and generator neutrals grounding cubicle.

- **Computerized Control System** - 1 Lot of Computerized control system for proper functions of control, automation, data acquisition and plant optimization.

- 1 Lot of Protection system.

- 1 Lot of Grounding system of power house
- 2 nos. of 11 kV, 1000 KVA DG set
- 11 KV and LT switchgear & panels
- 1 Lot of Power and control cables including cable racks and trays
- 1 Lot of 220V and 48V Batteries & battery charger
- 1 Lot of DC distribution board
- 1 Lot of Illumination system
- 1 set of Public address and communication system
- 1 Lot of testing equipments for Electrical workshop
- 1 Lot of Any other/all electrical auxiliaries required for performance durability and satisfactory operation of hydro power plant.

Mechanical auxiliaries and service equipment

- 1 Lot of Drainage and dewatering system for power house
- 1 Lot of Fire fighting system for power house equipment
- 1 Lot of Mulsifier system for power transformers
- 1 Lot of Lube and transformer oil handling equipment including oil purifiers, pumps, piping, etc.
- 1 Lot of Passenger and freight elevators
- 2 nos. of 225/50/10T capacity EOT crane for powerhouse
- 1 Lot of Other auxiliaries cranes
- 1 Lot of Ventilation & Air-conditioning system
- 1 Lot of Mechanical workshop with equipments
- 1 Lot of Any other/all mechanical auxiliaries required for performance durability and satisfactory operation of hydro power plant.
- Compressed air system for Powerhouse

D. Design Review Consultancy Contract

THDC will engage a Design Review Consultant (DRC) who during the implementation of the Project shall take responsibility for the detailed Hydraulic and Geotechnical design. DRC shall review all the detailed design and drawings etc. submitted by the EPC Contractors.

The DRC's scope of services shall be as under:

- to carry out detailed Hydraulic and Geotechnical design of the Project covering all aspects till commercial commissioning of project & six months thereafter. The Basic (tender stage) Hydraulic and Geotechnical design will be provided by the Employer at the start of agreement.
- to review the designs, drawings, engineering studies, analysis, equipment layout and reports submitted by two EPC Contractors and their compatibility with each other components to fulfill the objective during implementation of the Project .
- During the six months after commercial commissioning of the Project, DRC shall depute experts related to the job to ensure smooth operation of the plant by Employer and assist Employer in resolving any problem encountered during the operation of plant.

- technical solutions to the Engineering problems proposed by the EPC Contractors.
- to advise/ assist Employer in carrying out its Project management functions and helping out Engineer in monitoring & co-coordination of interface problem between Civil - Hydro Mechanical and Electro Mechanical contracts and help to resolve any differences that may arise during implementation of the Project.
- to assist in Inspection of the works, Schedule control, Cost control, Quality control and documentation of construction work etc.
- DRC shall engage Employer's Engineers in their Design Office to facilitate up-gradation of technical know-how and Capacity building on latest design techniques used and applied by them during the contract period.

E. Architectural Works & Finishing works of buildings

THDC shall appoint a separate Contractor for carrying out all architectural / finishing works such as plastering, flooring, false ceiling, doors & windows, internal electrification, internal water supply and sanitary items etc in power house structures including control room, pot-yard, central recording station in dam area and building of small HEP on d/s of the dam etc. These works are not in the scope of the Civil & HM Works Contract).

Design Responsibilities

THDC shall be responsible for the basic design of the Civil and Hydro Mechanical Works including all major dimensions of the structures and instrumentation layout, and for detailed hydraulic design and geo-technical design including excavation dimensions and stabilization measures.

Within the frame work of the basic design Contractor shall be responsible for carrying out the detailed design & structural design of all structures / works subject to the approval of Engineer. Payment will be based on the approved design in accordance with the Bill of Quantities.

RISK ALLOCATION

Allocation of various risks during the design & execution of the project is given in the risk register, which shall be a part of the contract document. Also Geotechnical Baseline Report (GBR) is a part of the contract document. The *Geotechnical Baseline Report* (GBR) describes the conditions expected to be encountered during tunnel construction and other rock excavations. It represents the Employer's best judgment of geotechnical conditions anticipated in the excavations. If the actual geotechnical conditions encountered during the execution differ from those specified in GBR, then the Contractor shall be paid in accordance with provisions of the contract.

Besides the GBR, the factual geotechnical information gathered during the project investigations has been assembled into a Geotechnical Data Report (GDR), which is available in the Central Documentation Center of the Employer for the Contractor's reference. The GDR is provided only for the information of the Contractor and does not form part of the Contract documents.

The Employer has commissioned a study on 'Assessment of Quality & Quantity of Construction Materials in Various Quarries'. Based on the investigations, it is expected that the designated

quarries will provide the material of acceptable quality and sufficient quantity. However, the Contractor has to ascertain borrowing of material in a manner so as to fulfill the total requirement of construction material for the works. If, in the designated quarries, the construction material of required quality falls deficient, then the Contractor shall carry out the required tests as specified in Technical Specifications.

Annex 5: Project Costs
INDIA: Vishnugad Pipalkoti Hydroelectric Project

Project Cost By Component and/or Activity	Local US \$million	Foreign US \$million	Total US \$million
<u>Project Component – 1</u>			
Major civil works including hydro-mechanical equipment and works	0.00	417.00	417.00
Electro-mechanical equipment	0.00	156.00	156.00
Rehabilitation & Resettlement	34.00	0.00	34.00
Environmental and Ecology	22.00	0.00	22.00
Establishment	39.00	0.00	39.00
Other Enabling Work ¹⁶	71.00	0.00	71.00
Total Baseline Cost excluding IDC	166.00	573.00	739.00
Physical Contingencies ¹⁷			61.00
Price Contingencies ¹⁸			25.00
Sub-Total			825.00
Interest During Construction (IDC)			87.00
Total for Project Component - 1*			912.00
<u>Project Component – 2</u>			
Technical Assistance for Capacity Building and Institutional Strengthening (B)	0.00	10.00	10.00
Total Project Cost			922.00

¹⁶ This includes the cost towards the small HEP with capacity of 4.44 MW (about US\$ 6 million) proposed to be installed at the base of the diversion dam.

¹⁷ Physical contingencies are considered at a rate of 15 percent for underground works including concreting, 10 percent for other civil works, and 5 percent for Electro-mechanical and hydro-mechanical works and calculated on the project cost excluding technical assistance component

¹⁸ Price contingencies are as per MUV index of the Bank, updated in November 2010 and calculated on the project cost excluding technical assistance component

Annex 6: Implementation Arrangements

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. THDC as the developer of VPHEP will be responsible for project implementation and operation, with support in some areas (catchment area treatment, land acquisition and R&R compensation) on the basis of an agreement with the state Government of Uttarakhand. The Ministry of Power, Government of India, has broad institutional oversight over THDC and its implementation of VPHEP. The Ministry of Environment and Forests has established the conditions of environmental clearance for the project. The Central Electricity Authority (CEA) is responsible, *inter alia*, for sector planning and techno-economic project oversight and the Central Electricity Regulatory Commission (CERC) is responsible for tariff formulation and notification as well as sector regulation. Both these agencies will follow their usual procedures with respect to the project investments.
2. A dedicated General Manager (GM) who reports to the Director (Technical) is based at site and has overall authority for the project. The GM heads a team at site that includes technical, procurement, financial and safeguards specialists. THDC corporate units support the project as required. Land acquisition will be completed before the commencement of civil works and the catchment area treatment plan will be implemented in the context of the state's reforestation program.
3. The tendering and award of the main contracts, following the international competitive bidding procedures, is being handled by the Corporate Contract Department and the infrastructure works (project roads, bridges, construction power etc.) are tendered and awarded from the project office.
4. **Operations Manual.** THDC has prepared a comprehensive Operations Manual that details all project implementation procedures and arrangements, including general project management; financial management; procurement/ contracts; and social and environmental safeguards. The VPHEP project team will be responsible for implementation of the Resettlement Action Plan (RAP) and those parts of the Environmental Management Plan (EMP) not covered by the state Forest Department. THDC has engaged a reputed NGO to facilitate the implementation of the RAP. A Design Review Consultant that will be engaged with project proceeds will assist the VPHEP team in the implementation of the main EPC contract for civil works and hydro-mechanical equipment.
5. Project-specific financial management arrangements are detailed in Annex 7. Project-specific procurement arrangements are detailed in Annex 8. Detailed implementation arrangements for environmental and social aspects of the project are detailed in Annex 10.
6. In addition to the provisions described in the Operations Manual, implementation arrangements have been detailed for specific aspects of the project through separate plans. These include:
 - TBM Contingency Plan

- Dam Safety Plan which includes Quality Management, Reservoir Operation and Maintenance, Safety of Dam and Other Structures and Emergency Preparedness Plan (under preparation)
- Resettlement Action Plan
- Environmental Management Plan

7. **Monitoring and evaluation.** The Corporate Project Monitoring Services Department will have overall responsibility for monitoring and evaluation of project implementation including monitoring values for the key performance indicators, with inputs from the VPHEP project team as required. With respect to social aspects of project implementation, since land acquisition and all relocation will have to be completed ahead of the start of specific construction activities, the process needs to be carefully documented and monitored. THDC has engaged an NGO to facilitate implementation of the RAP and this system is functional. With the support of the NGO, THDC generates aggregate monthly reports with village-specific information on the status of land acquisition and resettlement, compensation payments and assistance, and information on grievance redress.

8. External (third-party) monitoring will be conducted during the implementation period to provide independent verification that timely compensation payments and rehabilitation assistance are provided to those entitled, and that grievances are addressed in a prompt manner that brings resolution to the cases. A grievance redressal mechanism has been established and is functional, as detailed in Annex 10.

Annex 7: Financial Management and Disbursement Arrangements

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. **Summary of Financial Management (FM) Assessment.** THDC India Limited (THDC) is a joint venture between GOI and GOUP for development, construction, operation & maintenance of Hydro Electric Projects and was set up in July 1988 as a private limited company. On November 3, 2009, THDC was converted into a Public Limited Company, granted Mini-Ratna Category I status and upgraded to Schedule A Central Public Sector Undertaking. THDC *has a financial management system which is considered adequate, to account for and report on the project resources and expenditures accurately.* An action plan for enhancing Corporate Governance and Financial Accountability has been under implementation during preparation of this project. Actions have been completed in some areas and initiated in respect of the others which will be completed during the implementation of the project.

2. **Financial Management Strengths, Weaknesses and Mitigating Arrangements.** The project draws the following strengths in the area of financial management: a budgeting, accounting and reporting system has been operational for the entity for the past several years, which will be used for accounting and generating the required financial reports under the project. The entity has a functioning internal audit system which is being strengthened and subject to annual statutory audit by external CA firms appointed to CAG. Although the entity has not received an IBRD loan in the past, it has received a PHRD grant as a project preparation facility and thus has limited exposure to Bank processes.

3. The Bank team conducted a review of financial management, corporate governance and accountability arrangements of THDC¹⁹ which has indicated that THDC has institutionalized certain cardinal *principles*, in consonance with other public sector undertakings in India, in areas like accounting, auditing, internal control, budgeting and reporting which have laid the foundation for a basic financial accountability and corporate governance framework in the organization. However, this review also identified a few areas where THDC needed to take actions to improve corporate governance and financial accountability arrangements in the organization. (Refer to Table 3 of the assessment). THDC has taken several actions during preparation of the project such as appointment of independent directors in the board of THDC, constitution of an audit committee with independent directors with defined scope and coverage; conversion into a public limited company, initiating actions to further strengthen internal audit function and develop capabilities through well defined manuals and guidelines.

4. The FM risk for this project is currently rated at Substantial and the detailed risk assessment is available in the project files. The residual risk rating is substantial as THDC is in the process of putting in place a strengthened internal controls regime in terms of improving quality of internal audit and compliance, enlarging the audit committee with independent directors reviewing audit programs and important audit observations; greater focus needed on risk management, systems and procedures improvement; and finance manuals with appropriate guidelines are under preparation. The results of these actions will be tested during the implementation of the project.

¹⁹ A note on "Financial accountability and Corporate Governance arrangements" prepared by the Bank is available in the project files.

5. **Arrangements for oversight and accountability.** THDC will be responsible for the FM arrangements of the project. The company, a joint venture between the GoI and the GoUP is now a Schedule A, Public Limited Company and has been conferred Mini Ratna- Category 1 status (with effect from October 2009). This entails enhanced powers accruing to the company for capital investments, joint ventures etc.

6. At the helm of THDC's management is the 12-member Board of Directors (BoD)²⁰, comprising full-time Chairman & Managing Director (CMD), three full-time functional directors – Director (Finance), Director (Personnel), and Director (Technical), five government nominee directors²¹ and three independent directors²². The functional Directors are supported by Executive Directors (ED) and General Managers (GM) and their teams. The BoD meets on average twice in a quarter to consider operational matters including budget and revisions, major contracts and works, annual accounts and directors' report, audit committee proceedings, employee related matters, funding, and legal and arbitration issues.. THDC has a three-member Board Level Audit Committee comprising the three independent directors with Director (Finance) as nonvoting member²³. There is a Management Committee comprising EDs and GMs. It meets as and when required to discuss organizational matters that are referred to it. Vigilance Department carries out regular and surprise inspections of major and minor works.

7. The implementation arrangements for the project, which is institutionalized at different levels of hierarchies of the organization, are discussed in detail in Annex 6.

8. THDC shall provide the fiduciary assurance to IBRD over proper and efficient use of Loan proceeds. The mainstream FM systems of THDC, upgraded and housed as a part of their general accounting and financial systems, will be used to generate the financial and other progress reports under the project.

9. **Funds Flow:** The IBRD funds from this loan will be directly borrowed by THDC with a guarantee from GoI. Under the project, THDC will open a new segregated bank account (Designated Account - DA) denominated in INR or a foreign currency, in a Commercial Bank to receive the advances under the loan. THDC envisages receiving an advance as and when required to lower the negative carrying costs, but will however retain the flexibility of requesting advances up to US\$ 20 million. Foreign currency payments to suppliers/ vendors could be released directly from this DA. THDC would have the flexibility of converting USD into INR at periodic intervals for meeting project-related rupee payments and in these cases, the expenditures will be reported to the Bank using the actual rate of currency conversion. Alternatively THDC could also seek direct payments by IBRD to suppliers/ contractors based on duly authorized bills and documents for amounts exceeding USD 1,000,000. The Project will be financed by THDC either by transferring requisite funds to the site office or by making direct payments. THDC will

²⁰ According to the Articles of Association the maximum strength of the Board is pegged at 15.

²¹ JS (Hydro) GoI; Chairman CEA; Chairman CWC; Secretary (Energy) GoUP; PS (Irrigation) GoUP;

²² Dr Sudhir S Bloeria ex Chief Secretary J&K; Prof S C Saxena Director IIT, Roorkee; Dr K Aprameyan retd CMD BEML.

²³ Audit committee was reconstituted with independent directors in the 138 Board meeting held on June 26, 2008 as per DPE Guidelines; first meeting of the Board with independent directors was held on August 19, 2008. The chairman of the audit committee is an independent director.

use a dedicated bank account for WB financed project at the Site office to clearly delineate the funds flow. This will facilitate the accounting and preparation of the sub-trial balance for the project and the quarterly interim unaudited financial report (IUFR).

10. **Disbursement Arrangements:** There are no disbursement conditions. Disbursements will be made on the basis of the quarterly IUFRs²⁴. Supporting documentation, including completion reports, certificates and other documentation, will be retained by THDC and made available to the Bank during project supervision and also be audited as a part of annual project financial statements audit.

11. **Retroactive Financing:** Retroactive financing up to an amount of US\$ 120,000,000 (to be updated) will be available under the project for financing eligible activities procured under agreed guidelines.

12. **Designated Account:** As already mentioned, an account (denominated in INR or USD) will be established in a commercial bank in which the Bank would deposit advances for an amount up to the next six months requirements, as forecast by THDC. THDC will ensure that the commercial bank selected meets Bank requirements.

13. The following table specifies the categories of Eligible Expenditures that may be financed out of the proceeds of the Loan and the percentage of expenditures to be financed for Eligible Expenditures.

Category	Amount of the Loan Allocated (expressed in USD)	Percentage of Expenditures to be financed (inclusive of Taxes)
Civil works and hydro-mechanical equipment	460,000,000	100%
Electro-mechanical equipment	172,380,000	100%
Technical assistance consultancies	14,000,000	100%
Front-end Fee	1,620,000	
TOTAL AMOUNT	<u>648,000,000</u>	

14. **Budgetary control:** THDC prepares annual construction budget and also since 2006-07, a revenue budget for Tehri Stage I, which went into commercial production in September 2006²⁵. The budgets are prepared on cash basis in the format prescribed by MoP for power projects. Each year around September/October, budget estimates (for the forth-coming year) and revised estimates (for the current year) are prepared based on assessment of work progress. Budget estimates and revised estimates are submitted to MoP as are also monthly expenditure reports and status of funds release. For management purposes, monthly reports against budget are prepared and circulated to projects in charge and departmental heads of corporate/ liaison offices. Project-wise expenditure incurred is being reported to the Board and reporting of budget

²⁴ THDC would have the flexibility of furnishing reports earlier (say on a monthly basis) to seek early replenishments wherein they could also provide forecasts for a shorter period than six months.

²⁵ Revenue expenditure budget comprises – O&M, capital expenditure and bought out assets.

performance to Board is also being started. Construction budgets are prepared/ compiled by Planning Department based on information from various project units and departments.

15. THDC has so far followed government's budgeting and reporting requirements and its current systems are geared towards meeting these requirements. In view of the fact that it has commenced operations and is no longer totally in construction mode, and that there will be greater non-government debt funding for THDC's planned projects, there is a need to further strengthen and upgrade planning and budgetary control systems on commercial lines consistent with industry best practices. THDC has appointed consultants to develop budgetary control manual as part of strengthening overall financial management arrangements in the organization.

16. The entity construction budget incorporates a separate VPHEP budget based on the annual approved work plans. Thus it would facilitate monitoring of budgeted and actual expenditure of the project on periodic basis, analysis of variances and corrective actions. The project budget and variances will also be reflected in the quarterly IUFRR of the project.

17. Financial Accounting & Reporting: Financial accounting in THDC is the responsibility of Accounts & Taxation Department currently headed by DGM, reporting to GM (F)²⁶. There are presently ten accounting units²⁷ where accounting is carried out using Oracle-based accounting software. All accounting units prepare monthly trial balances. Since 2009-10 books are closed on quarterly basis. Annual trial balance, profit & loss account and balance sheet of each accounting unit are audited. Thereafter, the audited profit & loss account and balance sheets are consolidated at the Corporate Office. THDC uses a uniform chart of accounts at all the accounting units. The account heads are suitably grouped to generate financial statements and schedules in the required formats. THDC prepares its annual financial statements on accrual principles and follows accounting standards prescribed by the Institute of Chartered Accountants of India (ICAI). Significant accounting policies are disclosed in the annual report. The day-to-day accounting is on cash basis and liabilities are accrued/ provided for at the time of quarterly and annual closing. Financial transactions are approved in accordance with the formal Delegation of Powers (DoP) last updated in May 2008.

18. For VPHEP there will be a separate trial balance with general and sub-ledger codes to capture the project expenditure by category/ component/ contract package for monitoring and reporting. VPHEP is already a separate accounting unit and prepares its set of financial accounting statements which are audited. Separate trial balance and GL codes would only be used to segregate the IBRD and counterpart financed project resources and expenditure from other routine activities of VPHEP.

19. Finance Manual: THDC has issued office memoranda from time to time containing guidelines for carrying out accounting and financial management activities.²⁸ In order to consolidate and update the guidelines and to address THDC's current and future requirements, internal controls, industry best practices, computerized environment, IFRS and other statutory

²⁶ The department is temporarily reporting to Director Finance since the position of GM Finance is vacant.

²⁷ Rishikesh (Corporate Office), Tehri Stage I, Tehri PSP, Koteshwar, VPHEP, NCR, New Tehri Town (for new projects), Bhutan, Dehradun, and Lucknow

²⁸ The guidelines have been issued in 1990, 1991, 1993, 1999, 2006 and 2007.

requirements and management reporting needs etc THDC in December 2010 appointed consultants²⁹ to develop financial management manuals covering accounting, budgeting, cost accounting, internal audit and financial reporting. The manual will play an important role in that - it will serve as a guide for carrying out day-to-day financial accounting and management activities under appropriate checks and controls; bring about uniformity and consistency in practices across THDC and form the basis for audits and improvements.

20. There is a separate operations manual for the IBRD funded project to highlight the project management structure, powers and responsibilities, FM procedures and controls relating to project payments, control over project materials and assets, accounting, reporting and audits. This would serve as a handbook for the duration of the project.

21. Financial Reporting: The reporting system comprises the following periodic financial reports:

- To GoI, GoUP and THDC management:
 - Monthly statements, according to budget head - capital expenditure by project, revenue expenditure, fund release statement, amount receivable from GoUP on account of irrigation component
- To THDC Management
 - Monthly budget versus actual expenditure report with variances, circulated to THDC management
 - Monthly revenue realization report
 - Monthly project progress report (physical)

22. Reporting is linked to management's needs and these revolve around budget performance and variance analysis, periodic operating results, cash flow and working capital management, project management, cost management, etc. THDC commenced preparation of half-yearly accounts from financial year 2007-08 onwards and presented these accounts to the Board from 2009-10 onwards. THDC has now moved to quarterly reporting to the Board effectively from financial year 2010-11. An enhanced reporting package would be developed based on the recommendation of the consultants appointed to prepare financial manuals for THDC after carrying out an organization wide requirements assessment. This will ensure that only those reports that are required for decision making at various levels are generated.

23. The reporting framework for the WB - financed project will include quarterly un-audited financial reports (on cash basis) prepared by THDC, in an agreed format, which would give details on the project expenditure incurred till date along with projections of funds utilization in the next two quarters based on the budget, physical and financial progress of the project and contracting status. These reports will be prepared from information generated from THDC's FM and other reporting systems and submitted to Project Management and IBRD.

24. Accounting Policies and Procedures: The financial statements (balance sheet and the profit and loss account) of THDC are governed by the Indian Companies Act which requires preparation of annual financial statements on full accrual principles applying accounting standards issued by the Institute of Chartered Accountants of India (ICAI). Significant

²⁹ THDC has hired KPMG to prepare financial manuals. Deliverables are expected in the next six months.

accounting policies are disclosed in the annual report. The day-to-day accounting is on cash basis and liabilities are accrued/ provided for at the time of preparing quarterly and annual financial statements.

25. THDC has well defined accounting policies and procedures (in line with the requirements under the National Standards of Accounting³⁰ in India) in place for revenue recognition, construction accounting and treatment of expenditure under construction, fixed assets, grants-in-aid, booking of expenditures and valuation of inventories and investments. CERC has issued necessary instructions to power sector companies for charging depreciation for tariff purposes which is being followed by THDC from 2006-07 onwards. In respect of assets where no such rates have been notified, rates specified by the Companies Act are being used. THDC is also taking steps to implement IFRS from April 2012 onwards and have appointed consultants for IFRS implementation and training³¹.

26. **Costing system:** As required under the Companies Act 1956, and with the commissioning of Tehri Stage I, THDC is subject to cost record maintenance and an annual cost audit. Cost records are being maintained manually by the costing cell headed by a Deputy Manager who is a cost accountant. Cost accounts are being prepared on annual basis and audited. Cost accounts for 2010-11 are expected to be generated by the FAS at least on quarterly basis in order to provide periodic cost information to management. A cost accounting manual is under preparation by consultants. Costing is an effective tool for improving operational efficiency, removing bottlenecks and controlling costs. It also helps in preparing budget estimates, setting standards and in decision making. Thus an integrated financial and cost accounting system with periodic cost reports will further strengthen cost monitoring and control.

27. **Billing and tariff:** THDC is raising bills based on interim tariff orders issued by CERC pending declaration of the final tariff. A provisional tariff petition was filed by THDC on July 21, 2006 before CERC based on capital expenditure incurred up to December 31, 2005. According to CERC order dated December 28, 2006 a provisional tariff of Rs.3.50/kWh, as agreed with beneficiary states, was approved and which was valid up to December 31, 2006. CERC also notified two-part tariff effective from 01.01.2007 vide their order dated 28.12.2006. Through CERC's further orders, this two part provisional tariff was extended from time to time and is being followed for billing till now.³² This tariff is subject to adjustment after determination of the final tariff. The final completion cost has been approved by CCEA and subsequently the final tariff petition has been filed with CERC. There is a risk that CERC may not consider the entire cost over-runs in determining the tariff since it is required to apply 'prudence checks' while considering a tariff petition. THDC has pegged the actual tariff at Rs 4.82/kWh for 2007-08 gradually rising to Rs 5.98/kWh in 2011-12, based on the Annual Fixed Charges, calculated in line with revised CERC tariff regulations applicable from 2009-14, which is higher than the interim tariff allowed by CERC.

³⁰ As per the India - ROSC (A&A) dated December 2004, the Indian Accounting standards are modeled on International Financial Reporting Standards (IFRS) and except for some small revisions (required for customization to local circumstances and legal requirements) are largely in consonance.

³¹ The contract has been awarded to ICWAI- Management Accounting Research Foundation. Contract expiry date is March 31 2013.

³² Energy charge @ Rs 2.50 per kWh on the scheduled energy, and capacity charge @ Rs 18000/ MW per day for peaking support.

28. The responsibility for monthly billing and realization from beneficiary states rests with the Corporate Commercial Department. The department is headed by AGM and supported by nine executives, including finance personnel. This department is responsible for reconciliation of outstanding dues with beneficiary states; maintaining memorandum sales and debtors' records; review of debtors' position; and finalizing year end provisions for doubtful debts. THDC has stated that it is verifying/ reconciling its own generation data received from power house with that provided in the REA (prepared by NRLDC/ NRPC) as an internal control measure. The producing unit is responsible for accounting for sales and maintaining debtors' ledgers. A detailed sales accounting manual has been prepared.

29. During 2009-10 the total revenue from sale of energy was Rs.1417 crore including provisional billing of Rs.346 crore. Sundry debtors considered good as on March 31 2010 were Rs.758 crore representing 6 months' sales. During 2009-10, the total billing was Rs.1065 crores and sundry debtors were Rs.374 crores. Both sales and debtors figures are inflated by calculating annual billing based on full regulatory assets (annual fixed charges) not reflected in the provisional tariff. Supplementary bills are raised on the beneficiaries for the extra amounts for information only. The amounts are recoverable once the final tariff is announced. There is a possibility/ risk of write-off in future in case the final tariff is lower than the annual fixed charges considered in the supplementary bills.

Staffing – Finance function

30. The project's financial arrangements would be handled by finance staff working at corporate headquarters (Rishikesh), site office (Pipalkoti) and liaison office (NCR). At present there is a vacancy in the position of GM (Finance)³³. The staff strength of THDC as on March 31 2011 is 2192 comprising 758 executives, 177 supervisors, and 1257 workmen. The current strength of Finance Department is 109, comprising 98 executives and 11 supervisors spread across the corporate office and accounting units. The minimum qualification is a bachelor's degree. There are several with professional qualification/s (CA, ICWA, MBA, LLB); most with service experience of over 10 years. Finance staffing in the locations handling the project is as follows:

Location	Actual	Remarks
Corporate Office Rishikesh	47	43 executives (7 CA, 13 ICWA, 6 MBA and 17 graduates/ post graduates) and 4 supervisors (graduates).
Project Office Pipalkoti	6	6 executives (3 ICWA and 3 graduates/ post-graduates)
Liaison Office NCR	6	All executives (2 ICWA, 4 graduates)

31. According to THDC, in the absence of sanctioned strength, it is not possible to accurately determine the vacancies. In view of the planned diversifications and attrition levels there is a need for additional qualified and experienced executives at senior levels. THDC has recruited 14

³³ Accounting, taxation, budget and concurrence functions report to GM(F)

executive trainees in finance out of a total of 100 recruited till date. To adjudge the required staff strength, a proper staffing assessment would be necessary with a recruitment plan.

32. There is increasing management focus on human resources development. The MOU for 2009-10 envisaged training of 435 employees. Directors' reports for 2009-10 state that training was imparted to 2642 employees for 6270 man-days, Rs.3.49 crores were spent on training and learning activities and that plan for developing an HRD Institute has been finalized. Training and learning activities need to be sustained in line with the organization's policies, growth and the future objectives. The MOU also specifies broad training subjects such as enhancing functional areas, managerial, behavioral, leadership competencies, O&M, worker skills and disaster management etc. It is an accepted best practice to define minimum mandatory training hours/ days per person per annum and monitor its implementation through the appraisal process including effectiveness of training. The training and learning policy of THDC specifies minimum seven days training in a training year. This policy is yet to be fully implemented.

33. An IIM study carried out earlier covered (among others) manpower development in THDC and one of the functional areas identified for strengthening was financial management. In September 2007 the company issued training and learning policy and was expected to follow up with the appointment of consultants for a detailed training & learning needs (TLN) analysis in THDC. The consultants were appointed in June 2010 for grades below Manager and the revised date for submission of report is June 30 2011. In the meantime to strengthen present capacity, THDC is hiring young professionals (engineers, geologists, finance and HR) as executive trainees for induction after proper training and evaluation. Around 100 executive trainees have been hired in different disciplines. Personnel policies of the Corporation have been uploaded on THDC's website and are being updated regularly.

Project FM Arrangements

34. The following FM arrangements are being considered for VPHEP implementation -

- DGM Concurrent Audit Cell (CAC) at Corporate Office (CO) would be responsible for project FM and supported by Senior Manager Accounts located at project site. Additional need based support will be provided at CO and project level.
- Separate bank account for IBRD funds will be maintained at CO (special account) and at the project site. Direct payments by IBRD to contractors/ suppliers based on authorized documents would be an available option. Separate budget and accounts codes will be maintained to track activity/ package wise expenditure. THDC in the usual course will prepare a separate trial balance for VPHEP and a sub-trial balance for IBRD financed activities. The sub-trial balance format will facilitate direct mapping to the IUFR.
- Following Bank contracting procedures, all IBRD contracts will be awarded by ED - Contracts at CO. Copy of contract will be available with finance at CO and project.
- Project execution will be under the overall control of GM VPHEP. Each package under the project will be the responsibility of the individual Engineer-in-charge. Measurement Books will be maintained to measure works; bills will be raised as specified in the contract and checked and authorized by competent authority in accordance with company prescribed guidelines/ manual and the DOP. Project finance personnel will

check bills and pass them for payment. Payment options are RTGS/ check/ demand draft.

- Project will receive funds from CO (from special account as well as counterpart funds) based on periodic requisitions. The project will submit quarterly IUFR in the agreed format to the Bank for funds disbursement. The IUFR will be reconciled with the project trial balance and the project bank statements.

35. All original bills and related documents, records, etc. will be maintained at CO/ project site as appropriate and will be subject to both internal and statutory audit, which will be carried out under agreed terms of reference. Following laid down procedures, project monitoring will be carried out daily/ weekly/ monthly by MPS at project site and CO. Monthly progress review meetings will be held with Director (Technical). Suitable project monitoring software (e.g., Prima Vera) will be used as a monitoring tool by project engineers-in-charge and it would be possible for MPS at CO to provide progress reports in both physical and financial terms based on the software generated reports.

FM and other Information Systems

36. New on-line, integrated, web-based financial management systems have been developed and implemented in THDC. The applications are using dot net technology with RDBMS as Oracle 10g. IT infrastructure is in the form of wide area network. Connectivity between CO and units through 2 MBPS MPLS Data Circuit is being established. Security audit by NIC has been completed for web posting.

37. The financial accounting system (FAS) comprising 15 integrated modules are in operation. Further upgrades in the features are being carried out, for instance, a system of mapping budget codes with account codes has been successfully implemented. Annual technical support is being contracted out to the original developer for necessary upgrades based on user requirements. Computerized costing system is under implementation.

38. There are several stand-alone systems developments/ proposals:

- IT department has completed e-procurement for small purchases.
- Personnel department has partially developed separate HR systems with employee database.
- O&M software is under implementation in Tehri Phase 1
- Commercial department is running its own billing systems.
- Primavera - project monitoring system has been implemented in MPS.

39. Without an overall IT plan, development of stand-alone systems has serious consequences for the organization in terms of difficulties in integrating them and providing the necessary infrastructure and support. THDC is in the process of developing an IT roadmap which would be placed for Board approval once ready. The IT policy for THDC is in favor of development of IT systems under an overall integration plan as opposed to implementation of an ERP. For THDC, with its decentralized operations, integration is the key – whether through integrated package such as ERP or through stand alone systems accessible to all through proper application software, IT hardware and infrastructure. A cost-benefit analysis of development of applications

versus ERP customization could help in justifying the option selected. A committee could debate the options and finalize the IT roadmap. While ERP package implementation is expensive, takes time and is effort intensive, the value addition is also commensurate with the effort.

Corporate Governance

40. Corporate governance code issued by the Department of Public Enterprises (DPE) under Ministry of Heavy Industries and Public Enterprises is mandatory for all CPSUs. The aim is to institutionalize in CPSEs, good corporate governance practices that are broadly in conformity with SEBI guidelines (clause 49 of the Listing Agreement) to facilitate entry into the capital markets for resources. In the following table, the key components of the code of corporate governance and the present status in THDC are presented.

Table 1: Status of Corporate Governance in THDC

Model code	Present THDC status
Board of director shall have an optimum combination of functional, nominee and independent directors. The number of functional directors (including CMD/MD) should not exceed 50% of the actual strength of the board.	The current strength of THDC's board is 12: Full-time CMD; three full-time functional directors; five government nominees (one each from CEA, CWC and MoP and two from GoUP) and three independent directors.
The number of nominee directors shall be restricted to a maximum of two.	The constitution of the Board of THDC is presently under consideration by the GoI.
In case of CPSEs listed in stock exchanges, the number of independent directors shall be at least 50% of board members. In case of CPSEs not listed in the stock exchanges at least one third of the board members should be independent directors (part-time directors).	
Qualified and independent audit committee shall be set up giving the terms of reference with minimum three directors as members; Two thirds of the members of audit committee shall be independent directors; The chairman of the audit committee shall be an independent director.	THDC has a functioning audit committee with three members which includes all independent directors. The chairman of the audit committee is an independent director. Director Finance is a non-voting member.
Audit committees should meet at least four times in a year and not more than four months shall elapse between two meetings.	Detailed role and powers of the audit committee have been specified covering pertinent areas. According to the business rules of the audit committee at least four meetings are prescribed and held.
Risk management strategies and their oversight shall be one of the main responsibilities of the board and management. Disclosure on risks and concerns should from part of Director's report.	Risk Management manual has been approved by the Board.
The guidelines provide a list of minimum information that is required to be placed before the board and included in the report on corporate governance in the annual report of the company.	Quarterly results are being reported to the Board from FY 2010-11. Annual report on corporate governance is included in the Directors Report.

41. Independent directors: In May 2008 three independent directors were appointed to THDC's the Board. The first audit committee meeting with independent directors was held in August

2008. During 2009-10 six meetings of the audit committee were held. The current strength of THDC Board is 12. The number of independent directors will depend upon the strength of the reconstituted Board (presently under consideration by GoI).

42. Risk management: THDC is engaged in hydro development involving implementing and operating complex hydro projects subject to significant unforeseen events and risks. THDC has already identified relevant risk factors and developed risk management manual which have been approved by the Board. Risk management framework is expected to be rolled out in 2011-12. Regular risk assessment and monitoring of the effectiveness of risk management measures need to be put in place with internal audit and independent audit committee playing important roles.

43. In respect of other corporate governance measures, the code of business conduct/ ethics for board members and senior management has been approved (September 2009). Remunerations committee has been re-constituted with three independent directors and is holding regular meetings.

Internal audit (IA)

44. Internal audit department operates from Corporate Office in Rishikesh; the department is headed by Additional General Manager (Audit) reporting to Director (Finance). Currently there are four staff members including a Senior Engineer. The audit committee reviews internal audit programs and the synthesis of important audit observations of both in-house audit and audit by external CA firms. The internal audit manual is being updated; internal audit of THDC is being carried out by 14 firms which includes physical verification of stores and assets. Internal audit is carried out in 2 phases – April-December and January-March. An in-house consultant reviews/ updates policies and procedures for improvements where appropriate.

45. Past reports of statutory auditors had opined that the internal audit system required strengthening to make it commensurate with THDC's size and nature of business. Recognizing the steps taken by THDC to strengthen the function, the statutory audit report for FY 2009-10 for the first time assessed the internal audit function to be commensurate with THDC's size and nature of business. The actions taken by THDC to strengthen the function include appointment of AGM to head the department; broad scope audit program is approved by the audit committee and important audit observations are placed before the audit committee for review. The consultants engaged to prepare financial manuals are working with the internal audit department to develop detailed checklists for audit of the various departments/ activities of THDC. Further, with the implementation of the risk management manual internal audit will be more focused on reviewing the effectiveness of risk mitigation measures and suggesting improvements. Risk based audit approach would be suitably incorporated in the internal audit manual.

46. From a focus on financial transactions the scope of internal audit for 2010-11 has been broadened to cover commercial audit including reconciliation of generation and billing; review of O&M including scheduling, mandatory spares, emergency purchases; procurement/ e-procurement etc. Joint meeting between statutory auditors and internal auditors has been held for exchange of views and a better appreciation of the internal audit coverage to provide the basis for assessment by the statutory auditors of the effectiveness of internal audit.

47. **Actions proposed for strengthening:** There is already recognition that internal audit needs to be organization-wide and independent of the departments covered under its scope. In this context the following may be considered for further strengthening the function:

- **Role of IA department and scope:** Build up department's role/ objectives so that it can effectively manage the internal audit process. Ensuring high standards of quality of internal audit by CA firms has been a challenge. The department needs to continuously monitor audit quality; direct focus of internal audit on key areas of performance (risk based) and report to the audit committee synthesis report of prioritized internal audit observations monitor their resolution. With the implementation of risk management manual there is now a need for independent review of technical aspects of construction and operations to ensure that technical risks are suitably mitigated. THDC needs to introduce technical review/ audit under suitable terms of reference and submit technical audit reports to the audit committee periodically.
- **Independence and capacity:** Enhance independence of the function through direct reporting to CMD or to the audit committee in line with international trends and standards laid down by the Institute of Internal Auditors. Internal audit role has been traditionally defined narrowly to financial transactions whereas its ambit is organization-wide covering the entire supply chain. Thus the function should be independent of the departments it audits and be suitably positioned in the organization. Therefore the position of the head of the internal audit department should be at par with the heads of other departments. THDC has plans to recruit GM (Internal Audit) and proposes to address the independence aspect under guidance of the audit committee in due course. Adequate staffing and training to enhance knowledge and expertise of departmental staff are also critical requirements.
- **Auditor selection:** Define policy and assess the capacity of external firms to carry out the audit as per the management's objectives. In addition to financial audit, THDC needs to increase its focus on technical audit, commercial audit, systems audit and risk management audit. Thus skills requirements would be varied. In this scenario to provide value to the organization, separate specialized firms/ professionals may be required to carry out future audits of a high quality under specifically designed TORs.
- **Internal audit manual:** Update internal audit manual with objectives and guidelines for organization wide internal audit covering all departments and activities. Risks have been assessed and mitigation measures defined by management. Internal audit would review the control environment and associated risk mitigation practices, assess the situation, prioritize the impact and report. The manual would incorporate relevant standards and industry best practices and serve as the basis for audit. Consultants are in the process of developing internal audit manual.
- **Audit report:** Internal audit report need to quantify impact of observations and risks to the organization in terms of losses/ costs/ reduction in benefits etc to the extent practicable and prioritize them for maximum effect. There should be a document trail of response of and action by auditee, follow up on unresolved queries and implementation of suggestions. THDC could also consider instituting a definite time frame for response/ action to enhance accountability. Internal Audit observations should ideally be carried forward until they are closed to the satisfaction of the auditor or closed by management decision. There should be

compilation of important audit observations and compliance. Frequency of internal audit reports should be increased from the current two to four (quarterly).

48. The IBRD financed project would be subject to internal audit (under agreed terms of reference) and its reports would be made available to the IBRD periodically.

External Audit

49. Statutory auditors of THDC are appointed by the Comptroller and Auditor General (CAG) of India. The Statutory audit is carried out by independent firms of chartered accountants and covers all accounting units of THDC. Normally, the audit of all units is completed by July and the auditor's report is issued by August. The Board approved accounts and audit report are sent to CAG for supplemental audit as required under section 619 of the Companies Act. Audited accounts with CAG comments and auditors' report are placed before the audit committee and Board and after Board approval these are placed at the annual general meeting by September 30 each year. Statutory audit is conducted in accordance with auditing standards generally accepted in India. There are no material observations in auditors' report. The notes to accounts point out a few old outstanding matters which THDC may review and resolve.

50. Performance audit of THDC has been taken up by the CAG covering the past 15 years of operations of the company. The review is expected to be completed in six months and the report would be placed before the Parliament. The review would cover the complete process of concept to commissioning and report deviations. This would be an opportunity for THDC to further strengthen the controls based on the findings of the performance audit.

51. Specifically for the proposed IBRD financed VPHEP, a separate annual project audit report will be required. The project audit would be carried out by an independent and reputed firm of chartered accountants acceptable to World Bank under agreed terms of reference³⁴. The project audit report and project financial statements (containing component wise details of progress and funding sources) would be required to be submitted by September 30th each year i.e. 6 months after the end of the financial year along with the entity audit report. Thus the following audit reports will be monitored in Audit Reports Compliance System (ARCS) by the Bank:

Table 2: Audit Reports Monitoring

Agency	Audit Report	Audited by	Due Date
THDC	Annual Entity audit report as required under the Companies Act 1956	Statutory Auditors appointed by CAG	30 th September
THDC	Project audit and audit of Special Account	An independent firm of Chartered Accountants (which may include the statutory auditors)	30 th September

³⁴ The auditor could be the C&AG recommended statutory auditor, which will depend upon the credentials and experience of the audit firm selected and concurrence of the Bank.

52. Resettlement & Rehabilitation (Non Bank funded) component - fund flows and internal control: Although the IBRD project will not finance R&R costs associated with the project, the activity and the expenditure will be an integral part of the project. Regular reports will be prepared on physical and financial progress under this component, the expenditure would be audited as part of project/ entity audit – both statutory and internal audit. THDC has developed a project-specific Resettlement and Rehabilitation (R&R) Policy together with the Resettlement Action Plan (RAP), has deployed a social mitigation team (a sociologist and two social workers), and has contracted a reputed regional NGO to assist with communication with the villagers, preparation and implementation of the RAP, and preparation of local development activities. From a financial accountability perspective the RAP would ensure clear fund flows with adequate internal control and accountability.

53. VPHEP affects a total of 1,223 households (1,477 families with 5,159 persons) in 19 villages. R&R disbursements will cover payments in two phases – first relating to land and structure compensation to be paid by revenue department and second relating to Micro Plan covering (i) rehabilitation grant and subsistence grant for land loss; (ii) self resettlement grant specific to displaced households for Haat village; and (iii) resettlement grant and shifting allowance for displaced households of other villages. Under this framework, GM VPHEP will approve micro-plans for R&R assistance prepared with the help of NGO which will cover impacts, calculation of total R&R assistance due to PAF/ PAH under various heads and village wise overall phased disbursement plan as per R&R policy. Detailed PAF and PAH wise files will be maintained by THDC project office containing all details like unique identification number of PAF, ID cards, pass book, joint account number; copies of checks issued and notarized copy of the full and final settlement with the PAF.

54. The funds flow arrangements for R&R are as follows -After approval of micro plan by project GM, proposal for release of R&R assistance is prepared by Senior Manager Social in accordance with the disbursement plan and submitted to GM Project for approval and forwarded to project finance for issue of a check/ funds transfer through RTGS.

- Assistance below Rs.50,000/- is released in one installment. An agreement on full and final settlement is signed by PAF, notarized and retained by project office. PAF is required to submit a utilization certificate to S&E Department of THDC within three months which is verified by NGO.
- Assistance above Rs.50,000 is paid in two installments. The first installment is 60% of the total amount which is released after signing the agreement on full and final settlement and notarization. The PAF will be requested to submit a utilization certificate verified by the NGO to THDC before claiming the second installment. Project S&E department prepares proposal for release of second installment which is approved by GM project.
- Land compensation: For land compensation THDC deposits the required amount as per advice of SLAO. SLAO obtains pre-receipt signed by PAFs which is sent to the Treasury for preparation of PAF wise checks. Thereafter, on pre-identified date/s camp is organized by THDC in the respective village/s for the disbursement of checks. PAFs are informed of the camp at least seven days in advance. SLAO or his representative visits the village to disburse the checks in the presence of THDC representative and NGO. Thereafter THDC would follow up and ensure that land title is transferred to THDC through search of land records.

55. **Right to Information and Disclosure on project:** Under Right to Information (RTI) Act, 2005 a public authority is required to maintain and make available detailed records to facilitate right to information. It envisages computerization of records and accessibility through network. The Act also requires every public authority to, designate required number of Public Information Officers, in all administrative units or offices under it and publish particulars of such officers to provide information to persons requesting for it under the Act. PSUs are using their websites for meeting the requirements of RTI Act. THDC has an RTI page on its official website and a RTI secretariat. THDC has designated public information officers and posted their particulars on the RTI website along with other relevant company information. The annual financial statements are available in THDC's website. The RTI secretariat is functional and is receiving and dealing with cases received under the Act. As on March 31 2011 a total of 494 cases were received, eight rejected, eight is pending and the rest have been replied. There have been 77 appeals to the appellate authority (Director Personnel), 58 are rejected, 17 admitted and two are under process. A total of sixteen cases were referred to the Central Information Commission and all are disposed of.

56. THDC has developed a separate Web site for VPHEP where it will host in relation to the WB financed project its operations manual, financial management manual, annual audited financial statements, interim unaudited financial reports and the internal audit reports. These would be updated periodically to reflect the current status.

Table 3: Action plan for strengthening corporate governance & financial accountability arrangements in THDC – Implementation Status

Area of Action	Actions required for implementation and Date
Actions within the control of THDC (short term)	
<u>Internal audit</u> Improve the internal audit arrangements to fulfill managements objectives, size and nature of business in line with governance requirements Involve audit committee in strengthening the function	Commence implementation of risk-based internal audit in THDC. (FY 2011-12) Improved quality and adherence to broad scope TOR by CA firms. (FY 2011-12 audit) Plan technical audit with report to audit committee for independent monitoring of technical risk mitigation measures under risk management framework. (Firm up plan in FY 2011-12) Increase frequency of internal audit reports from the present two to four. (Starting FY 2012-13) Appoint GM to head internal audit function. (Continue search). Align reporting responsibilities of internal audit to make it independent in due course after consultation with the audit committee. (Initiate discussions and evolve plan in FY 2011-12) Develop internal audit manual for a comprehensive organization wide coverage with focus on risk management and systems improvement (Draft by September 2011)
<u>Capacity building</u> Recruit, training and build capacity in FM and HR	Initiate work on staffing requirements. (September 2011) Consultant prepared report on training needs analysis and action plan. (September

Area of Action	Actions required for implementation and Date
	2011)
<u>Cash forecasting</u> Introduce rolling cash forecasts for managing funds in a formal manner. This is linked to budgetary reporting and financial reporting	Implemented; to be continuously reviewed.
Actions within the control of THDC (medium term)	
<u>Risk management</u> Develop risk management system in line with the corporate governance guidelines	Risk Management Manual approved by Board. Roll-out in FY 2011-12.
<u>Information Technology (IT) Roadmap for THDC</u> Assess best way forward for integrating existing and proposed stand alone systems. Develop IT road map for the organization.	IT road map taking into account need for and feasibility of integrated and single data platform systems (anticipated completion in October 2011)
<u>Other MIS reporting</u> Formalize reporting requirements to support risk management and performance monitoring	Review organization wide reporting requirements and introduce need based reports to support decision making. (Part of finance manuals to be submitted by September 2011)
<u>Financial management Manuals</u> Develop/ update manuals for a more formalized and systems oriented corporate governance and financial accountability environment	Draft manuals covering (a) budgeting (b) costing (c) financial accounting, (d) reporting (By September 2011).
Actions beyond the control of THDC but critical from management and corporate governance perspective	
<u>Conversion into Public Limited Company</u> Complete formalities for conversion into public limited company for enhancing the corporate governance requirements.	Company is now a registered public limited company. Mini ratna status accorded.

Annex 8: Procurement Arrangements

INDIA: Vishnugad Pipalkoti Hydroelectric Project

A. General

Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, revised October 2006 and May 2010; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, revised October 2006 and May 2010; and the provisions stipulated in the Loan Agreement. The general description of various items under different expenditure categories is given below. For each contract to be financed by the Loan, the different procurement methods or consultant selection methods, the need for prequalification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank project team and indicated in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

Procurement Methods:

Except as provided under "Other Procurement Procedures" below, the goods and works for the project would be procured on the basis of International Competitive Bidding procedures as follows:

Procurement of Works: The main works for this project (4x111 MW) will be procured through one contract package namely "EPC contract for Civil Works and Hydro mechanical Equipment Works including Penstock liners" at an estimated cost of USD 461 million (with contingencies). The pre-qualification process for this package following ICB procedures of the Bank has been completed.

The bidding documents for this package prepared by THDC using the Bank's SBD for "Procurement of Works, version April 2007" for ICB have been issued to the pre-qualified bidders after the Bank's "No Objection". Bids were received on May 30, 2011 and are under evaluation.

Procurement of Goods: The main goods and equipment for this project (4x111 MW) will be procured through one contract package of goods namely "EPC contract for electro-mechanical works" at an estimated cost of USD 173 million (with contingencies). The pre-qualification process for the package following the Bank's ICB procedures started with prior review of the PQ documents by the Bank. The PQ applications have been received and the applications are being evaluated by THDC. THDC will need the Bank's "no objection" to the evaluation of the PQ applications when finalized.

THDC is preparing the draft bidding documents for this contract package.

This contract package will be procured using the Bank's latest SBD for "Procurement of Plant Design, Supply and Installation" version April 2008, revised August 2010 and will be cleared

with the Bank. At present, no procurement of goods based on “Procurement of Goods” following ICB procedures of the Bank is envisioned. If the need for this type of procurement arises, the Bank’s latest SBD for Procurement of Goods, version May 2007, revised May 2010 for ICB will be used.

The provisions of paragraphs 2.55 and 2.56 of the Procurement Guidelines, providing for domestic preference in the evaluation of bids, shall apply to goods manufactured in the territory of the borrower and the works (if GNP of India is below the specified threshold of GNP per capita). For procurement of “EPC contract for Civil Works and Hydro Mechanical Equipment Works including Penstock Liners” no domestic preference is applied.

Other Procurement Procedures: The following procurement methods may be used for all contracts to be financed by the Bank:

1. National Competitive Bidding: Works estimated to cost equivalent of USD 10 million or less and Goods estimated to cost USD 300,000 equivalent or less per contract may be procured under contracts awarded on the basis of National Competitive Bidding procedures in accordance with paragraph 3.3 and 3.4 of the guidelines and the following additional provisions:
 - Only the model bidding documents for NCB agreed with the Government of India Task Force (and as amended from time to time) shall be used for bidding.
 - Invitations to bid shall be advertised in at least one widely circulated national daily newspaper, at least 30 days prior to the deadline for the submission of bids.
 - No special preference will be accorded to any bidder either for price or for other terms and conditions when competing with foreign bidders, State owned enterprises, small-scale enterprises or enterprises from any given State.
 - Except with prior concurrence of the Bank, there shall be no negotiation of price with the bidders, even with the lowest evaluated bidder.
 - Extension of bid validity shall not be allowed without the prior concurrence of the Bank (i) for the first request for extension if it is longer than four weeks; and (ii) for all subsequent requests for the extension irrespective of the period (such concurrence will be considered by the Bank only in cases of Force Majeure and circumstances beyond the control of THDC).
 - Re-bidding shall not be carried out without the prior concurrence of the Bank. The system of rejecting bids outside a pre-determined margin or “bracket” of prices shall not be used in the Project.
 - Rate contracts entered into by Director General of Supplies & Disposals (DGS&D) will not be acceptable as a substitute for NCB procedures. Such contracts will be acceptable for any procurement under shopping procedures.

- Two or three envelope system shall not be used.
2. Shopping: Goods and works estimated to cost less than USD 30,000 per contract may be procured following Shopping procedures in accordance with the requirement of paragraph 3.5 of the Procurement Guidelines
 3. Direct Contracting: Goods and works which meet the requirements set forth in paragraph 3.6 of the Procurement Guidelines may be procured after the Bank's agreement on the basis of Direct Contracting in accordance with provisions of paragraph 3.6 and 3.7 of the Procurement Guidelines.

Selection of Consultants: At present only one Consultancy, namely "Consultancy Services as Review Consultants" has been identified and is under procurement, but additional consultancies will be developed during implementation, in particular for the Capacity Building and Institutional Strengthening Component. Under this component, initially consultant's services for skill gap analysis will be procured.

Short lists of consultants for services estimated to cost less than \$500,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. The Bank's Standard Request for Proposal document will be used for all procurement of Consultancy services to be procured under the Project.

Particular Methods of Procurement of Consultant Services:

Quality- and Cost-based Selection: Except as provided under "Other Procedures" below, consultant Services may be procured under contracts awarded on the basis of Quality- and Cost-based Selection in accordance with the provisions of Section II of the Consultant Guidelines.

Other Procedures

1. Quality-based Selection: Services which meet the requirements set forth in paragraph 3.2 of the Consultant Guidelines shall be procured under contracts awarded on the basis of Quality-based Selection in accordance with the provisions of paragraphs 3.1 through 3.4 of the Consultant Guidelines.
2. Selection under a Fixed Budget: Services which meet the requirements set forth in paragraph 3.5 of the Consultant Guidelines may be procured under contracts awarded on the basis of Selection under a Fixed Budget in accordance with the provisions of paragraph 3.5 of the Consultant Guidelines.
3. Least Cost Selection: Services which meet the requirements set forth in paragraph 3.6 of the Consultant Guidelines may be procured under contracts awarded on the basis of Least Cost Selection in accordance with the provisions of paragraph 3.6 of the Consultant Guidelines.

4. Selection Based on Consultants' Qualifications: Services estimated to cost less than \$100,000 equivalent per contract may be procured under contracts awarded in accordance with the provisions of paragraphs 3.1, 3.7 and 3.8 of the Consultant Guidelines.

5. Single Source Selection: Services for tasks in circumstances which meet the requirements of paragraph 3.10 of the Consultant Guidelines for Single Source Selection, may, with the Bank's prior agreement, be procured in accordance with the provisions of paragraphs 3.9 through 3.13 of the Consultant Guidelines.

6. Individual Consultants: Services for assignments that meet the requirements set forth in the first sentence of paragraph 5.1 of the Consultant Guidelines may be procured under contracts awarded to individual consultants in accordance with the provisions of paragraphs 5.2 through 5.3 of the Consultant Guidelines. Under the circumstances described in paragraph 5.4 of the Consultant Guidelines, such contracts may be awarded to individual consultants on a sole source basis.

B. Assessment of the agency's capacity to implement procurement

Procurement activities will be carried out by THDC. THDC has earlier not implemented any project with the Bank.

An assessment of the capacity of the Implementing Agency to implement procurement actions for the project has been carried out by the procurement specialist of the Bank during preparation of the project. The assessment revealed that the procurement activities are carried out by THDC as under:

- i) **Corporate Contract Department** - Headed by Executive Director and assisted by one Additional General Manager. At present there are about 9 executives in Corporate Contract Department out of which three executives are at the level of Sr. Manager, one at the level of Manager, one at the level of Dy. Manager, three at the level of Engineer, and one Law officer. One Sr. Manager, one Manager and two Engineers under this group handle procurement related to VPHEP and, in addition, handle other miscellaneous procurement to be made from Corporate office.
- (ii) **Indenting Departments** – Engineering and Project are the indenting depts. which are headed by the respective General Managers and directly assisted by Additional General Managers / Deputy General Managers.

Engineering Department is divided into two groups – Design (Civil & HM) and Design (electro-mechanical) each headed by a General Manager and further divided into various sub-groups like Civil, Hydro-Mechanical, Electrical, Mechanical, Communication etc. which are headed by Additional General Managers / Deputy General Managers. There are about 30 Executives in Civil group and about 27 in E/M group. The technical specifications, BOQ, etc. are prepared by the respective Design Departments.

- (iii) **Finance Department** - The concurrence group of Finance Department at Rishikesh is associated with Corporate Contracts Department in preparation of tender document, opening of bids, evaluation of bids and award of contract. The evaluation report and recommendation for award are scrutinized and vetted by the finance concurrence group. There are 35 Executives in Finance at Rishikesh, out of which, four Executives including Deputy General Manager carry out the function of corporate Finance Concurrence.
- (iv) **Quality Assurance & Inspection Dept.** – (QA&I) Dept. headed by Additional General Manager is responsible for tying up all quality and inspection aspects that would have to be incorporated in the bidding documents and adhered to during the execution of the contract. QA & I Dept. functions are managed by about 20 executives at different levels.
- (v) **The VPHEP Project** – This project is headed by a General Manager. He is responsible for implementation of the project as per schedule. There are about 40 Executives in Project site at present.

The process generally followed by THDC from the period between release of IFB up to the award of contracts is as under:

- Sale of bid documents is done by Corporate Contract Department. The period of sale is generally 30-45 days in case of domestic bidding and varies from 60 to 90 days for International Competitive bidding.
- Tender Committee composition for evaluation of bids and recommendation for award are as per Delegation of Powers. In the case of procurement requiring approval of Board of Directors / CMD, the tender committee members are at the level of General Manager (Design-Civil & HM / E&M) (as the case may be), Additional General Manager (Corporate Contracts), Deputy General Manager (Finance) and the GM (Project) as additional member. The level of Tender Committee depends on the level of the competent authority for approval of award for a particular package as per the Delegation of Powers of THDC.
- The Bid Evaluation schedule is prepared by Corporate Contract department based on the validity of bids and requirement of the scheme. Usually the validity of bids is 90 days for small value contracts and up to 180 days for large value and complex contracts.
- In case Pre-bid Conference is necessary, Corporate Contract department convenes the same, associating Engineering, Project and Finance Departments. Pre-bid Conference is generally held for most packages.
- Necessary amendments to bidding documents based on Pre-bid Conference or any modifications necessitated are issued by Corporate Contract department in consultation with Engineering, Project & Finance Departments.
- Bids are opened by the Tender Committee comprising representatives of Corporate Contracts, Finance & Engineering departments in the presence of representatives of the bidders who choose to attend the same.
- THDC follows single stage two envelope system of bidding. Therefore, the bid opening is done in two stages; First techno-commercial bid is opened and after techno-commercial evaluation and on ensuring the techno-commercial responsiveness, the price bids of only techno-commercially qualified bidders are opened. However, for the Bank funded procurement, Single Stage Single Envelope system of procurement would be used.

- The activities after opening of bids commence with verification of bid Security and decision regarding cases of late bid receipts etc. which is done by Corporate Contracts department in association with Engineering and Finance departments. The preliminary examination of bids is carried out with respect to the provisions in the bidding documents which include scope, verification of JV agreement (if applicable), deviations etc.
- Detailed evaluation is carried out by the Tender Committee where the member from Corporate Contracts Department acts as the Convener. The detailed evaluation of packages comprises (i) verification of Qualification Requirements, (ii) Commercial evaluation, (iii) Technical Evaluation, (iv) verification of capability and capacity etc. and recommendation on techno-commercial evaluation.
- The price bids are evaluated based on the arithmetical correction and vetted by the Financial concurrence department. The tender committee thereafter recommends for either negotiation with the lowest bidder (for contracts not funded by the Bank) or Award of contract. The bids are evaluated in terms of the conditions set forth in the Tender documents. Detailed evaluation comprises (i) Commercial Evaluation, (ii) Technical Evaluation, (iii) verification of Qualifying Requirement of technically and commercially responsive lowest evaluated bidder, (iv) verification of capability and capacity and (v) Award Recommendation.
- After finalization of the Evaluation Report by Tender Committee, the Evaluation report is put up for approval of competent authority. As per the existing Delegation of Powers, following is the authority competent to approve the award, depending upon the recommended award price for works and goods under open tendering:

	For Works	For Goods
Senior Manager	up to Rs. 5.0 million	up to Rs. 1.0 million
AGM/DGM	up to Rs. 20 million	up to Rs. 5.0 million
ED/General Manager	up to Rs. 50 million	up to Rs. 30 million
CMD	up to Rs. 100 million	up to Rs. 100 million
Board of Directors	above Rs. 100 million	above Rs. 100 million

- Once the award recommendations are approved by competent authority, the award is processed and placed on the successful bidder. The contract is awarded on the basis of lowest evaluated price as per the award criteria specified to the bidder meeting stipulated qualification requirements.
- The recommended bidder is then called for discussion to successfully resolve the technical and commercial issues in his bid vis-à-vis the bid documents. This meeting is convened by Corporate Contract Department and the members of Tender Committee of Finance, Design and Contracts are associated. The work schedule for completion of the Contract Package is tied-up with the bidder by corporate contract department in association with other relevant departments like design, project, QA&I etc. After successful resolution of all technical and commercial issues and finalization of work schedule, the necessary approval of competent authority for award is obtained. In contracts not funded by the Bank THDC may also invite bidders for price negotiations in case the quoted price is considered unreasonably high.
- The contract agreement is signed after the submission and verification of performance security within a specified time frame of about 28 days.

In addition to the Corporate Contract Department at Rishikesh, procurement groups also exist at THDC's project sites at Tehri, Koteshwar and Vishnugad Pipalkoti.

During assessment and also as per the experience so far, it is observed that THDC procurement capacity needs to be strengthened. Though THDC has not earlier implemented any project using World Bank funds, THDC have acquainted themselves with the World Bank guidelines and procedures and have also acquired experience for the procurement during the course of preparation of this project.

To mitigate risks associated with procurement, some additional training is required for the staff engaged to handle procurement under the project. In order to acquaint the officials with the World Bank procurement procedures, THDC has provided two weeks training on Bank procurement to three officers who are handling procurement functions for this project. The Bank also organized a 1-day training workshop on contracts management in June 2009 for THDC officials. THDC will also provide procurement training to two more officers from the Contracts Department. In addition, procurement training will also be provided by THDC to one or two officers in the Finance Department. As the two main contracts to be financed under the project are high-value contracts, the Bank's involvement and clearance is required at each stage of the procurement process which also mitigates the procurement risk.

At least 2-3 more staff would need to be deployed to reduce the time taken in processing procurement activities.

The overall procurement risk is substantial.

C. Procurement Plan

The Borrower has developed a detailed Procurement Plan for procurement to be carried out under the Project. This plan has been agreed between the Borrower and the Project Team and is available at New Delhi office of the Bank. It will also be available in the Project's database and in the Bank's external website. The Procurement Plan will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

D. Frequency of Procurement Supervision

In addition to the prior review to be carried out from Bank offices, the capacity assessment of the Implementing Agency indicates the requirement of two supervision missions as part of implementation support missions including visits to the field and post review of contracts.

Attachment 1

Details of the Procurement Arrangement involving International competition.

(a) List of contract Packages which will be procured following ICB

1. Main Packages

DETAILS OF THE PROCUREMENT ARRANGEMENT FOR WORKS/GOODS UNDER VISHNUGAD PIPALKOTI HYDRO ELECTRIC PROJECT 4 X 111 MW

Sl. No.	Contract Description of Works/Goods	Estimated Cost (Rs. mln)	Estimated Cost in equiv. US\$ Million	Method of procurement ICB/NCB	P-Q	Domestic Preference (Yes/No)	Review by Bank (Prior / Post)	Expected Bid Opening date	Comments
1	2	3	4	5	6	7	8	9	10
1	EPC contract for Civil Works and Hydro Mechanical Equipment Works including Penstock Liners	20,284	461	ICB	Yes	No	Yes	30.05.2011	
2	EPC contract for Electro Mechanical Works	7,612	173	ICB	Yes	No	Yes	30.11.2011	

2. Consulting Services.

(a) The main consultancy under the project is for the selection of Design Review Consultant and consultancy services for skill gap analysis & initial diagnostics for CBIS.

Sl. No.	Description of Assignment	Estimated Cost	Selection Method	Review by Bank (Prior / Post)	Proposals Submission Date	Comments
1	2	3	4	5	6	7
1	Design Review Consultancy	INR 140 Million	QCBS	Prior	31st August 2009	Negotiations are being held with the highest ranked consultant.
2	Consultancy services for skill gap analysis & initial diagnostics for CBIS	INR 9 million	QBS	Prior	31.12.2011	

The list of other consultancy services to be procured will be finalized during implementation of the project.

(b) Consultancy services estimated to cost USD 200,000 and above per contract and Single Source selection of consultants (firms) for assignments estimated to cost USD 100,000 and above will be subject to prior review by the Bank. In addition, the record of justification referred to in paragraph 5 of Appendix 1 to the Consultant Guidelines for

each contract for the employment of individual consultants estimated to cost the equivalent of USD 50,000 or more shall be subject to Prior Review by the Bank. All other consultancy contracts shall be subject to the post review

Shortlist comprised entirely of National Consultants: Short lists of consultants for services estimated to cost less than \$500,000 equivalent per contract may be comprised entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

Annex 9: Economic and Financial Analysis

INDIA: Vishnugad Pipalkoti Hydroelectric Project

A. Economic Analysis

1. The economic evaluation of VPHEP is based on cost-benefit methodology and includes a sensitivity analysis on various parameters that could affect the economic internal rate of return (EIRR) and net present value (NPV). In this economic analysis, only the direct benefits with immediate welfare implications for beneficiaries are computed. However, a hydropower project of the magnitude of VPHEP will have a number of non-quantifiable benefits particularly with respect to local and regional development. The project will positively impact the economic development of the state with respect to better infrastructure facilities to boost tourism³⁵ and industrial development, and also a more localized impact in terms of schools, health centers, roads, and commercial establishments being set up near the project to cater to workers, project-affected families and others living in the area. (A region-wide impact study, which is beyond the scope of this analysis, would be required to adequately quantify the welfare gains on different stakeholders.)

I. INTRODUCTION

2. VPHEP is a run-of-river type hydropower project, with a small pondage capacity, situated on the Alaknanda river in the state of Uttarakhand in northern India. Uttarakhand is endowed with a high hydro potential estimated at 18,000 MW, of which only about 18% has been harnessed so far. The development of VPHEP is aligned with Government of India (GoI)'s desire to move to a more optimal thermal-hydro generation mix in the ratio of 60:40 (compared to hydro's present 24% share in the country's total installed capacity).

3. In Uttarakhand, a number of projects have been commissioned or identified for further development, including VPHEP. The design capacity of the project is 444 MW (4 x 111MW), and it is expected to generate 1636 GWh based on a 95 percent availability of installed capacity in the 90 percent dependable year and with an environmental flow of 15.65 cumecs.³⁶ The developer also plans to install a small hydro plant with capacity of 4.44 MW with annual design energy of 29.42 GWh at the toe of the dam, to utilize the minimum environmental flows that will not be diverted from the river. The project is expected to be built in 4.5 years. The power generated will be evacuated through a 400 kV D/C line of about 30 km to a proposed pooling station near Kunwari Pass. The State of Uttarakhand will receive 12 percent of the power generated as a royalty for the use of the state's waters, and the rest will be dispatched to the northern region grid network.

³⁵ Uttarakhand is home to some of Hinduism's most important shrines which attract large numbers of pilgrims and tourists. In addition, the state has placed a strategic emphasis on development of recreational tourism. The development of new service and commercial establishments springing up due hydropower development can prove to be a boon to the economy. In coming years tourist arrivals are estimated to grow annually by 13% (from 9 million).

³⁶ If the total energy generation in the years for which hydrological data is available (N years) is arranged in descending order, the (N+1) x 0.9 th year would represent the 90 per cent dependable year. The 90 per cent dependable year is a year in which the annual energy generation has the probability of being equal to or in excess of 90 per cent of the expected period of operation of the scheme. (Source: www.powermin.nic.in/acts_notification/tariffnotification_generatingcompanies.htm).

4. The northern region, consisting of nine states and Union territories, is the largest among the five regional centers and covers 30% of the India's land area and 28% of its population. The effective generation capacity is 45 GW (as of December 2010) or 26% of the national capacity with thermal and hydro contributing more than half (60%) and one-third (30%) of capacity, respectively. The northern regional system is deficient in electricity supply in peak summer and winter months, the average shortage is 7.6% in energy and 8.1% in peak MW demand respectively. The voltage profile is typically within acceptable frequency range of 49.5 – 50.2 Hz about 90% of the time.³⁷

5. The hydro generation is fed by snow melt and the monsoon rains, with maximum generation during summer and minimum generation during winter months. On a daily operational basis, hydropower accommodates peak load demand to the maximum extent to which water resources are available. Nuclear and thermal power stations aim to provide base load electricity throughout the year. Because of the high availability of water in summer, however, most hydro plants operate continuously. The remaining peak demand unmet is accommodated by load shedding. In the winter season, the daily peak hours are more prominent though the level of requirement is lower than in summer. However, water resources available to power generation are also much more limited in winter. As a result, load shedding in the winter may exceed the level of load interruption in the summer.

6. Assuming that the current power generation mix and patterns of electricity demand would not change dramatically, VPHEP is expected to contribute to supplying additional base load electricity for reducing load shedding in summer and provide some peak energy in winter as long as hydro resources are available. If the expansion of generating capacity were to catch up with demand growth, some expensive thermal energy—presumably old coal-fired steam generation or gas turbines—could be replaced with electricity generated by the project.

II. COSTS AND BENEFITS

7. **Cost:** The total financial capital cost of the project is estimated at about Rs 4,022 crore³⁸ or US\$ 912 million, which is converted to economic terms by netting out financial transfers. The two primary spending items are civil works and hydro-mechanical and electro-mechanical equipment that account for about 69% of the total financial capital cost. Assuming a tax rate of 20% (Minimum Alternative Tax), physical and price contingencies amounting to Rs 386 crore (or US\$ 87 million), interest during construction (IDC) of Rs 381 crore (or US\$ 87 million), the economic project cost is Rs. 3255 crore. The annual operation and maintenance cost (O&M) and cost of maintaining spare parts is assumed to be 2 % and 0.3 % respectively of total project costs. In addition, the cost of evacuating the power is estimated to be Rs. 25.5 crores. The cost of mitigating the adverse environmental and social impacts is included in the total economic cost and reflects the resources required to implement the environmental management plan (EMP) including the compensatory afforestation and the resettlement action plan (RAP) for the project-affected families.

³⁷ NRLDC quarterly report 2010.

³⁸ This includes the cost of the small “toe of dam” generating station (Rs 26.9 crore).

8. **Economic valuation of additional energy:** As the generating capacity addition lags behind the rapidly growing demand for electricity, the VPHEP will benefit electricity consumers in the northern region whose demand is currently not being met due to supply constraints. India is experiencing a tremendous rise in demand for energy, fuelled by growth in industries and domestic demand. The demand for energy is projected to grow by 8.5% during the 11th plan period (2008-2012) from 647 billion kWh to 964 billion kWh. The peak demand projections during the same period are estimated to increase from 76 GW to 153 GW. In contrast to the demand-side growth, capacity additions of about 50 GW are expected (compared to target capacity additions of about 80 GW) during this period. The current plan of GOI is to add capacity amounting to 82 GW during the 12th plan (2012-2017). In summary, the peak demand shortfall is going to continue in the near future. Therefore, the capacity addition from VPHEP will contribute to the peak capacity of northern region to cater to the unmet demand.

9. As opposed to the financial returns to the project which will be valued at the levelized tariff of Rs 4.38/kWh (or US 9.9 cents/kWh), the economic value of the additional energy generated from the VPHEP can be estimated by using the availability based tariff (ABT) as a proxy.

10. ABT, introduced in July 2002, is an institutional mechanism to incentivize power generators (suppliers) and distribution companies (consumers) to conform to scheduled supply and demand values and thus stabilize the frequency in the system. ABT is one of the observable values of energy that the (regional) economy would certainly pay for the additional capacity of the project. In the ABT framework, if a generating station supplies less or more power to the grid than what is scheduled to be supplied, or if a distribution company draws more or less from the grid than it committed to drawing, then system frequency is affected. ABT is effectively a penalty tariff that is levied on the responsible party, the magnitude of which is a function of the impact of the unscheduled action on system frequency, a rate referred to as “Unscheduled Interchange (UI)”. The maximum commercial opportunity for generating stations is set at Rs 8.73 per kWh at a frequency of 49.5 Hz or below, meaning that every additional kWh is priced at Rs 8.73 when the system has severe (unexpected) power shortages (i.e., the frequency is very low). For overdrawal of electricity that results in the frequency dropping below 49.2 Hz, the incremental UI charge is equivalent to 100% of the UI charge at 49.5 Hz, i.e. Rs. 17.46/kWh. For purposes of the present analysis, the expected UI rate associated with an average frequency between 49.5 and 50.2 Hz was computed at Rs 5.7/kWh, which is used as a proxy of the value of base-load power generated in this analysis.

11. There are two other valuation techniques to estimate consumer welfare from provision of new capacity – willingness to pay (WTP)³⁹, and cost of captive generation⁴⁰ (Table 1). The former has limited applicability as there is no recent estimate of WTP in the northern India. The

³⁹ The 2001 TERI study also indicates that industrial customers’ willingness to pay is about Rs 6 per kWh—in constant 2006 prices—in Haryana and Karnataka. However, farmers’ willingness to pay for electric power may be very low at Rs 1.8 per kWh in Haryana and Rs 4.4 per kWh in Karnataka. Meanwhile, when calculating the tariffs to cover all financial costs without government subsidy, a state in the northern region, Rajasthan, should have Rs 3.5 per kWh in constant 2006 prices (ESMAP, 2004).

⁴⁰ The capital cost of private sector thermal power generation may be estimated at Rs 5.6 per kWh, and the total cost of captive diesel generators may be Rs. 12 per kWh with fuel costs included.

latter is a relevant proxy for the cost of coping with insufficient supply from the grid as power consumers are forced to resort to off-grid generation of power, which is usually costlier and dirtier. However, the ABT is a better proxy in this case as the additional capacity provided by VPHEP will be utilized primarily to meet the unserved demand in the northern region. The ABT is a lower bound of the estimation of the welfare of the additional energy generated by VPHEP; use of the other techniques would result in higher economic returns.

Table 1: Economic valuation of additional energy

Proxy	Economic value
Availability based tariff	
Lean season (winter)	UI rate: Rs. 8.73/kWh
Wet season (summer)	UI rate: Rs. 5.7/kWh
Willingness to pay	Rs. 7/kWh (2007 prices)
Coping cost of unserved energy	Rs. 12/kWh

12. **Global and Local Environmental Benefits:** The global and local environmental benefits are computed on the assumption that the alternative to building VPHEP would be to bring online another coal-fired plant. Therefore, VPHEP is alleviating the adverse environmental impacts of a coal-fired plant at both the global and local levels. VPHEP is expected to reduce greenhouse gas (GHG) emissions by approximately 1.6 million tons per year over the plant operation period assuming emissions of about 0.89 CO₂kg/kWh for a sub-critical Indian coal power station. The valuation of the CO₂ can vary depending on the methodology. In the European Union Emissions Trading Scheme (EU ETS), which is a dominant carbon market, the weighted average price increased to US\$10 per tCO₂e in 2007-2008. Using this value, the project will yield US\$16 million of emission rights every year. However, this market is limited in which modest targets for reducing CO₂ from large combustion sources are being set and \$10 is almost the lower bound of what a ton of CO₂ savings from the project would sell for. A more appropriate approach would be to value CO₂ at its unit damage values. Based on Markandya (2009), these values are estimated to be about US \$31 per tCO₂e in 2009 and the annual emission rights are valued at US \$49 million. In addition to the global environmental impact, the project will benefit local health and environment by substituting hydro generation for fossil fuel combustion—largely coal-burning power plants in the case of India—which would otherwise be used somewhere else in the region. The local health and environmental damages, such as air pollution, cannot be ignored, particularly in Indian cities. Pollutants are particulate emissions (PM10), SO₂, and NO_x.

13. There are a few studies on the estimation of local benefits. Lvovsky *et al.* (2000)⁴¹ estimate the local environmental cost of large-scale industrial coal-fired power generation in Mumbai at US\$22 per ton of coal in constant 1993 terms. Applying this estimate to the present case would mean that the VPHEP could reduce pollution costs by about US \$14.7 million per annum (by displacing coal-fired generation). This is equivalent to US 0.8 cents/ kWh.⁴² More recent studies have shown higher figures of local damage costs. A substantial study was carried

⁴¹ Lvovsky et al. (2002): Environmental costs of fossil fuels - a rapid assessment method with application to six cities. Environment Department Papers 78, The World Bank.

⁴² The VPHEP is expected to generate 1,662 GWh a year, which would require about 249,280 tons of coal if produced in a coal-fired generator. It is assumed that the quality of coal to be used is standard, i.e., the conversion factor is 24MJ/kg. It is noted that design energy is lower than annual energy.

out by Bussolo and O'Connor (2001)⁴³ in the context of estimating the ancillary benefits of policies that reduce carbon emissions. The researchers modeled the links between emissions and concentrations at the regional level (the concentrations of major pollutants in major cities was modeled as a function of emissions in four regions of the country). Damage items included primarily health effects and also some impacts on crops and water. The results show that a one ton reduction in carbon emissions is associated with a parallel reduction in local pollutants worth about US\$58 (at the 1995 exchange rate and 1995 prices). Other recent studies estimate the benefits of around US\$79/ton CO₂ (OECD, 2009)⁴⁴ and \$59/ton CO₂ (Markandya et al, 2009)⁴⁵. A figure of US\$59/CO₂ is employed for this analysis which is equivalent to US 5 cents/kWh. The total local environmental benefits amount to US \$96 million per year of operation of the plant.

14. **Climate change:** While the present understanding of the impact of climate change is too limited to inform specific investment decisions, it can be posited that there are three main areas of impact of climate change on hydropower projects. First, the available discharge of a river may change, because the hydrology is greatly influenced by local and regional weather conditions in the catchment area, such as temperature and precipitation. This could have a direct impact on the project's economic viability over the long run. Second, increased climate variability could result in an increased occurrence of extreme weather events, such as flooding. Finally, changing hydrology and increased extreme events might affect the sediment load in the river, which could lead to greater-than-expected turbine erosion.

15. The hydrological risk may be amplified when the global climate change impacts are taken into account. Global average temperature is expected to increase by 1.4 to 5.8°C during the period 1990 to 2100. Annual precipitation is also projected to increase or decrease, depending on the region, by 5 to 20 percent, compared with the past 30-year mean (IPCC, 2001). Based on the IPCC analysis, the temperature in the region containing the Alaknanda catchment will increase by about 2.5–3°C by 2050. There will also be a general increase in rainfall by about 7% (+/- 2%) by 2050. However, there is uncertainty regarding changes in precipitation as the understanding on the effect of climate change on monsoons is limited⁴⁶. Therefore, an evaluation of project-specific impacts of climate change cannot be carried out on the basis of current knowledge. It is reasonable to assume, however, that one area of impact will be a heightening or worsening of already existing volatility and risks (hydrology risk, sediment risk, etc.). Accordingly, the assessment of these risks has been incorporated in the sensitivity analysis.

III. ECONOMIC RATE OF RETURN

16. The baseline minimum environmental flow is assumed to be 15 cumecs⁴⁷ and an annual energy generation of 1662 GWh. The EIRR is estimated at 28 percent and NPV at Rs 39,512 million (US \$ 850 million) based on the baseline scenario presented in Table 2. The EIRR falls

⁴³ Bussolo, Maurizio and D. O'Connor. 2001. Clearing the air in India: the economics of climate policy with ancillary benefits. Technical paper no. 182. Paris: OECD Development Centre.

⁴⁴ OECD (2009). Co-benefits of Climate Policy. Paris: OECD.

⁴⁵ Markandya, A. et. al. (2009). Impact of public health of strategies to reduce greenhouse gases: Low carbon electricity generation. *The Lancet*, Vol. 374, Issue 9706, December 2009.

⁴⁶ "Sediment handling optimization study" 2008. Tehri Hydro Development Corporation

⁴⁷. GoI issued the revised environmental clearance in May 2011 with an environmental flow of 15.65 cumecs.

to 20% when the environmental benefits are excluded. The project lifetime is set at 35 years. The baseline EIRR is well above the conventional hurdle rate for power generation projects e.g., 12 percent. The estimated EIRR will exceed the hurdle rate by 2020, assuming the commissioning is on schedule (Figure 3a).

Table 2: Baseline assumptions

	90% dependable year Mandatory Discharge=15 cumecs	
	Lean season (Dec-Mar)	Wet season (Apr-Nov)
Annual energy generation (GWh)	1662	
Energy generation (GWh)	150.9	1511.5
Facility utilization rate (%)	1	1
Availability of installed capacity (%)	0.95	0.95
Net head	212	212
Efficiency of turbine	94	94
Efficiency of generator	98	98
Combined efficiency of turbine and generator	92	92

Table 3: Baseline Economic Rate of Return Calculation

Year	Cost					Valuation of additional energy			Environmental benefits		W Env Benefits		
	Economic Capital Cost (Rs Crores)	O & M cost (Rs Crores)	Maintenance spares (Rs Crores)	Transmission cost of evacuating power (Rs Crores)	TOTAL (Rs Crores)	Total Cost (Rs Millions)	Lean season	Wet season	Total	Global	Local	Total Benefits (Rs. Millions)	Net Benefits
		2.00%	0.3%	25.5			12.35	5.7					12%
2010	97				97	968						0	-968
2011	41				41	413						0	-413
2012	529				529	5288						0	-5288
2013	664				664	6640						0	-6640
2014	813			8.5	822	8216						0	-8216
2015	600			8.5	608	6084						0	-6084
2016	155			8.5	163	1630						0	-1630
2017		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2018		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2019		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2020		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2021		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2022		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2023		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2024		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2025		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2026		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2027		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2028		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2029		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2030		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2031		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2032		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
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2037		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2038		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2039		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
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2041		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2042		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2043		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
2044		58.0		8.7	67	667	1863.7	8615.9	10479.6	2400.3	4471.9	17351.7	16685
												EIRR	29%
												NPV (Rs Millions)	42603
												NPV (\$ Millions)	\$916.20

IV. SENSITIVITY ANALYSIS

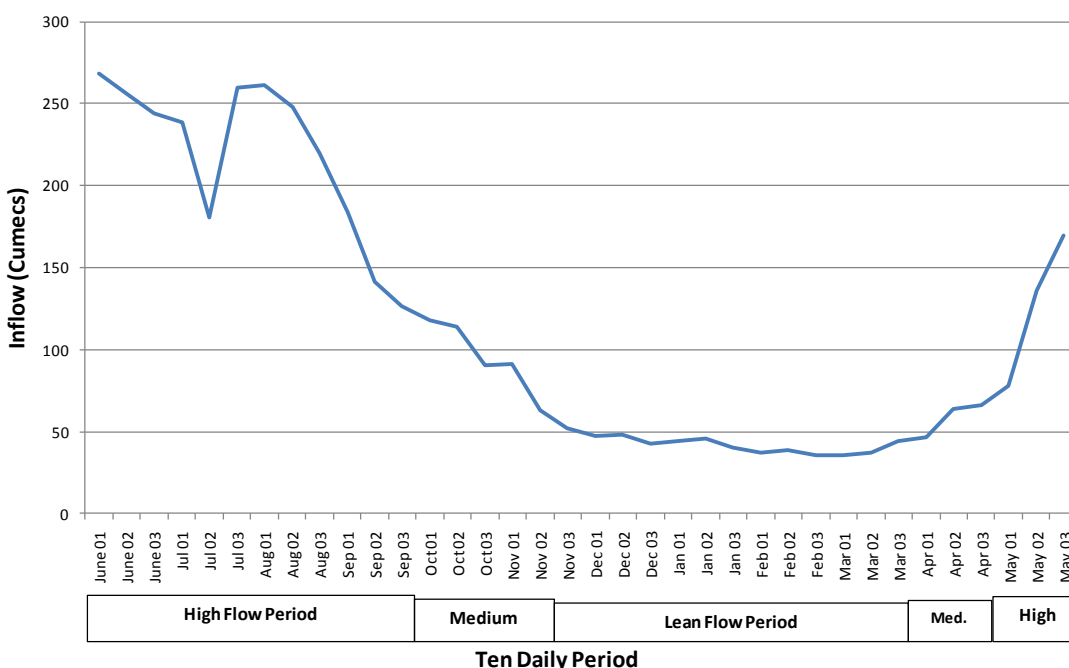
17. **Uncertainty associated with regional demand growth:** The analysis of the value of the project assumes that the high growth in the demand for power will continue into the foreseeable future. However, if the growth in electricity demand is less than expected, the economic benefit of energy generated by VPHEP may be lower than estimated. The economic benefit of the project will also depend on other power plant commissioned during and after the project period.

There are four ultra-mega power plants that are expected to come on-line during the 12th plan, but even then shortages are expected to continue considering the load growth. Consequently, the probability of excess supply in the near future is almost negligible.

18. Therefore, suppose that the region continues to have excess demand, but the regional power generation capacity—other than the VPHEP—is strengthened (possibly by improving transmission efficiency, reducing plant unavailability, bringing more capacity on-line). The impact will be captured as an increased and stabilized frequency in the regional grid. Consequently, the UI rate which technically ranges from zero to Rs 8.73 per kWh will be relatively lower. Needless to say, the opposite scenario is also possible. In the baseline analysis, an average value of Rs. 5.7/kWh and maximum value of Rs 8.73/kWh are employed to value the additional energy from VPHEP in the wet season and the lean seasons respectively. Even if the UI rate falls, the value cannot actually go down below the (levelized) tariffs at Rs 4.38/kWh (or US 9.9 cents/kWh). The EIRR ranges between 26% and 33% corresponding to a movement of the UI rate between Rs 5/kWh and Rs 9/kWh (Figure 3d).

19. **Hydrology risk:** The 10-day interval hydrology data from 2001 – 2008 show that the flows available in the project area vary significantly over the data intervals.

Figure 1: Pattern of inflow in 90% dependable year



Source: THDC

Table 3: Inflows available for generation

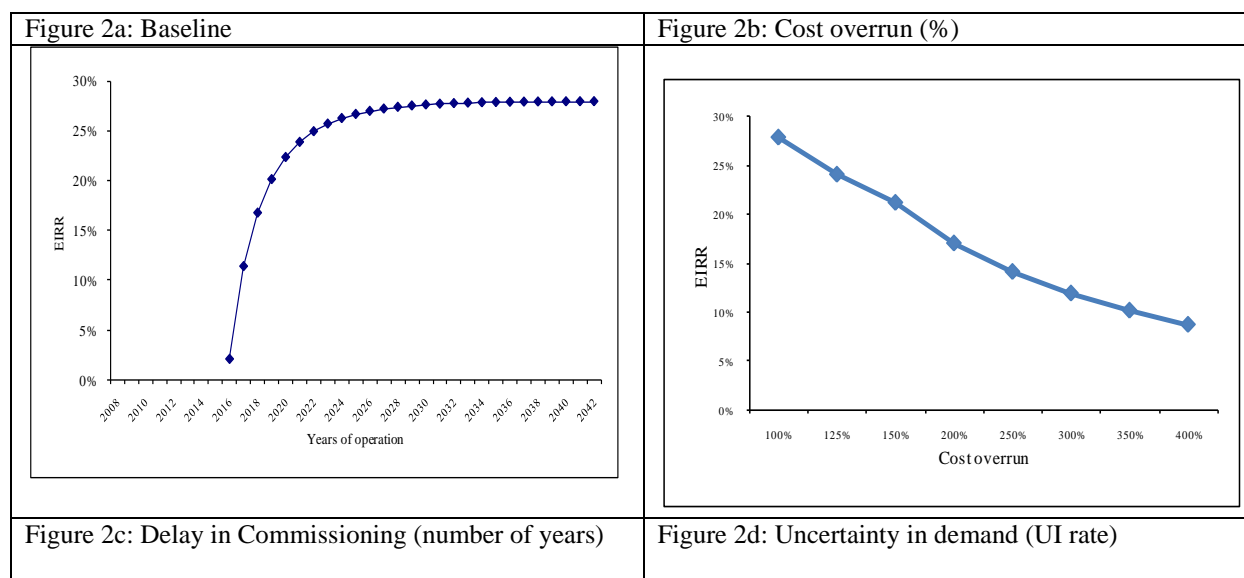
15 Cumecs Baseline	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May
Mandatory Discharge/Flushing Discharge (Cumecs)	34.33	34.33	34.33	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Inflow available for generation (Cumecs)	221.90	193.12	207.73	135.67	91.82	53.82	30.92	28.40	22.52	24.16	43.94	113.91
22 Cumecs Scenario	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May
Mandatory Discharge/Flushing Discharge (Cumecs)	34.33	34.33	34.33	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Inflow available for generation (Cumecs)	145.96	213.44	126.62	98.92	48.27	33.18	30.89	23.90	21.93	48.65	120.60	132.74

Source: THDC

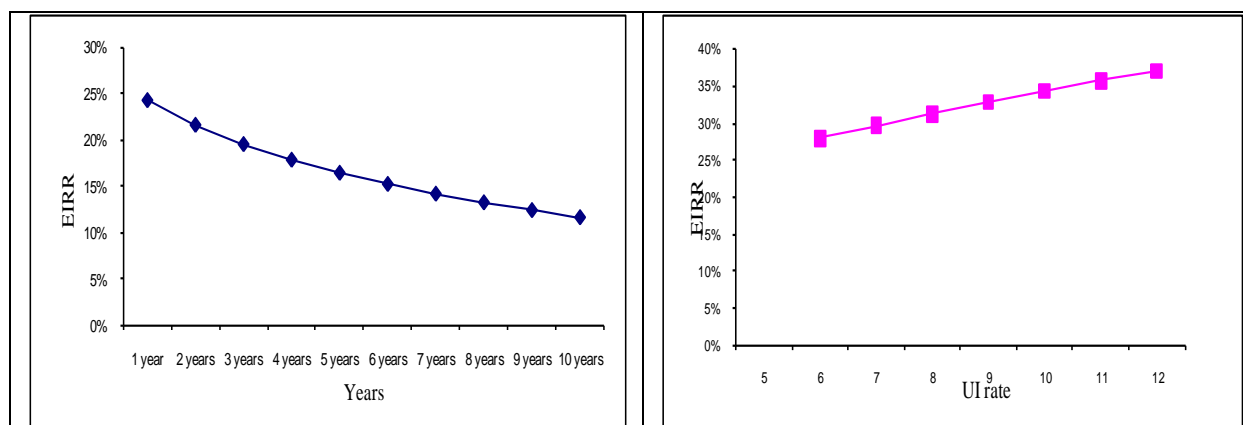
20. The base case assumes a mandatory environmental flow discharge of 15 cumecs⁴⁸. In this case, the total annual energy is 1662 GWh. In case the mandatory discharge is 22 cumecs in a 90% dependable year, the total annual energy becomes 1573 GWh. In such a case, the EIRR falls to 27%.

21. **Cost overrun & delay in commissioning:** For a variety of reasons, many hydropower projects built in India in recent years past have suffered cost overruns. These reasons include unforeseen geological problems (landslides, geothermal springs encountered while tunneling; other “geological surprises”); delays in obtaining the various required clearances and licenses; delays in land acquisition and finalizing compensation to project-affected people; disputes with contractors (which could be linked to other delay factors, such as unexpected geological problems) in the context of an inadequate risk allocation matrix. Any delay in construction increases labor costs associated with civil works as well as the overhead costs. The EIRR remains above the hurdle rate of 12 percent as long as the project costs do not exceed 300 percent of the estimated costs. However, a rise in the costs schedule by more than 350 percent will result in an EIRR below 12 percent (Figure 2b).

22. The opportunity cost of delayed commissioning of the plant will be substantial. A one-year delay in the construction of VPHEP would reduce the EIRR to 24 percent. If the project implementation is delayed for two years, the EIRR drops to 22 percent. If the project is delayed by more than 10 years, the EIRR drops to 12 percent. The probability of such a significant delay is relatively remote, but hydro projects in India have experienced more than 5 years of lag in several cases. In fact, two projects in Uttarakhand, Lakhwar Vyasi and Maneri Bhali, came on-line after about 15 years of delay (Figure 2c).



⁴⁸ GoI issued the revised environmental clearance on May 30, 2011, with an environmental flow requirement of 15.65 cumecs.



23. The project is robust to changes in cost, delay and demand projections in the two environmental flow regimes considered (15 cumecs and 22 cumecs). As the sensitivity analysis suggests, even in the event of project delays of 5 years or a doubling of cost overruns, the EIRR remains above the hurdle rate. However, if project is delayed by 5 years and costs double, then the EIRR will fall below the hurdle rate in both environmental flow regimes.

Table 4: Sensitivity analysis

	E-flows	Cost Overrun	Delay in Commissioning	EIRR
Baseline	15	100%	Nil	28%
E-flows of 15 cumecs and cost overrun of 200%	15	200%	Nil	18%
E-flows of 15 cumecs and delay of 5 years	15	100%	5	17%
E-flows of 15 cumecs and cost overrun of 200% and delay of 5 years	15	200%	5	11%
E-flows of 22 cumecs and cost overrun of 200%	22	200%	Nil	17%
E-flows of 22 cumecs and delay of 5 years	22	100%	5	17%
E-flows of 22 cumecs and cost overrun of 200% and delay of 5 years	22	100%	Nil	11%

V. LEAST COST ANALYSIS

24. VPHEP appears in the Hydro Development Plan for 12th Five Year Plan⁴⁹ as one of the projects that is planned to come on-line in the period 2012-17. In 2001, Central Electricity Authority (CEA) carried out a comprehensive study in which 399 candidate hydropower schemes were ranked into priority development categories based on ten major aspects⁵⁰ that play a vital role in implementation of a hydro project. These aspects were proxy indicators for

⁴⁹ Issued by Hydro Planning and Investigation Department of Central Electricity Authority (CEA), India in September 2008

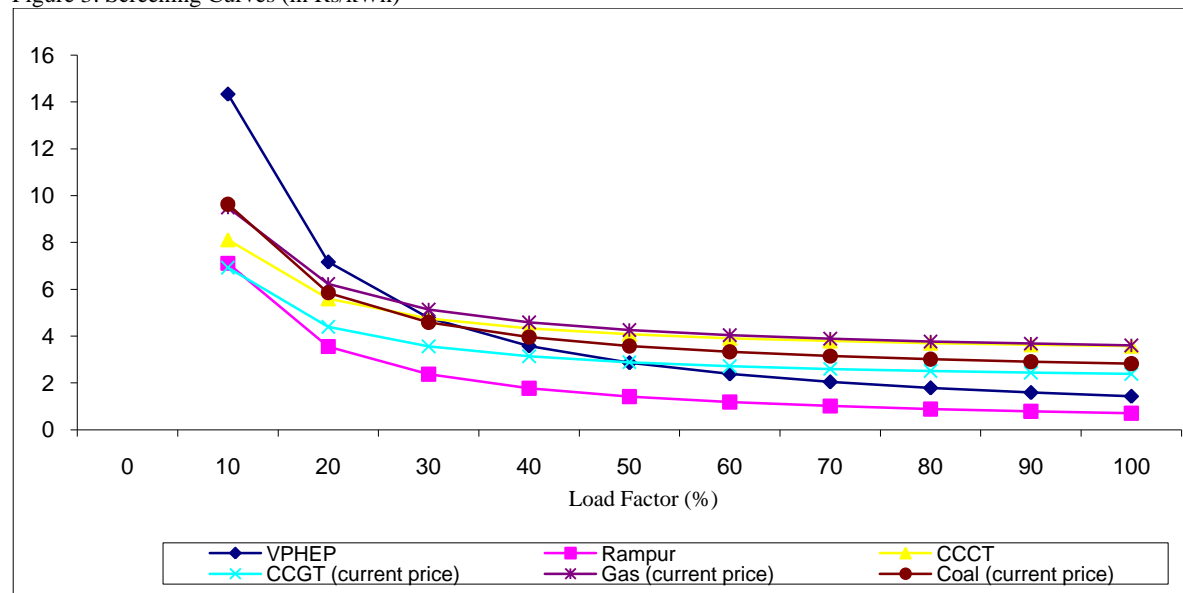
⁵⁰ Criteria that formed the basis for the Ranking Study of Hydroelectric Schemes are: (i) rehabilitation and resettlement impacts; (ii) whether projects are in areas subject to international water treaties; (iii) likelihood of delay due to complexities of inter-state co-ordination; (iv) project size; (v) type of scheme with a preference to projects that do not involve large storage; (vi) height of dam with a preference to projects with lower dams; (vii) length of tunnel/channel with a preference to projects with shorter tunnels; (viii) status of upstream and downstream hydroelectric project development with a preference to projects on rivers where there are already other projects; (ix) accessibility of site; and (x) status of project development with a preference to projects for which site investigations and feasibility studies are ready.

environmental impact, political risk, construction risk, and development lead time. Of 75 hydro schemes considered on the Ganga Basin for this study, 20 schemes including VPHEP were ranked under Category “A” (where Category “A” is the highest ranking with a score of 80 or above out of 100), with VPHEP appearing at eighth position. Category “A” projects are most attractive and viable and to be developed first, followed by Category “B”, “C”, “D”, and “E” category projects.

25. Based on an assessment of other input fuels and current fuel prices, VPHEP is the least cost option from a set of possible options described below. The other options are coal-fired steam generation, gas turbines (GTs), combined cycle combustion turbines (CCCT), biomass, wind, and solar power. Given that India has substantial reserves of abundant (but poor quality) coal and produces a considerable amount of coal and natural gas, the economically feasible forms are coal-fired generation, GTs and combined cycle gas turbines (CCGT).

26. The conventional screening curves analysis, where the cost per kilowatt-hour of each generation method is depicted over a range of capacity utilization rates, reveals that the unit cost of the VPHEP is estimated at Rs 3.3 per kWh with an annual load factor projected at 46 percent. Given the current international fuel prices⁵¹ and an average annual load factor of 50 percent, on the other hand, the unit costs of CCGT and coal-fired power plants are Rs 2.9 and 3.6, respectively. The combined cycle power generation system will be most costly, requiring Rs 4.1 per kWh.

Figure 3: Screening Curves (in Rs/kWh)



⁵¹ The international gas and coal prices are the average of 2009, 2010 and 2011 (to March) figures. The original data come from IMF Primary Commodity Price Database.

B. Financial analysis - Project

Project costs

1. The total estimated project cost for the project, including contingencies and interest during construction, is expected to be about US\$ 912 million⁵². For the purposes of financial analysis, the project cost includes only the costs incurred directly by THDC. Therefore, the costs associated with the construction of transmission line and associated facilities for evacuation of power from the project are excluded. Of equity of 30 percent for funding the project, 50 percent shall be contributed by THDC out of its internal resources and the balance 50 percent shall be shared between Government of India (GoI) and Government of Uttar Pradesh (GoUP) in the ratio of 3:1.

Electricity Sales

2. As per the revised Tariff Regulations, 2009, issued by Central Electricity Regulatory Commission (CERC), 12 percent of the energy generated from VPHEP (after excluding auxiliary consumption and transformation loss) will be given free of cost to the host state (i.e. GoUK) towards royalties for usage of state's water resources. For remaining 88 percent, THDC has already signed Power Purchase Agreements (PPA) with almost all the beneficiaries⁵³.

3. Construction period for the project is 4.5 years with commercial operation expected to start from May 2016 onwards. Electricity generation is projected to be at the design energy levels of 1673 MU (that includes the main plant and the small hydro plant). As per the Tariff Regulations 2009, tariff for supply of electricity from a hydro generating station is calculated using fixed costs that is calculated on an annual basis and recovered on monthly basis under capacity charge and energy charge, which is payable by the beneficiaries in proportion of their respective allocation of saleable capacity⁵⁴ of the generating station.

4. Electricity sales have been arrived at after providing for 12 percent free energy to GoUK towards royalties for usage of state's water resources. Only sales made during the commercial operating period are included in the financial analysis. Therefore, any sales made during the project commissioning period prior to full commercial operations are not included.

Electricity Tariffs

5. Electricity tariffs for the projects of THDC, being a Central Public Sector Undertaking (CPSU), are fixed by Central Electricity Regulatory Commission (CERC) based on terms and conditions for determination of tariff that are issued from time to time and are valid for a specific period. The latest tariff regulations issued by CERC are applicable from April 1, 2009 for a period of five years. Though the project is expected to be commissioned after the expiration of

⁵² At Base Exchange Rate of 1 USD = INR 44.1, escalated as per the exchange rate projections by the World Bank for project preparation. This project cost does not include the project component – Technical Assistance for Capacity Building and Institutional Strengthening – of US\$ 10 million.

⁵³ The entire capacity of the project has been booked through PPAs..

⁵⁴ This excludes free power to the host state

the period of the current tariff regulation, the revised tariff guidelines are followed as these are the acceptable norms to assess the financial viability of the central sector owned power projects in India. As per the revised tariff norms, the base rate of the regulated return on equity is 15.5% with an additional 0.5% as an incentive if the project is completed in time. This incentive, which may in the event generate additional revenues for the project, has not been included for the analysis.

6. The key features of the regulations are as follows:
 - Debt-Equity ratio of 70:30;
 - Interest on debt as per actual costs incurred based on six-months LIBOR plus a spread; working capital and short-term loans interest rate at 13.25 percent p.a.; and interest on cash balances at 4.5 percent p.a.;
 - Return on equity has been computed on pre-tax basis at a base rate of 15.5 percent p.a.⁵⁵ with any equity in excess of 30 percent being provided returns at a level equal to average cost of debt;
 - Auxiliary energy consumption that includes transformation loss at 1.2 percent⁵⁶;
 - Operations and Maintenance expenses are charged at 2.0 percent of the project cost, escalated at 5.72 percent p.a.;
 - Depreciation on straight line basis (as per rates prescribed by CERC), up to 90 percent of project cost (excluding land) for the first twelve years after the commissioning date. After that the remaining depreciable value of the asset is uniformly spread over the balance useful economic life of the project;
 - Working capital requirement calculated from O&M expenses for one month, maintenance spares at 15 percent of O&M expenses, and receivables for two months;
 - Annual energy for VPHEP at 1662 Million Units⁵⁷;

Other key assumptions used include:

- Exchange rates and inflation as per inflation and exchange rate projections followed for project costing exercise for projects in India⁵⁸;
- Physical contingencies have been considered at 15 percent for underground works including concreting, 10 percent for other civil works, and 5 percent for electro-mechanical and hydro-mechanical works.

7. The tariff in the first year is expected to be about Rs. 4.61/kWh (10.5 US cents per unit), with an average tariff of Rs 4.52/kWh (10.3 US cents per unit) and the levelized tariff (assuming a discount factor of 12 percent) over the life of the project expected to be about Rs 4.38/kWh (9.9 US cents per unit).

⁵⁵ Return on Equity (pre-tax) is at 19.36% p.a. during the period when Minimum Alternate Tax (MAT) is applicable, which is till FY 2026 for VPHEP and at 23.21% p.a. thereafter.

⁵⁶ As per CERC tariff regulations 2009, auxiliary consumption for underground hydro generating station with static excitation system is 1.2 percent

⁵⁷ At 15 cumecs of environmental flows

⁵⁸ Exchange rate and local inflation are as projected in December 2010 whereas foreign inflation is based on Manufacturer's Unit Value Index as projected in November 2010.

Debt service coverage ratio

8. The financial analysis shows that reasonable debt service cover ratios are achieved by the project. In the base case scenario, the minimum debt service coverage ratio (DSCR) is 2.35 in the first year of operation (2017) and the average DSCR is 2.47.

Project rates of return

9. Financial analysis of the project has been undertaken to assess the financial viability of the proposed project from the perspective of THDC, and also of the shareholders (i.e. GoI and GoUP). For the operating entity (THDC), viability has been assessed on the basis of the project financial internal rate of return (FIRR). Financial viability to shareholders is measured on the basis of the FIRR of equity invested (share) in the project.

10. In the prevalent regulatory regime, an annual pre-tax return on equity with a base rate of 15.5 percent is provided by the regulator during the years when the project is operational. The cost of debt is a pass through in tariff. As a result, the financial performance of the project, or that of THDC, remains unaffected by the cost of debt. Accordingly, IRR for the project and equity has been used as the index for financial appraisal.

11. As estimated by the Bank, the FIRR for the project is 9.5 percent and the FIRR of equity invested is 17.7 percent, assuming discount rate of 12 percent.

12. In addition to the dividends from the project, the shareholders will also receive other revenue from the project. GoI will receive income taxes and dividend distribution tax from the project. GoUK will receive 12 percent of the energy generated (at bus-bar) free, as a royalty for usage of water resources. This energy can be sold by GoUK either within the state or outside the state to other energy deficit states.

Table 9: Vishnugad Pipalkoti Hydropower Project - Cash Flows and FIRR

Rs in Crore

Financial Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Project FIRR															
Cash Inflows															
Revenue Earned	-	-	-	-	-	-	-	671	665	659	654	649	644	639	635
Cash Outflows															
Capital Expenditure	111	47	334	622	1,124	957	662	165	-	-	-	-	-	-	-
O&M Expenditure	-	-	-	-	-	-	-	80	85	90	95	100	106	112	119
Working Capital Increase	-	-	-	-	-	-	-	128	-	-	-	-	1	1	1
Net Cashflows	(111)	(47)	(334)	(622)	(1,124)	(957)	(662)	298	580	570	559	548	537	526	516
Project FIRR (Pre-Tax)	9.54%														

Equity IRR															
Cash Inflows															
Revenue Earned	-	-	-	-	-	-	-	671	665	659	654	649	644	639	635
Cash Outflows															
Equity Increase	111	47	52	144	336	281	70	165	-	-	-	-	-	-	-
O&M Expenditure	-	-	-	-	-	-	-	80	85	90	95	100	106	112	119
Working Capital Increase	-	-	-	-	-	-	-	128	-	-	-	-	1	1	1
Net Interest Paid	-	-	-	-	-	-	-	137	126	116	105	94	84	73	62
Debt Repayment	-	-	-	-	-	-	-	113	113	113	113	113	113	113	113
Net Cash Flows	(111)	(47)	(52)	(144)	(336)	(281)	(70)	49	341	341	341	341	340	340	341
Equity IRR	17.73%														

Table 10: VPHEP – Summary Financial Projections

Rs in Crore

Financial year Ending March 31 of Yea	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
<u>INCOME STATEMENT ITEMS</u>															
Revenue	-	-	-	-	-	-	-	671	665	659	654	649	644	639	635
Operating Income Before Interest & Finance Charges	-	-	-	-	-	-	-	404	399	399	400	400	401	402	403
Net Profit	-	-	-	-	-	-	-	265	264	268	272	276	280	284	289
<u>FUNDS STATEMENT ITEMS</u>															
Internal Cash Generation	-	-	-	-	-	-	-	498	492	489	486	483	480	477	474
Equity Contributions	111	47	52	144	336	281	70	165	-	-	-	-	-	-	-
Borrowings	-	-	282	479	788	676	591	-	-	-	-	-	-	-	-
Total Sources	111	47	334	622	1,124	957	662	663	492	489	486	483	480	477	474
Capital Expenditure	111	47	334	622	1,124	957	662	165	-	-	-	-	-	-	-
Debt Service	-	-	-	-	-	-	-	252	246	241	235	229	224	218	213
Increase (Decrease) in Working Capital	-	-	-	-	-	-	-	128	0	0	0	0	1	1	1
Increase (Decrease) in Cash	-	-	-	-	-	-	-	118	246	248	251	253	256	258	261
Total Applications	111	47	334	622	1,124	957	662	663	492	489	486	483	480	477	474

Rs in Crore

Financial year Ending March 31 of Yea	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
<u>BALANCE SHEET ITEMS</u>															
Net Fixed Assets in Operation	-	-	-	-	-	-	-	3,670	3,648	3,461	3,275	3,088	2,901	2,715	2,528
Capital Works-in-Progress	111	159	492	1,115	2,239	3,195	3,857	165	-	-	-	-	-	-	-
Forex Loss	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Current Assets	-	-	-	-	-	-	-	246	492	740	991	1,245	1,501	1,760	2,021
Total Assets	111	159	492	1,115	2,239	3,195	3,857	4,081	4,140	4,202	4,266	4,333	4,402	4,474	4,549
Debt	-	-	282	760	1,548	2,224	2,815	2,703	2,590	2,477	2,365	2,252	2,140	2,027	1,914
Equity	111	159	211	355	690	971	1,042	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206
Retained Earnings	-	-	-	-	-	-	-	172	344	518	695	874	1,056	1,241	1,429
Total Equity & Liabilities	111	159	492	1,115	2,239	3,195	3,857	4,081	4,140	4,202	4,266	4,333	4,402	4,474	4,549
<u>FINANCIAL RATIOS</u>															
Net Income as a % of Revenue	0%	0%	0%	0%	0%	0%	0%	39%	40%	41%	42%	43%	43%	44%	45%
Return on Equity	0%	0%	0%	0%	0%	0%	0%	22%	22%	22%	23%	23%	23%	24%	24%
Debt Service Coverage Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.35	2.38	2.43	2.49	2.56	2.63	2.70	2.78
Debt Equity Ratio	0.00	0.00	1.33	2.14	2.24	2.29	2.70	2.24	2.15	2.05	1.96	1.87	1.77	1.68	1.59

Sensitivity and Scenario Analysis

13. A sensitivity analysis was also carried out to understand the impact of cost escalations, implementation delays, and changes in regulated rate of return on equity (RoE) on financial internal rate of return (FIRR), debt service coverage ratio (DSCR), and tariffs. A summary of the scenario analysis is given in Table 11. The project is affected adversely in the case of a reduction in regulated rate of return on equity and implementation delays. In the worst case scenario, wherein an implementation delay of 2 years and cost escalation by 20 percent are coincident, the FIRR for project is estimated to be 8.2 percent and for equity 14.2 percent. A sensitivity analysis for the higher environmental flows was also carried out. Under this scenario, environmental flows at 22 cumecs (instead of 15 cumecs as in the base case) were considered. In this case, the capacity of the main power plant will be maintained at 444 MW but the capacity of the small “toe of dam” generating plant will increase from 4.44 MW to 6.52 MW, which will increase the cost of this component from Rs 26.9 crore to Rs 39.5 crore. As a result of the higher environmental flow, the design energy for the entire power plant will be reduced from 1,673 GWh to 1,598 GWh. This scenario is likely to have no impact on the project IRR, return on equity and DSCR. As the overall output is reduced, the tariff in this scenario will increase marginally.

Table 11: Sensitivity Analysis

S No	Scenario	Project FIRR	Equity IRR	Minimum DSCR	Tariff (Rs/kWh)	
		%	%		1st Year	Levellized
1	Base Case	9.5%	17.7%	2.35	4.61	4.38
2	Reduced Regulated Return on Equity (14.5%)	9.2%	17.1%	2.28	4.51	4.26
3	Increased Regulated Return on Equity (16.0%)	9.7%	18.1%	2.38	4.67	4.43
4	Increased Regulated Return on Equity (18.5%)	10.6%	19.6%	2.53	4.93	4.71
5	Cost Escalation by 20%	9.5%	17.7%	2.34	5.52	5.23
6	Delay of 2-years in Commissioning	8.2%	14.3%	2.46	4.99	4.77
7	Delay of 2 years and cost escalation by 20%	8.2%	14.2%	2.46	5.97	5.70
8	Environmental Flows increased to 22 cumecs	9.5%	17.7%	2.35	4.85	4.60

C. Financial Analysis – Entity

14. THDC started earning revenues in FY2007 when the first project, Tehri Stage I that includes the Tehri Dam and the Tehri Hydro Power Plant (HPP), became operational and started commercial production. Two units of Koteshwar Hydroelectric Project (KHEP) have been commissioned. The remaining two units will be commissioned by March 2012. The proposed Vishnugad Pipalkoti HEP and Tehri Pump Storage Project (PSP) are scheduled for commissioning in May 2016.

15. The current financial performance of THDC is generally satisfactory. FY2007 was the first full year of project operation for THDC. Since then revenue has increased more than three times (from Rs. 446 crore in FY 2007 to Rs 1,424 crore in FY 2010) and net income has increased by more than 4 times (from Rs. 118 crore in FY 2007 to Rs 480 crore in FY 2010). Profitability during FY 2009 measured by return on equity stood at 10 percent. This was lower

than the then regulated return of 14 percent (presently, the CERC allows a base rate for regulated pre-tax return on equity of 15.5 percent) in view of the expansion program being undertaken by THDC and the fact that returns are earned only once the investments become operational. As a result of the expansion in the capital expenditure program over the next few years with new hydro projects being developed, the return on equity is expected to drop again to 11 percent in FY2015 and FY2016 and to rise back once the new projects also start earning revenues.

16. The financial projections (summary tables at the end of the Annex) show the satisfactory debt-equity and DSCR levels being achieved by the entity. The forecasted minimum DSCR is 1.73 in FY2012 and FY2013 while the forecasted maximum debt-equity ratio is 1.66 in FY2015 and FY2016, which is well below the regulated DER of 2.33. This demonstrates that, subject to tariff adjustments in line with CERC's current regulatory framework, THDC's financial performance would continue to remain satisfactory.

17. Tariff for the central power sector utilities in India is determined as per tariff regulations of Central Electricity Regulatory Commission (CERC) issued from time to time and are valid for a specific time frame. Tehri Stage I is presently the only operational project for THDC for which it filed a petition with the commission for fixation of provisional tariff as per the tariff regulations of 2004, CERC⁵⁹. As an interim measure, the commission vide its order dated December 28, 2006 had approved the provisional tariff for the generating station till March 31, 2007.

Period	Tariff Rate
22.9.2006 to 31.12.2006	Rs.3.50 / kWh on single part basis
1.1.2007 to 31.3.2007	i) Energy charge @ Rs.2.50/kWh on the scheduled energy ii) Capacity charge @ Rs.18000 /MW /day

18. The above said provisional tariff of the generating station was allowed to be continued from April 1, 2007 to June 6, 2007 by the commission's order dated March 23, 2007 and was further extended up to December 31, 2007, and then to March 31, 2008, vide its order dated July 13, 2007 and December 19, 2007, respectively. CERC, vide its order dated March 28, 2008, further allowed that the above tariff shall continue till further orders subject to adjustment after determination of the final tariff.

19. All the four units of the Tehri Dam Project have been commissioned with the last unit being commissioned on July 8, 2007. The petition for the final tariff will also carry the information on amounts actually recovered from the beneficiaries during FY2007 and FY2008. The project completion cost at March 2008 price level is Rs 8,392.45 crore including IDC.. This completion cost includes an irrigation component to an extent of Rs 1,441.34 crore that has not been included in the project cost while submitting the final tariff petition. Thus, for tariff calculation, project cost equal to Rs 6,951.11 crore will be considered. The completion cost has been approved by the Standing Committee on Time and Cost Overruns after vetting of the estimates by CEA. This cost has further been approved by Cabinet Committee on Economic Affairs (CCEA). The petition for final tariff for the period September 22, 2006 to March 31, 2009, has been filed with CERC. Though the probability is low, a sensitivity analysis to

⁵⁹ As of June 2011, two of the four units of the Koteswar Dam were being synchronized which means that they are expected to start commercial operation soon.

understand the risk of disallowance of capital expenditure by CERC was carried out for the utility. Under first case, disallowance to the extent of 10 percent of project cost was considered whereas under second case, disallowance to the extent of 20 percent was considered. As per the analysis, FIRR will not change from the base case value of 14.7 percent..

20. Tehri Stage-I is the first project in operation for the company. THDC's main financial risk is the risk of non-payment by off-taking state utilities. To mitigate the risk THDC has a rebate policy in place that is updated every year. As per the policy (recently updated and applicable until 2014), the beneficiaries have to deposit a Letter of Credit (LC) equivalent to 105 percent of average billing over past twelve months. This ensures the timely payments by the states. Though THDC has not faced any payment problems so far, as their project portfolio expands in future this risk may increase.

21. In connection with the Tehri Dam Project, THDC is presently engaged in arbitration with contractors and faces contingent liabilities filed between 2000 and 2008. The approved completion cost includes contingent liabilities capped at Rs. 967.38 crores.

Key Assumptions for Financial Projections

22. The financial projections have been carried out by consolidating the projections of project in operation (i.e. Tehri – Stage I and Koteswar HEP, Units 1 and 2), projects under construction (i.e. the two remaining units of Koteswar HEP, Tehri PSP, and Vishnugad Pipalkoti HEP) and three other projects at various stages of development (Maleri Jhelum HEP, Jhelum Tamak HEP, and Dhukwan HEP) in the state of Uttarakhand. The cost information on the new projects is from the available pre-feasibility reports from Central Electricity Authority (CEA). For projects under construction, cost estimates have been taken from Investment Approval by Cabinet Committee on Economic Affairs (CCEA). The implementation schedule has been assumed as per the latest plans of THDC. The other key assumptions on which the financial projections are based are given below:

- Operating Revenues taken from audited accounts till FY2010, and for subsequent years calculated based on present commissioning schedule of projects and their likely tariff based on the cost estimates provided in the pre-feasibility reports;
- As per CERC Tariff Regulations 2009 applicable for the period 2009-14, Plant Availability Factor (PAF) is assumed to be at Normative Annual Plant Availability Factor (NAPAF) throughout the plant life. At NAPAF, full capacity charges are recoverable. In case PAF exceeds NAPAF, the project will earn additional revenue;
- Operation and maintenance expenses are projected to escalate as per the present CERC tariff norms/ regulations;
- Base rate for pre-tax return on equity taken at 15.5 percent, in accordance with the prevailing Tariff Regulations;
- A dividend of 30 percent of profit after tax is considered subject to sufficient cash and profit (including retained earnings) being available;
- Tax holiday of 10 years for each new project has been considered. During tax holiday period, Minimum Alternative Tax (MAT) is payable;
- MAT rate is considered at 19.93 percent, corporate income tax at 33.22 percent and Dividend distribution tax at 16.61 percent;

- For future hydropower projects, where loans are not contracted, the financing norms adopted are – Debt-Equity of 70:30;
- Exchange rates and inflation as inflation and exchange rate projections followed for project costing exercise for projects in India⁶⁰
- Capitalization of assets is assumed to take place in the year of commissioning
- Free Energy to Host State has been taken as 12 percent for all the projects.

⁶⁰ As of December 2010.

Table 12: Summary Financial Projections for Tehri Hydro Development Corporation Limited

	<i>Rs in Crore</i>															
Financial year Ending March 31 of Ye	2009*	2010*	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
<u>INCOME STATEMENT ITEMS</u>																
Revenue	1,069	1,424	1,313	1,907	1,886	1,871	1,891	1,901	3,751	3,996	3,709	3,715	3,722	3,684	3,722	3,656
Operating Income Before Interest & Finance Charges	749	909	820	1,206	1,172	1,143	1,132	1,127	2,306	2,458	2,141	2,113	2,086	2,011	2,011	1,904
Net Profit	325	480	458	644	624	633	639	672	1,332	1,440	1,182	1,226	1,270	1,336	1,375	1,300
<u>FUNDS STATEMENT ITEMS</u>																
Internal Cash Generation	968	1,086	990	1,449	1,418	1,382	1,347	1,303	2,688	2,840	2,601	2,547	2,493	2,383	2,352	2,246
Equity Contributions	(3)	-	230	274	414	804	716	433	465	39	-	-	-	-	-	-
Borrowings	(31)	263	547	506	1,189	1,684	1,840	1,781	729	99	-	-	-	-	-	-
Total Sources	934	1,350	1,767	2,228	3,021	3,870	3,903	3,517	3,882	2,979	2,601	2,547	2,493	2,383	2,352	2,246
Capital Expenditure	793	683	778	780	1,603	2,489	2,556	2,214	1,193	139	-	-	-	-	-	-
Debt Service	382	418	632	974	957	914	892	860	1,725	1,800	1,727	1,643	1,559	1,127	1,069	1,011
Increase (Decrease) in Working Capital	(194)	282	(33)	59	(63)	(73)	(84)	(97)	236	(82)	(196)	(171)	(197)	(236)	(262)	(320)
Increase (Decrease) in Cash	(47)	(34)	391	416	524	540	539	540	728	1,122	1,069	1,074	1,131	1,492	1,544	1,555
Total Applications	934	1,350	1,767	2,228	3,021	3,870	3,903	3,517	3,882	2,979	2,601	2,547	2,493	2,383	2,352	2,246

* Actuals

Rs in Crore

Financial year Ending March 31 of Ye	2009*	2010*	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BALANCE SHEET ITEMS																
Net Fixed Assets in Operation	7,896	7,546	7,718	7,239	6,761	9,201	8,911	8,468	11,373	10,540	15,196	15,144	14,146	13,149	12,151	11,153
Capital Works-in-Progress	1,691	2,382	2,814	3,594	5,197	4,767	7,122	9,288	6,624	6,598	946	-	-	-	-	-
Net Current Assets	167	414	1,218	1,693	2,154	2,621	3,105	3,599	4,611	5,699	6,618	7,566	8,542	9,839	11,162	12,435
Total Assets	9,754	10,342	11,751	12,526	14,112	16,589	19,138	21,355	22,609	22,838	22,759	22,709	22,689	22,988	23,313	23,588
Debt	4,344	4,608	5,574	5,656	6,422	7,684	9,100	10,447	10,370	9,623	8,776	7,930	7,083	6,514	5,944	5,375
Equity	3,298	3,298	3,639	3,913	4,327	5,131	5,847	6,281	6,745	6,785	6,785	6,785	6,785	6,785	6,785	6,785
Retained Earnings	2,112	2,436	2,539	2,957	3,363	3,775	4,191	4,628	5,494	6,430	7,198	7,995	8,821	9,690	10,584	11,429
Total Equity & Liabilities	9,754	10,342	11,751	12,526	14,112	16,589	19,138	21,355	22,609	22,838	22,760	22,710	22,689	22,988	23,313	23,589
FINANCIAL RATIOS																
Net Income as a % of Revenue	30%	34%	35%	34%	33%	34%	34%	35%	36%	36%	32%	33%	34%	36%	37%	36%
Return on Equity	10%	15%	13%	16%	14%	12%	11%	11%	20%	21%	17%	18%	19%	20%	20%	19%
Debt Service Coverage Ratio	2.38	3.00	1.83	1.73	1.73	1.77	1.82	1.88	1.89	1.92	1.82	1.89	1.98	2.67	2.81	2.87
Debt Equity Ratio	1.32	1.40	1.53	1.45	1.48	1.50	1.56	1.66	1.54	1.42	1.29	1.17	1.04	0.96	0.88	0.79

* Actuals

Annex 10: Safeguard Policy Issues
INDIA: Vishnugad Pipalkoti Hydroelectric Project

A. SOCIAL SAFEGUARDS

Background

1. The Vishnugad Pipalkoti Hydro Electric Project (VPHEP) in Chamoli district, Uttarakhand, will entail construction of a 65-meter high diversion dam which will channel water from the Alaknanda River through a 13.4 km headrace tunnel to an underground powerhouse located near the Haat village. A 3 km tailrace tunnel will return the water to the river.
2. The 2001 census found the total population of Chamoli district to be 370,359 persons with a population density of 45.85 persons per square kilometer. The Scheduled Caste and Scheduled Tribe (ST/SC) population constitutes 21 percent of the total, of which the ST population is about 4.0 percent. The literacy rate in the district is 74 percent (male literacy at 90 percent and female literacy at 62 percent), compared with 92 percent literacy in the project area (male literacy at 97 percent and female literacy at 86 percent). About 60 percent of the district is under forest followed by 19 percent of uncultivable waste land. The net crop area is only about 3.7% of the total area. Though agriculture is the main occupation in the district, about half of the population (48%) are marginal farmers owning less than 0.5 ha of land.
3. A Social Impact Assessment (SIA) for the project area was completed in April 2008. It found pronounced land fragmentation, with 82 percent of the land holdings below 0.5 ha, 96 percent below 1 ha, and 98 percent of the cultivated land not irrigated. Despite this, levels of income were found to be fairly high. Only about 7 percent of a sample of 182 project-affected households were found to have annual incomes below INR 15,000 (the state poverty line being INR 16,400 for a family of 5 persons), while 75 percent had annual incomes ranging from INR 25,000 to 200,000.⁶¹ About 29 percent of families are joint family households with an average size of 5.7 persons, and there is a correlation between high family incomes and the number of economically active adults in the family unit. Most families have multiple sources of income. Thus, 94 percent of the sample households were engaged in agriculture on own and leased land combined with non-farm wage labor for 21.5 percent, government service for 17.5 percent, and various business ventures for 31 percent (e.g. shops, businesses, small-scale contracting). An estimated 80 percent of the agricultural produce is consumed by the households themselves, and most of the affected households also own cows or buffaloes.

⁶¹ The Social Impact Assessment attempted to assess the net value of the agricultural subsistence production as an element of the overall family income. Since informal tenancy arrangements involving land owned by families that have emigrated from the area are common, the actual cultivated area is often larger than that owned by a particular family. This would be one of the factors accounting for the discrepancy between the findings on income levels by the SIA compared with official figures on Below Poverty Line (BPL) families, which use land ownership and social group as the basis for classification. Of the sample families, 55% are classified as BPL and possess a ration card.

Land Acquisition

4. The project triggers OP 4.12 on Involuntary Resettlement, and THDC has in August 2008 adopted a project-specific Resettlement and Rehabilitation Policy which goes beyond the National Resettlement and Rehabilitation Policy (NRRP) of 2007 and establishes compliance with OP 4.12. The policy has been translated into Hindi and is available at THDC's Project Information Center, in the *gram panchayat* offices, and has been disseminated in all affected villages through flyers, public meetings, and house visits.

5. THDC has deployed a social mitigation team comprising of a Senior Manager, a Manager and two social workers, and has contracted a reputed regional NGO to assist as an interface between the communities in the project area and THDC, in the implementation of the Resettlement Action Plan (RAP) and in planning and implementation of local development activities. In line with the NRRP (2007), the state government has appointed the District Magistrate of Chamoli district as an Administrator for land acquisition, resettlement, and rehabilitation (LA/R&R), and established grievance redress arrangements. In each affected village the *gram panchayats/shist mandals* (village councils) interact with the R&R Administrator and THDC on resettlement issues and developmental activities in the villages.

6. The SIA included consultations with stakeholders, information on socio-economic and cultural features of the population, and baseline data on land acquisition impacts. This information, together with subsequent consultations with communities in the project area regarding their concerns and verification and updating by THDC and the facilitating NGO of the SIA data on impacts, has informed the measures in the RAP on mitigation of land acquisition and other impacts. The cut-off date for entitlements for losses caused by land acquisition is December 31, 2008, when data collection was completed for all affected villages with the exception of Hatsari hamlet of Haat village where impacts were fully determined in December 2009 following modifications to the project's technical design.

7. **Land acquisition impacts:** As a run-of-river project, VPHEP has comparatively limited land acquisition impacts which affect a total of 1,250 households (1,481 families with 5,294 persons) in 18 villages. Of these 1,481 families, 773 are directly affected by loss of private land and/or structures, while the remaining 708 families are affected only by reduced access to grazing, fodder and fuel wood collection on government and *van panchayat* land (community held grazing and forest land). The project will require a total of 141.57 ha of land comprising 31.639 ha of private land, 90.09 ha of government forest/grazing land, 10.3 ha of *van panchayat* land, and 9.54 ha of state land owned by the Public Works Department.

Table 1: Project Components and land requirement

	Project Component	Area to be acquired (in ha.)
1	Dam and reservoir	29.95
2	Access roads	21.66
3	Quarry	11.71
4	Excavation dumping sites	5.04
5	Colony, power house, switchyard & TBM assembly	63.69
6	PWD roads	9.54
	Total	141.57

8. The acquisition of private land affects seven villages, while the remaining 11 project-affected villages will lose access only to government forest/grazing and/or *van panchayat* land. Of the private land requirement, 60 percent is being acquired from Haat village. The voluntary land transfer in Haat is based on land acquisition procedures to ensure complete recording of ownership, and on the compensation and assistance provisions in THDC's Resettlement and Rehabilitation Policy. A total of 265 families will be resettled under the project, and of these 92 percent are families from Haat who requested THDC to purchase their land and house and to facilitate their move to the opposite side of the river (see paras 10 and 11).

9. The land acquisition impacts by village are as follows:

Table 2: Purpose and impacts of land acquisition

	Affected Villages	Project Component	Government and VP land (ha)	Private land (ha)	Affected families	Displaced families
1	Haat	Power house, access road, Switchyard, TBM assembly	6.671	20.337	288 (178) ⁶²	242 (28)
2	Batula	Access road	1.788	0.542	134	5
3	Gulabkoti	Excavation Dumping Site	3.130	3.394	75	0
4	Naurak	Access road	2.393	0.121	139	0
5	Tundli Chak Haat	Access road	0.222	0.170	09	0
6	Jaisaal	Colony area	5.407	6.878	128	18
7	Guniyala	Access road	3.222	0.197	36	0
8	Math Jadetha	Access road	1.376	0	0	0
9	Baula (Durgapur)	Outlet for tailrace tunnel	3.623	0	0	0
10	Gadi	Quarry area	5.668	0	0	0
	Langsi	Access road		0	0	0
11	Tapovan	Access road	2.550	0	0	0
12	Dwing	Access road and Adit	0.950	0	0	0
13	Nauligwad	Quarry area	6.044	0	0	0
14	Palla	Dam area	3.975	0	0	0
15	Salna	Reservoir area	5.080	0	0	0
16	Thaing	Reservoir area	1.600	0	0	0
17	Paini	Reservoir area	6.975	0	0	0
18	Helong	Dam site/reservoir area	16.586	0	0	0
Memo:						
	Langsi	Access road (PWD)	5.93	0	0	0
	Haat, Jaisal and Batula	PWD land in these villages	3.61			
		Use of subsoil for underground works (powerhouse and tunnels)	23.13 ⁶³			
TOTAL			109.93	31.639	773	265

⁶² Figures in parentheses correspond to the land acquisition impacts in Haat under the original land acquisition scenario where only 5.77 ha of private land were to be acquired in Haat.

⁶³ In the case of subsoils "land acquisition" is notional and is actually a payment to the Forest Department for the right to work in the subsoils (for the underground infrastructure).

10. **Haat village:** The land to be acquired by the project exceeds the project's initial land requirement of 103.93 ha (of which 17.51 ha were private land) because THDC agreed to a demand from the village Haat that the company acquire land and houses from anyone in the village who wished to relocate. THDC agreed to acquire the additional land in recognition of the disproportionate impact on the village of land acquisition and construction disturbance from the powerhouse, switchyard, a surge shaft, and access roads.

11. A total of 136 households (242 families) from Haat offered their land (amounting to 18.672 ha) and houses to THDC for acquisition.⁶⁴ Of the 136 households whose houses are acquired, 95 reside in the village and are entitled to a grant of INR 1 million that THDC provides to households that chose to resettle on their own.⁶⁵ Eight households (11 families) in the hamlet of Hatsari opted not to relocate. In view of this, in order to limit the land acquisition impacts on Hatsari, THDC shifted the location of the switchyard from land in the hamlet to already acquired government forest land, and also realigned an access road. The land acquisition impacts on the 8 households were reduced to 1.36 ha as a result of which the total amount of private land to be acquired in Haat is 20.337 ha.

12. **Impact on private land holdings:** An analysis of the loss of agricultural land showed that 32 percent of the affected landholders are losing less than 10 percent of their total holdings. Five landowners will be rendered landless and 264 landholders are losing more than 75 percent of their land. About 30 landowners would be left with less than a *naali* (the basic local unit of land = 1/50th ha = 200 sq.m.) after land acquisition, and therefore all their land will be acquired. The minimum compensation being made available to affected landholders is equivalent to 1.5 *naali*, even if the actual amount of agricultural or residential land acquired is less than this amount. The majority of the affected landowners (about 96 percent) across various impact categories are marginal farmers with holdings below 1 ha prior to land acquisition.

13. **Grazing and forest land:** Villages use both government land and *van panchayat* (forest council) land for grazing and fodder collection. *Van panchayats* were formed from 1921 onwards for the use and management of forest and grazing land by village communities. A total of 11 villages will lose access to an average of 2.5 percent of the government forest land that they use at present for grass collection and grazing, and a total of 8 villages lose access to an average of 0.9 percent of the *van panchayat* land they use for grazing and collection of grass and firewood. Of these villages, 3 lose access to both government forest and *van panchayat* land.

14. About 90 percent of village households use *van panchayat* and/or government forest land for collection of grass for livestock fodder or for collection of firewood. The SIA estimated that the average annual loss of income per household from restrictions in access to grazing, fodder and fuel wood collection would be around INR 10,000. Under THDC's R&R Policy, these

⁶⁴ The 20.337 ha corresponds to 69% of the privately held land in the village. The rest is held by the inhabitants of the Hatsari hamlet who did not want to relocate along with the majority of the households in Haat.

⁶⁵ The other 41 households who own houses or are part-owners of houses in Haat have already migrated and settled elsewhere over the years. Such out-migration due to pressure on land has been characteristic of the area for at least a century (Gazetteer of Garhwal Himalaya, Government Press, Allahabad 1910, p. 74). Since the agricultural land in Haat is of low productivity, land is fragmented into un-viable holdings, and there is no functioning land market in the area (except along the highway on the other side of the river), those who have migrated from Haat or have alternative houses and land elsewhere had a strong interest in having THDC acquire their land and houses.

households will each be provided with compensation equivalent to 100 days per year of minimum agricultural wages (INR 100/day) for a 5-year period, which will provide supplementary income until replanted fodder and trees on vacant government forest and *van panchayat* land have matured. In Haat, THDC will also provide an alternative access route to enable the villagers (primarily women) to access the *van panchayat* land during and after the construction period.

15. Buildings and resettlement: A total of 139 private structures and 31 community properties are being acquired under the project. Of the private structures, 99 are residential, five are residential and commercial, three are only commercial, and the remaining 32 are cattle sheds or dilapidated structures. Of the families losing their houses, three are non-titleholders, who will nevertheless receive the minimum compensation of INR 100,000. Of the 104 residential and residential / commercial houses to be acquired, 94 are in Haat, and the remainder are in the villages of Jaisal (6) and Batula (4). All the families that will be resettling will be moving to locations of their own choice. In addition to the house compensation – which in the case of Haat equals the agreed selling price – all the relocating households that are resident in the houses acquired (including the non-titleholders) will receive the additional INR 1 million for self-resettlement to substitute for the infrastructure they would have access to in a resettlement site.

16. Most of the households in Haat own either a house or land on the other side of the river, in the adjacent villages of Maina, Daswana, and Mayapur. There are 17 Scheduled Caste households (29 families) from Haat most of whom hold agricultural *patta* land – granted by the government and allocated by the *gram panchayat* to landless families – in Daswana. Permission has been given by the District Magistrate to build houses on this land. While the NRRP of 2007 does not provide for compensation for *patta* land, THDC is paying compensation equivalent to land held as private property. This will enable the three Scheduled Caste households, who do not have land outside Haat, to buy replacement land with the payment they receive for their *patta* land.

17. Facilities: Since the affected families that will relocate have chosen to move individually to locations of their own choice where most already own an alternative house, THDC will not establish resettlement sites. In the case of Haat, the relocation will be across the river where people will be closer to the schools and health facilities that they already use. For the Scheduled Caste families from Haat who are moving to Daswana and building new houses there, THDC will provide a road connection to the site and access to electricity and water.

18. Trees: The acquisition of land for the project also results in loss of trees both on private land and government land. The total number of trees (fruit, fodder, and timber) that will need to be felled in the project-affected villages is about 6,150, of which 4,672 are privately owned.

19. Entitlements: Under THDC's R&R Policy, those who lose private land have a choice between two compensation options. Option 1 is based on NRRP 2007, whereas Option 2 is based on negotiated settlement. Of the 773 families from whom land and/or houses will be acquired, 269 have chosen Option 1 while 504 have chosen Option 2. Under Option 1, a PAP is entitled to compensation at market value for the lost asset and R&R assistance. Under Option 2, the land value was negotiated at the rate of INR 100,000 per *naali* (a *naali* is equivalent to 200

sq.m.) irrespective of land quality. THDC prepared and shared with PAPs the micro plan for each household with details on the compensation and R&R assistance under both options. Each PAP was therefore aware of the amount he or she would be entitled to under each option and could make an informed decision. The village-wise break-down is as follows:

Table 3: PAF choice of options

Village	Option 1	Option 2
	Number of families	
Haat	0	288
Batula	98	0
Gulabkoti	0	75
Naurakh	139	0
Tundli Chak Haat	0	9
Jaisal	0	128
Guniyala	32	4
Total	269	504

20. The following is a summary of the two options:

21. **Option 1**⁶⁶ includes:

- Land compensation based on the Land Acquisition Act. The Circle Rate in the project area ranges from INR 18,000 to 102,000 per *naali*. The amount paid for land would include the compensation amount, solatium (30 percent of the compensation amount), interest (12 percent from the date of award), and R&R assistance.
- As per the category of affected families (refer Table 4 below), eligible families are entitled to a Rehabilitation Grant ranging from Rs. 36,500 to Rs. 100,000 plus a Subsistence Grant of 300 days of minimum agricultural wages (MAW).

22. **Option 2** which is based on negotiated settlement includes the following:

- INR 100,000 per *naali* irrespective of land quality. This rate is the result of a negotiated process that started with demands by the PAPs based on the package offered by another developer (NTPC) in one the projects located upstream of VPHEP. Market values for land in the affected villages and the surrounding area (with the exception of land across the river along the Highway) are significantly lower than the INR 100,000 per *naali*, and as low as INR 18,000 per *naali* as most of the cultivated land (98 percent) in the affected villages is unirrigated. Thus, the replacement value of the land would not have not been higher than the negotiated rate given the location and quality of land. The amount will also consider the post project value of the land, and interest of 12 percent from the date of award.

⁶⁶ “Land for land”, although included as an option in THDC’s corporate R&R Policy, could not be applied in the case of VPHEP as (i) no replacement government land was available; and (ii) the absence of a functioning land market in the area renders it impossible for THDC to furnish land losers with adequate replacement land. Furthermore, all affected families have chosen to obtain possible replacement land on their own.

- Any land compensation amount above the government Circle Rate will be paid by THDC as R&R assistance. Even if a PAP has a landholding of less than a *naali* or is landless, he/she will be entitled to an R&R package equivalent to the value of at least 1.5 *naali*.

23. **Option 1 and 2** share the following features:

- The minimum compensation for agricultural land will be for 1.5 *naali* (even if the PAP holds less than a *naali*).
- THDC will pay the replacement value of a structure based on PWD's latest Schedule of Rates. Compensation for homestead land will be calculated as per the process followed for agricultural land. The minimum compensation for homestead land will be for a *naali* even if the PAP holds less than a *naali*.
- In case an entire village is displaced, THDC may in consultation with the PAPs construct a new resettlement colony which will include (i) individual developed plots of 250 sq.m.; (ii) basic amenities such as roads (access and internal), electricity, storm water drains, drinking water and sanitation facilities.
- Any community property that will be affected by the project will be replaced by THDC before the demolition or acquisition of the community property. In case of grazing land and *van panchayat* land, THDC will provide access roads to the residual *van panchayat* and/or grazing land. In addition, each affected household will be paid 100 days of MAW per year for a period of 5 years. The amount will be paid as a grant towards the loss of fuel and fodder.
- Employment in the project will be provided subject to employment suitability and availability, and all adult PAPs will if they so chose be included in activities to assist income generation.
- Insurance policy for vulnerable persons.
- Houses above the alignment (within 500 m corridor) of the HRT and TRT will be insured.

24. Table 3 presents the different categories of project affected families (PAFs) as per THDC's R&R policy based on the severity of loss.

Table 4: Entitlement matrix

PAF Category	Severity of loss/impact	Mitigation measures
A	PAFs who own agricultural land that has all been acquired.	Option 1: <ul style="list-style-type: none"> Land compensation based on the LA Act. Rehabilitation Grant of 1,000 days of minimum agricultural wages (MAW) plus subsistence grant of 300 days MAW. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
B	PAFs owning agricultural land who lose partial land and become marginal farmers (left with un-irrigated land holding up to 1 ha or ½ ha. irrigated land).	Option 1: <ul style="list-style-type: none"> Land compensation based on the LA Act. Rehabilitation Grant of 750 days of MAW plus subsistence grant of 300 days MAW. Additional INR 30,000 if losing > 50% of

PAF Category	Severity of loss/impact	Mitigation measures
		land. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
C	PAFs owning agricultural land losing partial land and becoming small farmer (left with un-irrigated land holding up to 2 ha. or irrigated holding up to 1 ha.).	Option 1: <ul style="list-style-type: none"> Land compensation based on the LA Act. Rehabilitation Grant of 750 days of MAW plus subsistence grant of 300 days MAW. Additional INR 30,000 if losing > 50% of land. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
D	PAFs owning agricultural land and losing partial land but not covered in either category B or C.	Option 1: <ul style="list-style-type: none"> Land compensation based on the LA Act. Rehabilitation Grant of 750 days of MAW plus subsistence grant of 300 days MAW. Additional INR 30,000 if losing > 50% of land. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
E	Agricultural laborer PAF including squatters and encroachers who does not own land in the acquired area but who earns his/her livelihood principally by manual labor & have been deprived of his /her livelihood due to acquisition.	Option 1: Rehabilitation Grant of 750 days of MAW plus subsistence grant of 300 days MAW. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
F	Non agricultural laborer PAF including squatters and encroachers who are not an agricultural labor PAF, who earns his livelihood principally by manual labor or as a rural artisan or having any client relationship with the PAF community, immediately before acquisition and has been deprived of his/her such livelihood due to acquisition.	Option 1: Rehabilitation Grant of 750 days of MAW plus subsistence grant of 300 days MAW. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
G	PAFs losing partial land in case of linked projects/schemes, such as connecting approach roads & bridges outside the project and its associated area etc., wherein only a narrow stretch of land extending several kilometers is being acquired.	Option 1: Rehabilitation Grant of 500 days of MAW plus subsistence grant of 300 days MAW. Option 2: INR 100,000 per <i>naali</i> with minimum area compensated of 1.5 <i>naali</i> .
H	Occupiers i.e. PAFs of STs in possession of forest land since 13th December 2005.	Option 1: Rehabilitation Grant of 500 days of MAW.
I	PAFs who are Homestead Oustees (HSO) or totally displaced and whose house has been acquired.	Option 1: <ul style="list-style-type: none"> House compensation based on PWD's Schedule of Rates. Self-Rehabilitation Grant of INR 50,000 to 100,000 plus resettlement Grant of INR 40,000 plus Shifting Allowance of INR 20,000.
J	Vulnerable Persons	Insurance Policy.
K	Impact on houses above the tunnel alignment	Insurance Cover.

25. Income restoration: All PAPs losing agriculture land or getting displaced or losing livelihood will be supported by THDC for restoration of income. For income restoration, the NGO contracted for RAP implementation along with the Environmental and Social Cell of THDC has completed the need assessment survey to identify trades for training. The NGO is in the process of (i) identifying master trainers for training (master trainers for certain trades have already been identified); (ii) establishing backward and forward linkages for each trade selected; and (iii) arranging for training logistics. Training has already been imparted to the first batch of PAPs in the following trades: hotel management; motor mechanics; tailoring; dairy; backyard poultry; vermi composting; agriculture; masonry for low-cost housing; and preparatory training for the paramilitary forces. Apart from individual IR trainings, two SHGs have been formed in Haat village for sweater knitting for school children. The NGO will also monitor each PAP and document the progress of income restoration. A challenge facing the planning of income-generation assistance is that PAPs from the General Castes, which constitute about 62% of the PAPs, are generally not willing to engage in trades perceived to be “menial” such as carpentry, masonry, electrical work etc., for which there is likely to be an increasing demand as the local economy grows, stimulated both by the development of hydropower and growth in tourism and pilgrimage. The experience of the income generation schemes as well as the overall income restoration for PAPs will be evaluated in the midterm and final evaluation of the RAP implementation. This external monitoring and evaluation will be in addition to the internal monitoring carried out by THDC.

26. Budget and management of compensation and rehabilitation payments: The costs of land acquisition, resettlement and rehabilitation are included in the project’s overall costs. A budget of INR 736.7 million (about USD 16.3 million) has been earmarked for RAP implementation and monitoring, which may be enhanced in future as required.

Table 5: Budget

Budget Head	Unit	Quantity	Cost per unit	Cost in INR million
Rehabilitation Assistance				
Subsistence Allowance to 328 PAFs @ 21900.00	PAF	328	21900	7.183
Rehabilitation Grant to 25 PAFs in A Category (1000 days MAW)	PAF	25	100000	2.5
Rehabilitation Grant to 248 PAFs in G category (500 days MAW)	PAF	248	50000	9.052
Rehabilitation Grant to 55 PAFs in B-F category(750 days MAW)	PAF	55	75000	3.011
HCA for PAFs losing > 50% land but not losing house for 8 PAFs @ Rs. 30,000	PAF	8	30000	0.24
Sub Total				21.98
Resettlement Assistance				
Housing plot for 150 PAFs @100 sqm./Additional assistance to 125 HHs in Haat @ Rs. 10.00 Lacs per HHs	HHs	125	1000000	125
Cattle shed (inclusive of Resettlement Grant) for 11 PAFs in Batula @ Rs. 40000	PAF	11	40000	0.44
Transportation cost (for 8 PAFs @ Rs. 20,000.00 in Batula)	PAF	8	20000	0.16
Self Resettlement Grant for 8 PAFs in Batula @ 1.00 Lac	PAF	8	100000	0.8

Sub Total				126.4
R&R Assistance to PAFs for Option II of R&R Policy towards land acquisition				
R&R Assistance (Difference of land @ 1.00 Lac per Naali and Compensation paid through SLAO) to PAFs in Gulabkoti, Jaisaal & Tenduli Chak	THs			36.82
R&R Assistance (Difference of land @ 1.00 Lac per Naali and Compensation paid through SLAO) to PAFs in Haat	THs			66.33
Sub Total				103.16
Grants towards loss of fodder and fuel				
Grants towards loss of fodder and fuel for 2000 HH @ Rs. 56250	HH	2000	56250	112.5
Sub Total				112.5
Area Development Activities @ one percent of the total project cost				
Community Development & Welfare schemes	Estimated			20
Roads	Estimated			80
Upgradation of educational facilities/Assistance for education	Estimated			50
Community Centre/community facilities	Estimated			40
Water Supply Schemes	Estimated			45.6
Sanitation Schemes	Estimated			20
Training Facilities	Estimated			5
Insurance for vulnerable PAPs	PAPs	444	100000	44.4
Scholarship to students etc.	Estimated			5
Sub Total				310
Other Income Generation and Rehabilitation assistance for PAFs				
Income generation and Training for affected persons	Estimated			3.72
Scholarship/tuition fees for affected persons	Estimated			5.58
Income generation and Training for vulnerable persons	Estimated			4.44
Income generation and Training for vulnerable households (<i>Van panchayat</i> land)	Estimated			8.51
Sub Total				22.25
Training and Awareness				
Training of Project and NGO staff	Estimated			0.5
Preventive measures for HIV/AIDS	Estimated			0.3
Sub total				0.8
Support for RAP Implementation				
Fee for M&E (External Agency) for four years	Actual			7.4
Cost of M&E (THDC)	Estimated			0.5
NGO Cost for RAP Implementation for another 4 years	Actual			11.24
Printing of I-card, policy and photographs	Estimated			0.5
Sub total				19.64
Insurance cover for properties above the tunnel alignment				
Insurance of structures within 250-250M along the alignment of tunnel				
Videography of structures for 2500 structures @ Rs. 2000	Structures	2500	2000	5
Insurance of 2500 structures for 5 years @ Rs. 1200 per structure per year	Structures	2500	1200	15
Sub total				20
GRAND TOTAL				736.74

27. Each project affected family (PAF) will open a joint (husband/wife) bank account. The PAPs are familiar with banking transactions, and the SIA found that 30% of households have savings accounts, while 76% have taken credit from banks. Based on the agreement between the PAF and the LA/R&R Administrator/THDC regarding entitlements, a passbook will be issued to the PAF listing the specific compensation and assistance amounts for each applicable entitlement. The total amount for the compensation and assistance entitlements will be deposited into an escrow bank account, and funds corresponding to specific entitlements will be transferred to the account of the PAF when conditions for the release of funds are met. Thus land compensation funds will be transferred when the PAF has identified replacement land and produce the required documentation, house compensation funds are released in installments related to physical progress on replacement house construction, and income generation assistance is released when the PAF identifies viable options and/or completes skills training.

28. A task force with representation from the concerned village *panchayat* and from THDC and the district administration will oversee the release of funds for different entitlements, and the process will be facilitated by the NGO contracted to assist in RAP implementation.

29. **Grievance redress:** A district level grievance redress mechanism headed by a retired *zilla parishad* CEO with a background in the law has been established with representation of a PAP from each of the affected villages, an NGO representative, and THDC's project-level social manager as secretary. THDC has also developed by-laws for the grievance redressal cell. Complaints must be processed within 15 days, and if the resolution proposed by this body is not accepted by the aggrieved PAP, the case can be referred to the Commissioner for LA/R&R. THDC will maintain a register of complaints, their processing, and their resolution. As of March 2011, the GRC had conducted nine formal hearings; a review carried out at this time showed that few individual cases are reported to the GRC.

30. **Monitoring and evaluation:** Since land acquisition and all relocation will have to be completed ahead of the start of specific construction activities, the process needs to be carefully monitored in order to identify and resolve problems on a timely basis. The VPHEP team at the project site will generate aggregate monthly reports (with copy to the MPS Department to inform management) with village-specific information on the status of land acquisition and resettlement, compensation payments and assistance, and information on grievance redress. These monthly reports will help THDC assess the need for any course correction that may be required to manage the processes of land acquisition and resettlement. Apart from THDC's own monitoring, a committee for internal monitoring has been constituted headed by the Sub-Divisional Magistrate in Chamoli and with participation of project staff and PAPs. THDC has also hired an external agency for third party independent monitoring. External monitor has so far submitted one quarterly report. The agency provides independent verification of timely payments of compensation and rehabilitation assistance to those entitled and that grievances are addressed in a prompt manner. An evaluation of the achievement of the objective of R&R activities – restoration or improvement of PAP living standards – will be conducted as part of the project midterm review and before project closure.

31. The key monitoring indicators for implementation of the RAP are detailed in Annex 3.

Indigenous Peoples

32. OP 4.10 was not found to be triggered since there are no Scheduled Tribe communities in the project area. The population in the project affected villages is predominantly Hindu general castes (about two thirds) and scheduled castes (one third). In Haat the affected population includes 11 Bhotia families (8 households) who migrated from Malari near the Hindu pilgrimage site of Badrinath on the upper reaches of the Alaknanda River 15 years ago and settled in the village. Another project-affected Bhotia household resides in Batula. In the Malari area, the Bhotias were traditionally involved in trans-Himalayan trade and in the management of the temple at Badrinath.⁶⁷ Of the families settled in Haat and Batula, some have acquired marginal landholdings while others are tenants, and some hold government jobs. They still hold land in their original home area. The Bhotia families do not speak a separate language from that of the majority population (Garhwali and Hindi) and are Hindus. They do not have a historically based collective attachment to the land in Haat or any customary rights to forest and grazing land. Nor do they or have political institutions that separate them from the majority population.

Non-land acquisition impacts

33. People in villages affected by land acquisition as well as those in the 12 non-affected villages situated on the mountain above the head and tailrace tunnels expressed concern over the possible impacts on their houses of blasting or blasting-induced landslides during construction and/or soil subsidence after construction of the tunnel. To address these concerns, THDC has: (i) commissioned a study by the Department of Earth Sciences, IIT Roorkee (which was disseminated to the concerned villagers in local language in December 2009); (ii) provided for an insurance scheme to cover any impacts that might arise (although these are not anticipated); (iii) established a baseline of the current condition of all habitations against which damage assessments can be made; and (iv) mapped and measured all water sources to enable assessment and mitigation of any future decrease in water availability caused by project construction activities. While not entirely doing away with the need for blasting to construct the headrace tunnel, the decision to use a tunnel boring machine means that the bulk of the tunneling will be carried out without blasting.

34. The project will not have downstream impacts on livelihoods since the water of the Alaknanda within the project area and down-stream is not used for irrigation or livelihood dependent fishery. Agriculture is primarily rain-fed. Only 15 percent of the agricultural land in the entire district is irrigated, and about 2% in the affected villages. This irrigation is based on tributary streams and springs, not on intakes in the Alaknanda River. With no industries in the area, there is also no industrial demand for water.

Local Development and benefit sharing

35. While the project causes adverse impacts, it will also bring positive benefits to the local population. Two categories of local development funds will be available. The first includes dedicated funds of INR 310 million that will be used for the 18 affected villages over five years during the construction period. THDC has by March 2011 spent INR 14.2 million from

⁶⁷ Gazetteer of Garhwal Himalaya, p. 63.

corporate social responsibility funds on minor infrastructure development projects and community welfare schemes in ten villages. The infrastructure created include access path to temples and common properties, bus shelter and water supply schemes. The welfare schemes include distribution of computers, furniture, bags etc in schools, plantation of fruit bearing trees, assistance for construction of vermi-compost pits, garbage bins for waste management, installation of solar lights on village roads, providing seed money towards income generation schemes, distribution of sweaters, blankets, rain coats, generators and furnishing of community centers. For this category, investment plans will be prepared by the communities. Civil works will be carried out by contractors or by the *gram panchayats* with monitoring by the beneficiary community. In addition, during the construction period, contracts for small civil works will to the extent possible be given to eligible PAPs. THDC will also provide 100 kWh of free electricity per month for a period of 10 years to affected households.

36. The second category derives from the National Hydro Policy, which recommends that one percent of the plant's generation (or monetary equivalent) be available for local development activities in a wider area comprising both directly and indirectly affected communities after the commissioning of the Project.

37. Apart from project specific R&R Policy and RAP, THDC has developed Corporate Social Responsibility Policy for the implementation of Community Development scheme. The scheme addresses the issue of "Community Development" in the neighborhood area of operating stations where construction has been completed and rehabilitation and resettlement issues addressed stand as per the R&R policy of Corporation applicable for Project under construction stage/planned for construction. To plan, execute, follow-up and monitor the CSR-CD schemes of THDC, "Society for Empowerment and Welfare Activities" (SEWA) was registered on March 24, 2009.

B. ENVIRONMENTAL MANGEMENT

Environmental Impact Assessment, Management Plans and Monitoring Arrangements

38. **Project location:** VPHEP is located on the Alaknanda River in Chamoli district in the state of Uttarakhand. It is a run-of-the river hydro power project for which a 65-meter-high diversion dam will be constructed near village Helong (79°29'30"E and 30°30'50"N), and an underground power house at village Haat (79°24'56"E and 30°25'31"N). The nearest railway station is at Rishikesh (225km from project site). National Highway 58 (Ghaziabad-Rishikesh-Pipalkoti-Joshimath) runs parallel to the eastern bank of the Alaknanda, whereas the project components are located on the western bank.

39. The Alaknanda originates from the two glaciers of Bhagirath Kharak and Satopanth, located some 16 km upstream of Badrinath. The topography of the Alaknanda sub-basin is divided in two distinct zones, the snow-fed zone of the Greater Himalayas, and the rain-fed zone of the Lesser Himalayas. The total catchment of the Alaknanda is 11,040 sq km, of which the catchment of the project is 4,672 sq km, some 2,896 sq km of which is snow-bound area.

40. Environmental context of the project influence area: The project influence area has an altitude range of 1,500m to 5,000m. The vegetation varies with altitude and topography. The major forest type up to an elevation of 2,000-2,200m is Upper Himalayan Pine, which is essentially dense mixed forest with pine as the dominant tree. The bank of the Alaknanda here is shadowed by a highway, which has several villages dotted along its length. The forests adjacent to the river banks are substantially degraded as a result of centuries of exploitation and human activity.

41. Forest management in the state: In Uttarakhand, forestry is the dominant land use (34,662 sq km or 64.8% of state area), followed by agriculture. However, the forests have a long history of degradation, and only 4,002 sq km are dense forests, the remaining being a mix of moderately dense and open forests. The predominantly rural and agrarian population of the state depends on the forests for their requirements of fuel, fodder, animal grazing, and timber. The forests in the state are divided into three groups – reserved forests, community (Panchayati) forests, and land earmarked for grazing. Reserved forests are protected and managed by the state forest department. The community forests are managed by van panchayats, where the land is delineated and allotted by the state forests department to user groups (self-help groups among the village communities) who protect and develop the forests, and use the forest produce for the benefit of identified users. Such community forests are managed by a management committee elected by the user groups and headed by the sarpanch (elected village head). There are about 12,000 van panchayats in the state, and in general this is regarded as a successful institutional arrangement.

42. Protected areas: For managing forests, biodiversity and wildlife, vast tracts of forest land are protected. Together these protected areas cover about 13.4 percent of the state's total area. There are six national parks (total area 4,731 sq km), and six wildlife sanctuaries (total area 2,419 sq km) in Uttarakhand. The protection status of these areas is held to be satisfactory. Of the protected areas, two national parks (the Nanda Devi National Park and the Valley of Flowers National Park) and a wildlife sanctuary (the Kedarnath Wildlife Sanctuary) are located in the Alaknanda sub-basin. The two national parks comprise the Nanda Devi Biosphere Reserve, a World Heritage site famed for its Himalayan highland biodiversity.

43. Seismicity: As per Indian standards for seismicity (Indian Standard 1893 part I, 2002), the state lies in seismic zones V (which is most severe with respect to possible earthquake impacts) and IV. These zones correspond to effective peak ground accelerations of 0.36'g' and 0.24'g'. The most severe earthquake in recent history of the state occurred on 29 March 1999. This earthquake, usually referred to as the 'Chamoli earthquake' had a magnitude of 6.8 on the Richter Scale, and an epicenter intensity of VIII. The effects of this earthquake, the most severe in the Alaknanda valley, were noticed even beyond a radius of 200km from the epicenter.

44. Environmental assessment process in the project: the project is classified as a Category A operation under the environmental screening procedures specified in World Bank OP 4.01. It triggers seven of the ten World Bank safeguard policies, and as such requires a comprehensive environmental assessment. The project also requires a comprehensive environmental impact assessment (EIA) under the regulations of GOI and the State Government of Uttarakhand.

45. An initial EIA including description of the project's baseline environmental conditions; probable adverse social and environmental impacts; and an environmental management plan was prepared by consultants (WAPCOS Ltd) in 2007. Subsequently, additional environmental studies by independent consultants were undertaken to enhance the analysis, which involved additional detailed field investigation and community consultations over a period of about a year (April 2008-May 2009). Further, two other distinct management plans were prepared, such as the catchment area treatment plan for 84,085 ha of catchment (by the Uttarakhand State Forest Department) and the safety assurance plan (prepared by THDC). The initial EIA and the additional environmental studies and additional management plans were consolidated into the project's Environmental Assessment and Management Plan (EA/EMP) in 2009. The EA/EMP also includes the description of management activities along with institutional responsibilities, capacity building and training plans, implementation schedules, budget, and arrangements for monitoring and evaluation.

46. The EA/EMP has been supplemented with the following studies and project management documents: (i) Study of managed river flows in the project stretch of the Alaknanda River; (ii) assessment of the terrestrial biodiversity impacts of the Project, including supplemental study of project impact on the Kedarnath Wildlife Sanctuary; (iii) assessment of archeological, physical and cultural resources; (iv) Safety Assurance Plan for the project; (v) catchment area treatment plan for the project prepared by the Uttarakhand State Forest Department; and (vi) Social Impact Assessment and Resettlement Action Plan. The summary recommendations, as applicable, of all the above studies have been incorporated in the project EMP.

47. Public consultation and disclosure: The project has engaged stakeholders including the project-affected people to discuss different aspects of the project over the last three years. THDC has organized community meetings, meetings with village elders and elected leaders of the villages. In the course of project preparation, a number of significant formal and informal meetings were organized. 109 formal consultation meetings on the project, including environmental and social issues, had been held by March 2011. There were eleven focused consultations related to environmental issues during EA consolidation process, and these are recorded in the EA. As part of the regulatory clearance process, formal public hearings were organized twice in October 2006 and January 2007. In keeping with World Bank policy, the final consolidated EA/EMP and RAP were disclosed at a public meeting in September 2009.

48. At Haat village, a Project Information Center (PIC) was set up in July 2007, where the local community and any other stakeholders have full access, and this PIC has been helpful for the local public in recording their views about the project. Additionally, from 2008-11 THDC operated a second PIC at its office in Pipalkoti which contained a 3-D schematic model depicting all the proposed components of the project. In February 2011, THDC consolidated the two PICs to a single PIC at the new project colony that was established near the villages Jaisaal and Haat. This PIC will remain functional throughout the project implementation period.

49. The EIA report (based on which regulatory clearance for the project was granted) was duly disclosed before the formal public hearing, with assistance from the State Pollution Control Board. The consolidated and updated EA/EMP that was prepared after incorporation of recommendations of additional environmental studies and the RAP (including translation of the

Executive Summaries in the local language, Hindi) is available in the PICs, offices of the affected *panchayats*, office of the District Magistrate/Collector/ SDM and in THDC's corporate office at Rishikesh. These documents are also available on THDC's website (www.thdc.gov.in).

50. The availability of these documents was announced in the local newspapers (both English and Hindi newspapers) on 27 July 2009. These documents were disclosed in the Bank's InfoShop in draft form on September 14, 2009 and in their final version in November 2009. A stakeholder's public dissemination meeting was also held on September 13, 2009, at the project site at Pipalkoti, where the draft EA/EMP, the RAP and all other project details were shared with stakeholders.

51. Environmental policy and regulatory framework, and regulatory clearances: The project is subject to a variety of national and state laws, and rules and regulations. Among these, the prominent are: The Forest Act, 1927; the Forest (Conservation) Act, 1980; the Wildlife (Protection) Act, 1972; the National Wildlife Action Plan, 1983, revised 2002; the National Conservation Strategy, 1992; the National Forest Policy, 1988; the Environment (Protection) Act, 1986; and the Environmental Impact Assessment Notification, 2006. As per the regulatory procedures, the project requires (i) forestry clearances, and (ii) the three-stage environmental clearances (which verify that all activities in the project are in conformity with each of the relevant environmental policies, laws and regulations).

52. The Stage-I environmental clearance from GOI Ministry of Environment and Forests (MoEF) was obtained in 2003, which allowed detailed site investigations. MoEF granted Stage-II environmental clearance, which allows provisional creation of infrastructure needed for pre-construction, in May 2005. The final environmental clearance was granted by MoEF in August 2007, based on the forests and environmental clearance by GOUk, the no-objection certificate from the Uttarakhand State Pollution Control Board, and the reports of the public hearing organized in October 2006 and January 2007. On the basis of the comprehensive cumulative impact assessment that was completed in April 2011, MoEF amended the minimum flow requirement from 3 cumecs (as stipulated in the original environmental clearance) to 15.65 cumecs. The Stage 1 forest clearance was issued by MoEF in June 2011. As a condition of the forest clearance, the project EIA will be placed before the National Wildlife Board of India which will consider the project impact on the Kedarnath Wildlife Sanctuary and recommend measures to mitigate any adverse impacts..

53. The project does not require regulatory clearance under the Ancient Sites and Remains Act, as it does not impact, directly or indirectly any known or notified cultural heritage resource. This was confirmed by a survey of archeological, historical and religious resources around the project area. The EMP contains enhancement plans for cultural properties in proximity to the project, and a chance find procedure.

54. Analysis of alternatives and avoidance of possible environmental and social impacts: Analyses of alternatives for the project was done at both the initial identification and the project design stages. The analysis at the initial project identification stage was carried out by the State government about 25 years ago, and the project-level analyses were conducted between 2003 and 2007.

55. Project identification and analysis: In 1984, the Uttar Pradesh Irrigation Department identified the project with an installed capacity of 340 MW. Several alternative sites were considered in the identification report. The “run of the river” option included a barrage at village Helong and an underground powerhouse at village Birahi on the western bank of the Alaknanda. Two alternatives were considered for a “high dam and large storage” option – with an underground powerhouse at village Birahi on the western bank; or with a surface powerhouse near village Haat, on the eastern bank of the Alaknanda. The “run of the river” option was chosen. Subsequently, Government of Uttarakhand allotted the project to THDC and mandated THDC to undertake all required detailed investigations.

56. THDC undertook detailed investigations related to design and location of project components. The major siting decisions involved the location of the diversion dam, headrace tunnel, spillway, powerhouse, project township, workers’ accommodation, quarry and borrow areas, approach and haul roads, and muck disposal sites. The analysis to select the most suitable location for each of these is discussed below.

57. Location of the diversion dam: Five alternatives were considered and analyzed (see Table 6). While each of these were conceptually possible locations for the diversion dam, there were varying levels of environmental, geological and social issues attached to each. Each of the possible locations was analyzed as to the probable impacts on physical environment, terrestrial and aquatic biodiversity, and human settlements. The analyses considered the possible dam sites as well as associated impacts from the headrace tunnel, the sedimentation chambers, and the approach roads.

58. On the basis of detailed analyses (see summary of analyses in Table 6), alternative D5 was selected for construction of the diversion dam with a low height spillway. This selection ensured that the submergence caused by the diurnal storage is minimized (only about 21.5ha on the riverbed), and that no human settlement was affected by submergence. This site selection also ensured that acquisition of private land for the other components of the Project is also minimized so as to avoid, as much as possible, involuntary displacement and other impacts associated with acquisition of private land. Consequently, about 70% of the land required for the Project is public land, already vested in the government. Once the dam site was finalized, location/alignments of other project components like the headrace tunnel, the powerhouse, the approach roads were selected, with due consideration to further minimize the possible environmental and social impacts.

Table 6 - Summary of Analyses for Alternative Location for the Diversion dam

Alternative	Location	Environmental, Social & Technical issues	Summary
D-1 Site (a relatively high dam)	Near <i>Pipalkoti</i> town	<ul style="list-style-type: none"> Pipalkoti town and 6 villages will submerge; Huge forestland under submergence The national highway, NH-58 is below highest submergence level, would need realignment for 30km 	Not suitable for a storage dam

		<ul style="list-style-type: none"> • The Main Central Thrust is too close to the site; the geological formation is of calcareous rock 	
D-1 with low height Upper Barrage	Downstream of Animath rivulet	<ul style="list-style-type: none"> • Overburden depth too much- much excavation required 	Not suitable
D-1 with low height Lower Barrage	Near village <i>Helong</i>	<ul style="list-style-type: none"> • Close to MCT • Full head not able to utilize 	Not suitable
D-2 Site	120m downstream of D-1	<ul style="list-style-type: none"> • Overburden depth is too much 	Not suitable
D-3 Site	200m downstream of D-2	<ul style="list-style-type: none"> • Rockfall prone • 20m thick river borne material terrace above water level on both bank 	Not suitable
D-4 Site	1.5km downstream of D-1	<ul style="list-style-type: none"> • Low environmental and social impacts 	Found suitable
D-5	50m downstream of D-4	<ul style="list-style-type: none"> • Most appropriate from environmental, social and technical aspects, does not involve submergence of villages. Less tree cutting. Does not require realignment of NH-58. 	Finally selected

59. Alignment of the headrace tunnel: A 13.4km long and 8.8 m diameter modified horse shoe shaped headrace tunnel (HRT) has been proposed on western bank of the river. The geological profile of the rock structure in the tunnel are completely folded and faulted. The alignment of the tunnel is crossed by several perennial and ephemeral drains and a rivulet, the Maina Nadi (a small inflow stream), which intersects the tunnel about 9 km downstream of the diversion dam. The alignment of the tunnel has been optimally fixed to provide adequate rock cover below the drainage crossings. The most critical stretch of the HRT passes below the Maina Nadi that required proper rock cover; detailed and adequate site investigations were carried out for finalizing and selecting the layout of the alignment. The construction of the HRT will not have any significant impact on the environment as it is an underground tunnel. The HRT, particularly the openings to the surface, is below or on sparsely vegetated land with scattered pine trees, and does not involve clearing of land.

60. Location and orientation of the powerhouse complex: Geology and ecology of the area, availability of head and discharge in the river, as well as human habitation and density of population are some of the main issues considered for the location of the powerhouse. To minimize the impact on the surrounding ecology, THDC abandoned the option of a surface powerhouse, and opted for the proposed underground structure which is more secure and environmentally viable. The underground powerhouse complex will comprise of two separate caverns. The main machine hall cavern is 146m long, 20.3m wide and 50m high. It will have a 34m long service bay and 27m long control room and space for 4 units of 111 MW each. The transformer cavern will be 142m long, 16m wide and 24m high to accommodate transformer and Gas Insulated Switchgear (GIS) etc. The draft tubes shall be provided with a draft tube gate. The site for the powerhouse complex is selected inside a hill on the western bank the Alaknanda

downstream of village Haat, 15km downstream of the diversion dam, covering an area of 2ha. The exact siting was determined based on the steepness of the slope of the river bank, and the paucity of space in the alternative possible site considered near the confluence of the Birahi Ganga with the Alaknanda. The detailed topographical study of the surrounding, and the geological investigations confirmed that the powerhouse complex was suitable for accommodating the necessary components of the complex and the tunnels – the cable tunnel, the ventilation tunnel, and the adit to the penstock. The orientation of the powerhouse was decided on the basis of in-situ stress and foliation direction. The area on the surface (below which the powerhouse complex will be constructed) is sparsely vegetated, with degraded forests, and all floral species found are common in occurrence. The powerhouse site is located on the bank opposite to the national highway NH-58. These confirm that the small pre-construction works required at the surface will have no noticeable impact on environment, and will not disrupt normal traffic.

61. Spillway and energy dissipation structures: For optimal utilization of the head and water available from the different streams joining the river the site, an ogee spillway with vertical gates is proposed for the design peak maximum flood of 10,805 m³/second. Four openings, each with clear opening of size 6.6m x 15m high are proposed to cater to design flood discharge, including one additional gate to conform to the Bureau of India Standards (BIS) safety code. Radial Gates will be operated by means of hydraulic hoists. Provision of stop log gates with gantry crane has also been made. Energy dissipation is proposed through a trajectory type of bucket, which throws the water through the air and into the plunge pool. Protection works in term of a concrete apron are planned immediately downstream of the bucket.

62. Location and alignment of approach roads and haul roads: The project is adjacent to the NH-58, at a distance of about 225 km from Rishikesh. Approach roads from NH-58 doubling as haul roads are required to connect the dam site, the adits and the muck disposal areas, and the powerhouse and the workers' camps. Careful analyses minimized the number of these roads to four, with a total road length 25.6 km (with a total area of 21.65 ha). As far as possible, existing small roads and existing alignments of footpaths were used. . The dam and appurtenant structures including the dump yard near Gulabkoti village have been connected by a 10.0 m wide road from NH-58 (near Tarud Pani). The western bank (right abutment) is connected by a 40 R triple double reinforced Bailey bridge over the Alaknanda River.. As most of the HRT will be constructed by TBM, no adit is required near Dwing. However, as a contingency plan, an old abandoned road starting from the village Gulabkoti (constructed long ago to connect an adit portal opposite the Patal Ganga) will be used to reconstruct an approach to Dwing adit. This use of this abandoned road has ensured that felling of trees, cutting through the hill slope and land acquisition were all avoided. The approach road from Pipalkoti to adit portal near rivulet Maina Nadi is designed to provide additional benefits to the nearby western bank village communities of Tenduli, Math and Guniyala. By extending this approach road to these villages, along the existing alignment of the foot track as far as possible, the Project tries to provide benefits to the villagers, who otherwise walk daily up and downhill to Pipalkoti for accessing market, health and education services. The fourth approach road, of dual carriage way, starting near village Koriya will connect the powerhouse, the switchyard, the top and the bottom of the surge shaft, outfall of the tailrace tunnel, and the residential complex. This alignment traverses open scrub areas dominated by common thorny bushes, and small parcels agricultural land. On the western

bank, an existing old PWD road (old road to Badrinath) will be used for haulage between village Siyasain to the bridge on the Alaknanda. For the purposes of the Project, a section of this road from village Koriya to village Siyasain will be upgraded and resurfaced. To serve the local communities in future, the roads connecting the adits will be constructed as permanent roads.

63. Location of the Project township: The proposed township is in village Siyasain, 20km downstream of the diversion dam, on the western bank of the Alaknanda. This site was chosen due to its proximity to Pipalkoti (where commercial facilities, hotels, guest houses and other services are available at about 4km away from the township, and need not be duplicated within the township); and easy access from NH-58 near Pipalkoti (by a bridge connecting villages Jaisal and Siyasain). All these consideration helped minimizing the land requirement for the township to about 13ha. Within this limited area, however, all other required facilities – such as the residential and office buildings, post office, fire station, guest houses, local shopping, police station, water treatment plant, sewage treatment plants, solid waste management infrastructure – all will be built and provided. A site on the eastern bank was not selected as most of the construction work will happen on the western bank, and also to avoid unreasonable disturbance to the traffic on the NH-58. Additionally, a location on western bank ensures that the Project components including the powerhouse complex and the dam site are accessible through the alternative road on the western bank which carries much less traffic compared to NH-58. At a local level, the exact site was chosen to take advantage of the barren and gently sloping patches of land available. About 60% of this land is owned by the local government, and the remaining 40% is designated as forest land, albeit without forest cover (with very few small patches of wild grass, a few scattered trees).

64. Construction workers' camps: Location of the two construction workers' camps at villages Gulabkoti and Batula were chosen based on accessibility from the approach roads constructed by the project (and thereby avoiding the need for more roads), proximity to the dam site and the powerhouse site, and proximity to the shopping facilities. Each of the camps is located on the eastern bank of the Alaknanda due to unavailability of flat parcels of land on the western bank. Each of the sites is accessible from the NH-58 through the current footbridges at villages Haat, Tenduli, Huna and on the Tapan Nala; and in future will be accessible through the new bridges under construction at Haat, Tunli, Helong and on the Birahi .

65. Quarry and borrow areas: Three quarries and three borrow areas are proposed to be used by the Project. The first quarry is located at village Gulabkoti is 2km downstream of the proposed dam site and adjacent to NH-58. The second, the Patal Ganga quarry, a terraced deposit of coarse aggregates is 5km downstream of the proposed dam site. The third site at village Garigaon near the Birahi is 5km upstream of the proposed powerhouse. The Borrow Areas are located at villages Bajipur, Haat and Bhagisera. The quarry and borrow areas had been selected for their proximity to NH-58 and the work sites, particularly to the proposed sites of the diversion dam and the powerhouse, to reduce the transportation distance and costs. Detailed investigations confirmed that these areas do not support any significant forests or biodiversity. These areas are almost barren, dominated by common shrubs such as *Colebrookia oppositifolia* and *Euphorbia royleana*.

66. The “no project” alternative: The demand for power in the agricultural, industrial and domestic sectors in Uttarakhand and other northern states of India is increasing. Most of the states are experiencing chronic and at times severe power shortages. The Central Electricity Authority (CEA) projected the growth in demand in the northern region at the rate of 7 percent during the 10th Plan and at the rate of 6.9 percent during the 11th Plan periods. The current deficit in power supply in Uttarakhand and North India is 2.8 percent and 9.1 percent, respectively. To overcome the shortage (even in the best case demand management scenario), it is necessary to increase generation of hydro power, for which there is significant potential in Uttarakhand. There is no other suitable renewable source of energy to replace hydropower in North India. The “no-project-scenario” may lead to greater problems of (a) non-availability of electricity affecting households, hospitals, tourism and other commercial activities, industry and agriculture; and (b) dependence on diesel generators and firewood to meet local requirements, leading to larger green house gas emissions and other environmental and health related problems. The “no project scenario” that aggravates the shortage of clean energy and promotes alternative polluting generation is replete with larger environmental and health problems, and is unviable.

67. **Summary of environmental impacts and the mitigation measures**: Detailed investigations related to biotic and abiotic resources, their current status and possible impacts from the Project activities were conducted during the environmental assessment. Each of the environmental issues was examined at four levels: (i) the basin/sub-basin or catchment area level as appropriate, (ii) for the project influence area, determined to be an area 7km on all around the project sites; (iii) for the project’s immediate influence area, determined to be 500m all around the project affected areas; and (iv) the project affected areas or the project’s actual footprint equal to all the public and private areas acquired and used for the project. The project will use a total 141.57 ha of land (31.64 ha of private land, 90.09 ha of government forest and grazing land, 10.3 ha of community held grazing and forest land, and 9.54 ha of land owned by the state Public Works Department. All land has been acquired in keeping with the established laws and procedures for doing so; MoEF clearance (Stage 1) for the last lot of forest land acquisition of 80.51 ha (1.60 and 8.283 ha of government and civil forest land and 70.62 ha of community-held grazing and forest land) was given in June 2011.

68. Forests, natural habitats and wildlife: The state has rich forests; forest area in the state is 34,662 sq km equal to 64.8% of the geographic area of the state. Of the 16 types of forests found in India, 8 could be found in Uttarakhand. In the Alaknanda basin, the forests are of four types - Himalayan Sub-tropical Pine (900-2000m above MSL), Temperate forests (2000-2800m above MSL), Sub Alpine forests (2800-3800m above MSL), and Alpines tree lines and meadows (3800-4500m above MSL). Of the total forests in the Alaknanda basin, a substantial 47% has dense cover (crown cover of 74%), but 35% of the forests are open (with crown cover 10-40%), and the remaining 17% areas has less than 10% crown cover. The catchment area mainly comprises open and dense mixed forest, with pine as the dominant species. Forests in the project influence area (7 km all around the project) are mainly degraded forests, dominated by middle age to mature pine trees. Young trees are generally deficient, scattered in small patches. Scattered *Chir* forest patches are already either destroyed or unable to regenerate owing to excessively dry and shallow soil. Open shrub formations occupy the ground storey. Human settlements, intensive agricultural and horticultural activities for many centuries; large-scale

lopping and browsing during 1850-1950, and expanding roads and road induced developments were the key reasons for the historical degradation of the forests (see Table 7).

Table 7 – Distribution and Presence of Forests (by type) around the Project

Forest Type	Areas Surrounding the Project				
	Entire State	Alaknanda Basin	Project Influence Area	Immediate Influence Area	Directly Affected Area
Moist Alpine Scrub	+	+	-	-	-
Sub- Alpine Forests	+	+	-	-	-
Himalayan Dry Temperate Forests	+	+	+	-	-
Himalayan Moist Temperate Forests	+	+	+	-	-
Sub-tropical Pine Forests	+	+	+	+	+
Tropical Dry Deciduous Forests	+	-	-	-	-
Tropical Deciduous Forests	+	-	-	-	-
Littoral & Swamp Forests	+	-	-	-	-

Table 8 – Distribution and Natural Habitats and Resources around the Project

Parameters	Areas Surrounding the Project				
	Entire State	Alaknanda Basin	Project Influence Area	Immediate Influence Area	Directly Affected Area
Forests Type	8	5	3	1	1
Flora: Number of Species	4048	800	154	96	87
Flora : Diversity Index	-	-	-	0.89 -2.41	0.89 - 2.41
National Parks	6	2	0	0	0
Wildlife Sanctuaries	6	1	1*	0	0
Biosphere Reserve	1	1	1**	1	0
Threatened / Protected fauna (# species)	22	15	9***	3****	3****
Other Fauna	2248		33	32	32
<p>*The project lies outside the boundaries of Nanda Devi Biosphere Reserve (NDBR) and Kedarnath Wildlife Sanctuary and the project's dam site is at a distance of 36 km from the core zone of NDBR and 5.2 km (aerial) from KWLS.</p> <p>** The project lies outside but touches the boundary of the transitional zone of the NDBR.</p> <p>*** Varanus bengalensis, Panthera Pardus, Capricornis sumataensis Moschus chrysogaster, Ursus aretos, Felis bengalensis, Hemitragus jemlahicus, Pseudois nayur, (as per Indian Wildlife Protection Act 1972); Selenarctos thibetanus - vulnerable as per IUCN</p> <p>**** Panthera Pardus, Ursus aretos, Varanus bengalensis (as per Indian Wildlife Protection Act 1972)</p>					

69. Detailed investigations were carried out during the EA for identification of the floral and faunal species in the project's influence area, immediate influence area and the directly affected area. The directly affected area has 87 species of flora (34 species of trees, 26 shrubs, 18 herbs, three climbers, two pteridophytes, and one epiphyte), while the immediate influence area has 96 species compared to the wider influence area which has 154 species. These small figures and the low floral diversity indices indicate the relatively poor floral wealth in the surrounding of the project compared to that of the basin or the state. All the floral species found in the project affected area are common in occurrence and are found abundantly throughout the region. Three herb species (*Berginia ligulata*, *Hedychium spicatum* and *Thalictrum foliolosum*) found in the forest patches near the adit at village Maina feature in the IUCN Red List, but are common in India and abundant in the Himalayas in the altitude range of 1000-300m above MSL. Although no significant impact is envisaged from the Project, these vulnerable species will be conserved

through the compensatory afforestation works, and by including these in a herbal garden proposed in the EMP.

70. Distribution and occurrence of fauna in the surrounding of the project is historically affected by the relatively lower vegetation cover, intense human settlements and traffic, agricultural activities such as trench cultivation, all resulting in the relative lack of feeding, breeding, hiding and resting sites. Dominant reptile in the area is common - *Calotes versicolor*. Mammals are all domestic animals - cows, buffaloes, donkeys, horses, mules, sheep, goats and dogs. The avifauna recorded during the survey are all common - myna, magpie, pigeon, black durango, grey shrike and white cheek bulbul. Additional and specific public consultation in the villages in the project influence area reported sighting of leopards, bears, brown bears, monkeys and deer; and reported bear and leopard attacks on domestic cows and dogs. Other than the leopard (*Panthera pardus*) and the brown bear (*Selenarctos thibetanus*) none of the reported or known species are in the IUCN Red List or are considered rare or endangered. However, there is a need to provide for and protect wildlife habitats in the wider project influence area; and the Project will support improving forest cover and protection of wildlife habitats as part of the EMP and the catchment area treatment plan.

71. Each of the land parcels affected by the project was examined for biodiversity values. Each of the land parcels show very low diversity of trees, shrubs, grasses and herbs; all below 2.5, and lowest at the quarry sites (see Table 9). The project will require that approximately 6,150 trees be felled. These trees are common and abundant - *Melia azedarach*, *Albizia lebbek*, *Cedrela toona*, *Pinus roxburghii*, *Alnus nepalensis*, *Bauhinia variegata*, *Mallotus philippinensis* and *Cupressus torulosa*. No endangered, rare, threatened or endemic tree will be felled or affected. Felling will not affect the structure or the composition of existing forest, the forest cover or the distribution characteristics of flora.

Table 9 – Biodiversity indices for the Land Parcels directly affected by the Project

Site	Bio diversity index		
	Trees	Shrubs	Grasses & Herbs
Dam site	2.29	2.13	1.71
Power house & Colony	2.41	2.48	1.92
Adits	2.07	2.07	1.37
Quarry sites	2.33	2.33	1.16

72. The project dam site is 5.2 km (aerial distance) from an eastern boundary of the Kedarnath Wildlife Sanctuary (KWLS) which falls in the valley adjacent to the Alaknanda River valley, from which it separated by high and sheer mountains; as a result of this topography, the terrestrial distance is somewhat greater. The boundary of the sanctuary is at an elevation of 1900m above the dam site at nearly 1:2 slope (direct uphill). The KWLS lies in the upper catchment of the Alaknanda and Mandakini (a tributary of the Alaknanda) and covers a territory of 97,518 ha in the altitude range of 1,160 m to 7,068 m. There are 45 villages located within the Sanctuary and 128 villages outside the Sanctuary within 5 km of the boundary. The inhabitants depend substantially on the Sanctuary for fuel wood, fodder, medicinal plants and pastures for livestock grazing. Rights and concession are provided to the villages under settlement rules.

73. The assessment of the project's impact on KWLS suggests no significant impacts as: (a)

there is no acquisition of land within the Sanctuary; (b) major project infrastructure such as the powerhouse and the headrace tunnel are underground; and (c) the use of a tunnel-boring machine will mean that there is minimal disturbance to geological and soil strata.

74. The Nanda Devi Biosphere Reserve, a World Heritage site, is located in the northern part of the West Himalayas and includes parts of the districts of Chamoli, Bageshwar and Pithoragarh, in the altitude range of 1,800 – 7,817 m. The NDBR consists of a core zone (712 km²), surrounded by a buffer zone (5,148 km²) which in turn is surrounded by a transition zone (584 km²). The core zone, which includes two national parks, is protected as an absolutely undisturbed area. In the buffer zone, which surrounds the core zone, uses and activities are limited and managed in ways that protect the core zone.

75. The project's dam site is located 36 km away from the core zone of the NDBR. The project is located outside the transition zone (the outermost boundary of the biosphere reserve), and at its closest touches the boundary of the transition zone (at the dam site). Although there is no direct impact of the project on the protected areas, the EA assessed the potential of indirect impacts on the transition and buffer zones of the NDBR, and determined that such impacts are not significant, during construction or operation.

76. Although no significant direct impacts of the project on the protected areas are expected, the EA assessed that there is a possibility of wildlife movement in the area for water or as result of vibration disturbance during construction and operation. The EMP includes a wildlife monitoring plan which is in addition to the provision of INR 24.35 million for wildlife management provided to NDBR and KWLS Forest Divisions of the State Forest Department under the CAT Plan of the project.

77. To compensate for the approximately 100 ha of forest land (designated forest/grazing land and van panchayat land) that will be acquired, the project will undertake compensatory afforestation of 201 ha of degraded forest land at a cost of INR 64 million through the State Forest Department. Further, the project will plant 12,306 trees as part of the larger green belt development and plantation along the approach roads to compensate for the trees felled. The EMP also includes measures such as preventing disturbance to forest and wildlife during implementation of the project, proper disposal and management of muck and debris, and redevelopment of muck disposal sites and quarries. A detailed CAT plan has been prepared to conserve and enhance the degraded patches of the treatable catchment, at a cost of INR 470 million. Although the impacts on the NDBR and the KWLS and other protected areas are expected to be insignificant, the Project, as enhancement measures, provides for interventions to enhance the quality and the management of the buffer zone of NDBR including wildlife conservation support, and had allocated INR 44 million and INR 10 million for soil conservation, forestry and wildlife management of KWLS in the CAT plan budget.

78. The Alaknanda basin includes 37 micro-watersheds in 5 sub-watersheds, viz., the Saraswati, the Dhauliganga, the Rishiganga, the Budhiganga and the Nagoigad sub-watersheds. A number of catchment area treatment plans have been prepared, and the one for the Tapovan-Vishnugad project is already under implementation. The CAT plan for this project will cover 18 of the micro-watersheds in Budhiganga and Nagoigad sub-watersheds. These 18 micro-watersheds

spread over an area of 84,085 ha, of which 12,964 ha is rocky and snowbound. The remaining 71,121ha (including 6,674ha of agricultural land, 40,678ha of forests, and 23,796 ha without any forest cover), included in the project's CAT Plan is degraded in large patches owing to a combination of different factors, sometimes accentuated by overgrazing, exploitation for fodder and fuel wood, and the different urban and rural construction activities. Construction activities in the Project will potentially trigger additional soil erosion in the catchment. The CAT plan will, therefore support afforestation in a total of 1,000ha, including 450ha of forest densification, 50ha of pasture development and 300ha of medicinal plantation development. An additional 1,200ha will be covered under assisted natural regeneration. Soil and moisture conservation works all around the selected micro-watersheds will include vegetative check dams, gully plugging, stone check dams, crate-wire check dams, spurs and percolation tanks. Additional activities, to reduce the dependence of the local communities on the forest areas for grazing and extraction of fuel wood and fodder, will include livelihood support; eco-restoration and eco-development works; awareness programs for adoption and synergy with the current watershed generation programs; and raising improved *van panchayat* forests and pastoral development works.

79. In-stream flow, water quality and aquatic life: The average flow in the river at dam site is 182.7m³/s. Average low flow in the range of 35m³/s occurs during January, February and March. Flow during November-December and April-May varies between 35 and 100m³/s. Downstream of the diversion dam, there are several tributaries, including a major tributary the Birahi, and relatively smaller tributaries – the Pataal Ganga, Maina Nadi, Garur Ganga, Dwing Nala, Lanji Nala, Pipalkoti Nala, Gadora Nala, Jaisal Nala and Tapan Nala. Diversion of river flow through the headrace and tailrace tunnels is a major impact that was studied specifically during the EA. While in the peak flow seasons, the river stretch downstream of the diversion dam will continue to receive sufficient flow, the lean season flow conditions were analyzed carefully, particularly for a stretch of 2.7 km downstream of the diversion dam, which receives no significant flow from tributaries during the lean season. The in-stream flow studies included a 12-month monitoring of flows in the tributaries joining the Alaknanda between the diversion dam and the tailrace outfall.

80. In the entire project influence area and downstream of the diversion dam, there is no organized irrigation, agriculture is mostly rain-fed (only about 15% of the agricultural area in the district receives irrigation through local canals and traditional *gullis* – none dependent on the Alaknanda or its tributaries upstream of the diversion dam); and the water from the Alaknanda is not used for irrigation. Water from the Alaknanda is not used for any water supply scheme, nor is there any industrial water demand. The modified in-stream flow, therefore, has no impact on downstream irrigation, domestic water supply or industrial water demand.

81. There is no commercial fishing in the Alaknanda in the entire project influence area. However, small-scale (cast net, fishing line and hanging loop) round-the-year fishing takes place in the tributaries downstream of the diversion dam, particularly in the Birahi. Aquatic life in the Alaknanda and its tributaries is relatively limited, but contains some diverse periphyton (18 species of 3 families), phytoplankton (10 species from 3 families), zooplankton (3 taxa of 5 species), macrozoobenthos (22 taxa from 5 orders) and 20 species of fish. There are a few pockets of riparian vegetation in the Alaknanda and its downstream tributaries, especially the Birahi which provide good habitat for fish. Two endangered subspecies of the migratory fish mahaseer (*Tor tor* and *Tor putitora*) are found downstream of the project in the Alaknanda.

During their migration, these species do not reach the dam site, and their migration route will not be impacted by the project. Except for two more vulnerable fish species (*Schizothoracichthys progastus* and *Pseudecheneis sulcatus*), all other fish species are abundantly available in the state and the country. The natural lean flow regime for the riparian vegetation in the tributaries will not be affected by the project, and on the main stem of the Alaknanda, the lean flow regime will not be modified critically except in the immediate stretch of 2.7 km downstream of the diversion dam. The stretch of the Alaknanda immediately downstream of the dam will also be affected by construction activities (such as extraction of aggregates, gravel and sand from the river bed), which may destabilize the sub-stratum; increase turbidity, silting of the bottom of the channel, and erosion of the river channel. These flow and other channel modifications are likely to upset the composition of aquatic organisms and the stability of the ecosystem. The impacts on fish life in the river might not be significant given the relative paucity of the fish population, but some impacts will occur and need to be compensated. Such compensation is planned through a fish management plan, included in the EMP in consultation and agreement of the State Fisheries Department. This plan will include supporting a hatchery to produce and propagate snow trout; using the hatchery in the Tehri Dam Project to further improve propagation of mahaseer; improvement of vegetation cover on the banks of the Birahi to provide continued and better habitats for vulnerable fish species; supporting relevant fisheries institutions in the study and management of efforts to divert the migration route of mahaseer towards the Birahi; and controlling extraction of sand, pebbles, gravels and stones from the Alaknanda and the Birahi. Towards all these above, the EMP includes a specific budget of INR 11.4 million.

82. In order to address aquatic and aesthetic requirements, a minimum flow of $15.65 \text{ m}^3/\text{s}$ will be maintained at all times, as stipulated in the revised environmental clearance issued by MoEF in May 2011. The minimum flow requirement is particularly important for the 2.7 km stretch downstream of the dam, before river flows are augmented by inflows from perennial streams into the Alaknanda.

83. Downstream hazard and dam safety issues: An analysis examined the potential worst-case scenario for downstream hazards due to dam failure, combined with the maximum probable flood. Most of the villages downstream of the dam are located at a sufficiently high elevation to avoid the affects of a flood. A few villages at low elevations have agricultural land and access routes to agricultural land below the potential worst-case flood flow level, but no settlement or houses. In the worst-case scenario, people working and domestic animals grazing in the agricultural fields in these villages would face the risk in the event of a dam failure. The diversion dam and other appurtenants have been designed by qualified engineers, reviewed by independent experts, and the highest relevant dam safety authorities in India for conformance to the highest prescribed safety standards, including consideration of the seismic zone standards. The project's dam safety program includes establishment of a dam safety surveillance and monitoring program; rapid analysis and interpretation of instrumentation and observation data; periodic inspection and safety reviews; evaluations of the surveillance, monitoring, inspection and preparedness by an independent panel of experts. An emergency action plan (EAP) is also in place, to take care of potential hazards posed by a dam break, and preventive actions to minimize, to the extent possible, the loss of life and damage to property in any event of failure of dam.

84. Health and safety issues for the local communities and construction workers: The project does not create storage that accentuates vector-borne diseases. The water from the Alaknanda is not used for drinking purposes by the upstream or downstream communities. Workers' camps have been planned to avoid pathological contamination of streams and rivulets which are used for sourcing drinking water in the project influence area. Overall, the project is expected to have no significant negative health impacts on the local communities and workers it employs, with the possible exception of impacts from noise and fugitive particulate emission during the construction period. These noise and air pollution impacts will be minimized through careful mitigation measures. However, the unstable geology of the area, specifically in the context of large-scale underground construction and excavation works, poses serious potential safety risks, mainly for the construction workers and THDC staff employed, but to a lesser extent to the local communities. To address this serious risk, the project has developed and adopted a safety manual, which prescribes a systematic approach to ensure safe implementation of the works using standards similar to ISO 9001. Based on this manual, the safety management plan will include activities and responsibilities to ensure effective health and safety management at the construction sites, machines and plants; fire prevention and fire fighting arrangements. Preventive actions will be supplemented by first aid, immediate medical care, and evacuation plans. Safety standards and activities have also been included in each of the bid documents to be used for procurement of the contractors.

85. Archaeological and physical cultural properties: Detailed surveys conducted during the EA discovered physical cultural resources and archaeological sites and remains in eight villages in the project influence area. All these villages are on the eastern bank of the river while most of the project infrastructure is located on the western bank. The approach roads are all away from these villages, and are not expected to create any direct or indirect impacts on the sites and remains. The contractors or THDC, under the national regulation in force, do not have any rights to these known or any chance-find sites, remains or properties (including coins, artifacts or statues). A chance-find procedure has been incorporated in the EMP. A "chance-find" card will be completed for archeological finds and the Engineer-in-Charge at site will be responsible for ensuring completion of these cards at all construction sites. The EMP includes a provision of INR 2.5 million for enhancement and conservation of temples of the villages located on the western bank of the Alaknanda.

86. Construction related issues – labor camps, muck disposal, approach and haul roads and blasting impacts: The construction phase is likely to last for a period of about 5 years. The work force associated with the project is expected to peak at around 2,000 skilled and semi-skilled workers, and about 600 high-skill technical staff – many of whom will be from outside the project area. Most of these workers have their accommodations in designated labor/construction camps. The issues likely to be associated with the construction camps include sewage and solid waste disposal, health and hygiene including the possible incremental threat of communicable diseases such as HIV/AIDS, improper use of local community resources, poaching of wildlife, and incremental extraction of fuel wood. The project will generate an estimated volume of 3.1 million m³ of muck, which will need to be properly disposed and managed to prevent disposal into the rivers and resultant water and air pollution. Four approach and haul roads with a total length of 25.6 km will be constructed. The relevant issues include accelerated landslide and

erosion, generation of debris, dust pollution, disturbance of local drainage, siltation of streams, and clearing of forested patches.

87. Labor camps have been carefully sited at two villages (Gulabkoti and Batula) to minimize associated impacts and to minimize the need to create additional infrastructure, such as additional approach roads, bridges, and shopping facilities. These labor camps will comply with the relevant state and national regulations related to environment protection, pollution prevention, forest conservation, safety, and any other applicable laws. The EMP specifies the standards and activities required to comply with the regulations, and manage issues such as emission and dust, borrow areas management, site storm water drainage, sewerage, solid waste management, and public or workers' safety. To ensure proper site sanitation and prevention of water contamination around the site, public toilets with adequate primary treatment are proposed (with septic tanks and soak pits). The EMP includes provisions for medical and first aid-kits, health and hygiene awareness camps; emergency evacuation and referral in case of emergency and diseases; HIV/AIDS awareness campaign and referral procedures. The EMP also includes provisions for safe disposal of solid wastes, supply of liquefied petroleum gas cylinders and community kitchen to prevent dependence on fuel wood, and bans poaching. Most of these are the specific responsibility of the contractors on behalf of the THDC, and as such have been included in the contract documents.

88. Four sites at different locations in the project villages have been identified for muck disposal. The identified sites are at the villages Haat, Siyasain, Jaisaal and Gulabkoti. Specific muck disposal measures have been included in the EMP. These measures include reuse of part of the muck as construction material, protection of muck disposal sites, and rehabilitation of the sites. For each of the four sites, retaining walls up to heights of 7m at the bottom will be constructed before disposal starts, and terracing will proceed upwards as disposal continues to prevent rolling down of muck onto the Alaknanda. Each area will be rehabilitated for stabilization of slopes, landscaping and landscaped terraces. Muck disposal at each site will start from one end to the other, and rehabilitation will start as soon as disposal on one half of the surface of the sites is complete. Only native plant species will be used for vegetative measures as part of rehabilitation or landscaping of the sites.

89. Further to carefully aligning the approach and haul roads to avoid many of the potential environmental issues (see section on the analysis of alternatives), the EMP includes measures to ensure adequate site drainage, control air and noise pollution, slope stabilization including bioengineering of the cut slope. Regular water sprinkling on construction sites and unpaved roads particularly near habitation will be undertaken to control fugitive dust. Trucks carrying soil, sand and stone will be covered to avoid spilling. Plants, machinery and equipment will be handled to minimize generation of dust. All crushers, machineries, vehicles and equipments used in construction shall conform to relative dust and other emission standards specified by the Central Pollution Control Board.

90. For the major portion (12.0 km) of the 13.4 km long headrace tunnel, the project proposes to use a Tunnel-Boring Machine (TBM) instead of drill and blast techniques. TBM has many environmental advantages such as: (i) no blasting; (ii) minimum disturbance to surrounding rock strata; (iii) minimal impacts on local ecology and environment; (iv) considerable reduction in

noise, dust and air pollution compared to drill and blast methods, and (v) fine muck output from the drilling operation which in turn is easier to dispose off and rehabilitate. The project will follow requisite Indian standard procedures for the portion of the HRT and the tailrace tunnel to be driven by drill and blasting.

91. Induced and cumulative effects: The most significant induced positive effect of the project will be creation of new job opportunities in the area. The substantial new construction and direct employment are likely to trigger associated development in several commercial sectors such as transportation, automobile, consumer durables; local small-scale commercial sectors dealing with daily consumer needs (non-perishable food items and perishable commodities such as vegetables, fruits and milk). Each of these will provide additional employment opportunities for local communities. At the same time the pressure on the existing health services infrastructure might increase. The project will, therefore, finance a hospital and extend health services to local people. The risk of communicable diseases such as HIV/AIDS will be managed by propagating awareness on preventive measures and a diagnosis and referral program. The potential increasing urbanization of the area around the project, particularly at Pipalkoti, may lead to an increasing demand for water, the possible drying up of small water sources and perceived damage to existing properties. The project has committed that any water source that dries up during construction or operation of the project will be compensated by the project, either by supplying water directly or by developing and protecting alternative sources. These water sources have been mapped and measured and will be monitored as part of the adaptive monitoring plan for the project. In addition, the project will provide for some augmentation of water supply to the villages as part of the local development program, if desired by the community. Although it is unlikely that underground works hundreds of meters below the surface could result in damage of existing properties, the project commissioned an expert study of this issue, provided for an insurance scheme to cover such impacts, and established a baseline of the current condition of all habitations against which damage assessments can be made.

92. Along with the EA, a specific analysis of cumulative effects was undertaken, based on separate extensive stakeholder consultation and expert inputs. Major cumulative effects of hydropower development in the Alaknanda basin include the creation of additional employment, including for local communities. In addition, parts of the revenue from the projects go to the state which could be used to provide better access to social amenities. The possible negative cumulative affects relate to the influx of population to the project area, and include threats to biodiversity, deterioration of water quality, increased pollution levels all over the Alaknanda basin, and increased HIV/AIDS risks. Most of these possible effects and the mitigation or management had been described in the preceding paragraphs. A basin-level association of hydropower developers has been formed, and the state governments together with the developers are discussing ways to manage the cumulative effects of basin development. Climate change, extreme weather events and increasing flash floods could also pose risks to the project. These risks have been analyzed for the project to the extent possible based on the limited understanding of the likely nature of climate change in the Alaknanda River valley. The sensitivity analyses carried out as part of the economic and the financial analyses suggest that viability of the project is not affected by the worst-case scenarios for climate change and the possible extreme events.

93. Assessment of the cumulative impact of hydropower development: the MoEF commissioned a cumulative impact assessment of the development of the Bhagirathi and Alaknanda Rivers for purposes of hydropower which examined the development plans for these two rivers and their tributaries which constitute the upper reaches of the Ganges river system in India. This study was completed in March 2011 and MoEF is in the process of assessing the study's findings and recommendations.

94. **Lessons learnt from the Tehri Dam Project:** The EA undertook an appraisal of the lessons learnt from the earlier major project implemented by THDC, with an aim to incorporate the lessons in the design of the current Project and its EMP. The Tehri Dam Project was approved by the Planning Commission in 1972 and accorded administrative approval in 1976 by GoUP. The pre-construction, the resettlement and rehabilitation, and the catchment area treatment activities started during 1976-78. This was before many of the applicable environmental policies and regulations came into force. Since then, the policy and regulatory framework has evolved considerably, with the coming into effect of the Forest (Conservation) Act of 1980, the Environment (Protection) Act of 1986, the National Forest Policy of 1988, National Environment Impact Assessment Notification of 1994 (revised 2006), the National Water Policy of 2002, and the National Environment Policy of 2006. Most of the environmental management actions planned in the Tehri Dam Project were implemented reasonably well. Nonetheless, there are some lessons from the Tehri Dam Project which have been applied to the proposed project. These concern mainly the catchment area treatment and compensatory afforestation; the need for advanced works for managing construction-related impacts; and the need to undertake detailed and specific assessment of social impacts.

95. With respect to the treatment of the catchment area, the lessons from the Tehri Dam Project include (a) the need for the treatment plan to be prepared in active consultation with the State Forest Department, to ensure suitability of the treatment activities for the local native flora and fauna; (b) the importance of specifying fruit trees, medicinal plants, herbs in the plan; (c) the importance of implementing and monitoring the plan in active partnership with the local communities and *van panchayats*. With respect to compensatory afforestation, the experience of the Tehri Dam Project indicates that compensatory afforestation should (a) be able to supply forest goods and services to the local people in a sustainable manner; (b) be designed and implemented with a long-term ecological restoration goal in mind; and (c) respect the local variation in ecological associations, the impacts on native flora and fauna. With respect to the construction-related activities, the most important lesson is that advance preventive measures are required to be implemented before the actual use of these sites start. An example is the need for advance construction of retaining walls to prevent rolling of disposed materials from the muck disposal sites. Similarly site rehabilitation activities need to be planned early, including at some cases as in restoration of cut hill slopes along with the main construction activity. With the benefit of these lessons, THDC has already taken a conscious decision to initiate actions on all the above aspects, as applicable to the project. The works related to the reinstatements of muck disposal sites or cut hill slopes of the approach roads have already started; and those related to the catchment area treatment, the compensatory afforestation, or the construction of fish hatcheries will start soon.

Table 10 – Budget for Implementation of the Environmental Management Plan

Environment Management Sub-Plans	Description of Activities Proposed	Budget (INR million)
Biodiversity management	Development of herbal garden, compensatory afforestation, roadside plantation, wildlife protection	66.60
Catchment area treatment plan	Forestry work; soil and moisture conservation; wildlife management; village level development and livelihood support, income generation activities, and alternate energy support for local communities; fisheries management and propagation; renovation works; support for village and micro-watershed level planning; training, capacity building and exposure visits; and implementation management support.	470.10
Muck disposal and rehabilitation plan	Plantation on spoil slope, turfing of slopes; fencing; nursery development and maintenance, watch and ward; and water sprinkling system for maintenance	19.78
Fisheries management	Transportation of seeds from Tehri Mahseer hatchery; snow trout hatchery and its maintenance, habitat restoration on the Alaknanda and its tributaries	11.40
Greenbelt development	Plantation of trees, shrubs and herbs	6.15
Restoration of quarry sites	Filling up the excavated site; green maturing, fertilizers, bio-pesticides; fencing; maintenance, watch and ward	5.00
Solid waste management	Procurement, operation and maintenance of two covered truck for transportation of solid waste to landfill site; collection and disposal of solid waste	9.80
Measures for road construction	Clearing & grubbing; breast wall, catch water interceptors, and drainage system along roads	9.00
Sanitary facilities for labor camps	Community toilets, septic tank including shallow sewers, operation and maintenance	12.50
Provision of fuel	LPG cylinders and kerosene	1.00
Public health delivery	Establish dispensary and first aid centers; employing medical staff; provision of medicine, ambulance; HIV/AIDS awareness camps, diagnosis and referral	37.30
Environmental monitoring	Monitoring of water quality, ambient air quality, noise, soil erosion sedimentation and soil quality, incidence of water related diseases, aquatic ecology, vegetation cover in the Project's immediate influence areas, and implementation of EMP, the safety assurance plan	22.31
Capacity building Adaptive Capacity Building	Staffing; training and exposure visit of THDC Staff & Adaptive capacity building	85.46
Environment management system	Formulation of the appropriate quality manual and quality procedures, implementation of environmental management system- ISO 14000.	2.00
Wildlife management	Wildlife monitoring activities around the project area	1.50
Cultural property	Enhancement and conservation of ancient temples and other cultural properties, a new archaeological museum	2.50
Grand Total		762.40

96. Arrangements for implementation of the EMP and environmental monitoring: While the primary responsibility for the implementation of the EMP is borne by THDC or the contractors on behalf of the THDC, a number of EMP activities, such as the compensatory afforestation, the CAT plan, the fisheries and the wildlife conservation support activities will be implemented by the state government agencies (using funds transferred by THDC). THDC will

endeavor to ensure adequate monitoring of these works by engaging implementing departments through regular dialogue, joint inspections and regular sharing of status reports.

97. The responsibility for implementing the compensatory afforestation and the CAT plan will lie with the concerned Divisional Forest Officer (DFO). The Environmental Management Cell (EMC) of THDC will regularly supervise implementation of the compensatory afforestation and the CAT plan. The EMC will also monitor physical and financial progress and prepare a quarterly progress report. Funds will be released by THDC based on an annual action plan. THDC will initiate a discussion with state Forest Department to sign an agreement for effective implementation and regular joint monitoring with the participation of local communities.

98. Activities for which the contractors are responsible will be specified in the contract documents. The contractors will provide detailed action plans and will report on implementation in their monthly progress reports. THDC's project-level social and environment team which is headed by a senior manager will supervise implementation of these activities by the contractors, and will prepare quarterly progress reports on the implementation of the EMP, including compliance to the applicable environmental regulations and norms. The EMP includes a project-level staffing plan which envisions recruitment of an environment specialist and a social specialist.

99. Third-party monitoring of the implementation of the EMP will be conducted by an agency and/or a committee of experts, depending on the content of the assignment. The third-party monitors will visit the project twice a year to review implementation of the EMP and, as needed, suggest improvements. The international panel of environmental and social experts already retained by THDC to advise on the scope and content of EA during project preparation will continue in the implementation period as well, and will recommend corrective actions as needed and appropriate. Terms of reference for the third-party monitors have been developed and THDC plans to start this work concurrently with the implementation of the project.

100. The project will continue to engage the local communities and stakeholders through periodic public consultations, special events such as cultural programs, and will take the community view into consideration at all stages of the project construction and operation. A community communication plan has been prepared and will be implemented by THDC (see Annex 17). The PIC will continue to function throughout the project construction and operation period for continued public disclosure, and for recording public comments and suggestions.

101. **Capacity-Building at THDC Corporate:** In the course of its successful implementation of environmental management measures at the Tehri Hydro Power Project, THDC has acquired good capacity for managing the environmental impacts of a large, complex reservoir project. This core capacity will stand the company in good stead in coming years as it expands its operations and, consequently, faces the need for a considerable enhancement to its social and environmental management capacity. Recognizing that the current level of staffing for these functions at THDC is inadequate for the demands of the new projects that the company has taken on, THDC has launched a program of capacity-building which includes focused training of officers in environmental and social management (separate groups).

102. THDC has adopted a corporate environmental mission statement and environmental policies which stress the need to develop adequate long-term capacity to manage environmental aspects of its projects. The environment policy calls upon THDC to develop and maintain adaptive environmental management mechanisms and adequate risk management systems. During preparation of the proposed project, THDC undertook an assessment of its medium-term capacity building needs. A Corporate Environment and Social Group has been established, headed by a General Manager (Environment & Social) and consisting of senior managers and specialist staff from both environment and social skill sets. The Environmental and Social Group reports to the Director (Technical) of THDC. THDC plans to retain at least one environmental staff member at the project during the construction and operation phases.

103. THDC has already taken a number of other actions to augment the capacity of the environmental and social group. For medium term capacity building, a capacity building plan has been prepared. It includes the development plan for staffing of the environmental and social group, and procurement of monitoring equipments. Additionally, a detailed training plan has been prepared, which includes training of the corporate and the project level environmental and social staff of THDC, as well as training of the corporate and project level managerial staff on environmental management.

104. THDC has launched an environmental capacity-building program through collaboration with the regional Garhwal University, Srinagar, Uttarakhand. Under this program, 14 officers are participating in a one-year environmental management training course. Upon completion of the course, the officers will be deployed to different projects.

Annex 11: Project Preparation and Supervision
INDIA: Vishnugad Pipalkoti Hydroelectric Project

	Planned	Actual
PCN review	04/03/2007	04/03/2007
Initial PID to PIC	04/16/2007	04/26/2007
Initial ISDS to PIC	04/16/2007	04/19/2007
Appraisal	04/24/2009	11/16/2009
Negotiations	06/09/2011	
Board/RVP approval	06/30/2011	
Planned date of effectiveness	09/01/2011	
Planned date of mid-term review	06/13/2013	
Planned closing date	12/31/2017	

Key institutions responsible for preparation of the project: THDC India Limited
Responsible agency: Ministry of Power (MoP), Government of India.

Bank staff and consultants who worked on the project included:

Name	Title	Unit
Michael Haney	Team Leader/Sr. Energy Specialist	SASDE
Manoj Jain	Sr. Financial Management Specialist	SARFM
Ramola Bhuyan	Sr. Financial Management Specialist	SARFM
Savinay Grover	Financial Management Analyst	SARFM
Sushil Kumar Bahl	Sr. Procurement Specialist	SARPS
Yash Gupta	Procurement Specialist	SARPS
Asger Christensen	Lead Social Dev. Specialist	SASDI
Tapas Paul	Sr. Environmental Specialist	SASDI
Gennady Pilch	Sr. Counsel	LEGES
Kishor Uprety	Sr. Counsel	LEGES
Sudeshna Ghosh Banerjee	Sr. Economist	SASDE
Stephen Lintner	Sr. Adviser	OPCQC
Alessandro Palmieri	Lead Dam Specialist	OPCQC
Daryl Fields	Sr. Water Resources Specialist	ECSSD
Pyush Dogra	Environmental Specialist	SASDI
Sona Thakur	Communications Officer	SAREX
Mani Khurana	Economist	SASDE
Abdulaziz Faghi	Operations Officer	SASDE
Ashish Khanna	Sr. Energy Specialist	SASDE
Pravin Karki	Sr. Energy Specialist	SASDE
Rohit Mittal	Sr. Energy Specialist	SASDE
Surbhi Goyal	Operations Analyst	SASDE
Minerva Espinosa-Apurada	Program Assistant	SASDO
Shaukat Javed	Program Assistant	SASDO
Deepali Uppal	Program Assistant	SASDO

Barry Trembath	Consultant/Hydropower Engineer	SASDE
Parthapriya Ghosh	Social Development Specialist	SASDI
Atsushi Iimi	Sr. Economist	FEUSE
Mohammed Hasan	Sr. Social Development Specialist	SASDI
Sunil Kumar Khosla	Sr. Energy Specialist	SASDE
Sanjay Pahuja	Sr. Water Resources Specialist	SASDI
Daniel Gibson	Lead Social Development Specialist	ECAVP
Lars Odegaard	Consultant/Hydropower Engineer	SASDE
Judith K. Plummer	Sr. Financial Analyst	SASDE
Roxanne Hakim	Sr. Anthropologist	AFTCS
Glenn S. Morgan	Lead Environmental Specialist	LCSEN
Laura K. S. French	Junior Professional Associate	ETWWA

Bank funds expended to date on project preparation:

1. Bank resources:	\$1,113,865
2. Trust funds	
a. DFID TF055160:	160,923
b. AUSAID TF093030:	228,777
Total:	\$1,503,565

Estimated Approval and Supervision costs:

- 77. Remaining costs to approval:
- 78. Estimated annual supervision cost:

Annex 12: Governance and Accountability Action Plan

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. Three key areas of potential governance and accountability risk for the Project have been identified. Significant work has been carried out by the Borrower with the support of the Bank team to identify and mitigate these risks. A summary of these three areas and the mitigation measures undertaken follows.

2. ***Technical aspects of project design and implementation.*** The risks here pertain to possible inaccuracies or limitations in survey and geological investigations and the consequent difficulty of accurately defining technical specifications in the bid documents and in assessing project costs and project completion time. Inaccurate or insufficient technical information in the preparation of the project can lead to disputes with the contractors (depending on how contractor requests for variations are treated) and significant time- and cost-overruns during the implementation phase. Mitigation measures include: (i) deployment of independent consultants to carry out detailed technical and design studies, incorporating the lessons of domestic and international experience in hydropower development; (ii) training in geotechnical/rock mechanics design and applications of these concepts in hydropower projects at a leading international institute, and (iii) use of an international panel of experts to review and advise on the technical design of the project.

3. ***Management of large contracts.*** In complex infrastructure projects, it is not unusual for disputes to arise between the developer and the contractor. If not efficiently addressed and resolved, such disputes can lead to delays in project implementation and higher costs. In India, hydropower projects in particular have suffered significant time- and cost-overruns as a result of disputes between developers and contractors. Inadequate technical information and suboptimal contract documents (ambiguous allocation of risk) are often at the heart of these conflicts. The risks associated with contract management have been mitigated through the preparation of a geo-technical baseline report (the first of its kind in a hydropower project in India) which provides a shared baseline of information, as distinct from the past practice of forcing bidders to make their own interpretations of the data provided, thus reducing the potential for disputes; and through the preparation of a risk register that defines and allocates between the two parties to the contract the various risks the project faces and identifies measures to be taken in case the risk materializes. In addition, the client will engage a Design Review Consultant (DRC) to perform key design and implementation tasks such as reviewing design drawings and documentation and assisting with the coordination of technical and project management aspects between the EPC contractors. Beyond these measures that are built into the formal bidding and contracting process, technical assistance will be provided to improve the company's capacity for resolving potential disputes without resorting to formal dispute resolution mechanisms. A training workshop on contract management issues was presented in the course of project preparation and others will be planned during project implementation.

4. ***Social and environmental aspects of the project.*** THDC has good technical capacity but, like most traditional engineering-centric companies, remains to some extent under-equipped to manage the complex social and environment aspects of hydropower development and the related public communication aspects. The Bank has engaged deeply with THDC in this area, and over the preparation phase has helped to augment the company's capacity to handle these aspects of

hydropower development. The PHRD project preparation grant has been used to provide training in environmental impact assessments and to engage specialized environmental and social staff. The PHRD grant was also used to fund a Communications Needs Assessment.

5. These and other issues are highlighted in the sections below, along with mitigation measures.

6. **Background:** The growth in India's installed electricity generation capacity has been dominated by thermal plant in recent decades with the result that the share of hydropower in the total installed capacity has been reduced to about 24%, which is suboptimal from a system perspective. The plans to meet India's need for electricity assign a significant role to the exploitation of the country's undeveloped hydropower potential, which is estimated at about 120,000 MW, with the goal eventually of bringing hydro's share in the total generation mix to 40%. Plans to develop about 30,000 MW of hydropower capacity over the coming decade represent a development program on a scale that has never before been attempted in India: today's existing installed hydropower generation capacity of about 37,000 MW was developed over more than 50 years.

7. The purpose of the proposed Vishnugad Pipalkoti Hydro Electric Project is to augment India's capacity for generating electricity. As such, the objective of the physical investment is not complex. However, it is manifest that the chronic shortage of electricity is a fundamental constraint to economic and human development in India. Moreover, the actual implementation of an infrastructure project of this size in a manner that is techno-economically sound and socially and environmentally responsible and sustainable, and responds to the evolving standards in these areas in India, is a challenge of a great order. Many hydropower projects in India have suffered considerable time- and cost-overruns that often reflect underlying poor practice in planning, project and contract management, and management of social and environmental aspects of these projects, and result in electricity that is more expensive than envisioned when the investment decisions were made.

8. The Bank's engagement is aimed at addressing some of the key barriers to the sound implementation of hydropower projects by supporting efforts to strengthen THDC with respect to the preparation and safe implementation of economically, environmentally and socially sustainable hydropower projects. The project will consist of two components: (i) construction of the 444 MW Vishnugad Pipalkoti Hydro Electric Project; and (ii) technical assistance for institutional strengthening and capacity-building to assist THDC in addressing the needs of its major capital expansion program, including assistance in adopting recognized good practices in hydropower development and operations, and improving the corporate capacity for project preparation, project implementation and contract management.

9. **Approach to Project Design and Preparation:** The project design reflects the experiences and important lessons learned from hydropower projects worldwide as well as in India, including the Bank-funded Nathpa Jhakri HEP. These lessons have in common the objectives of avoiding costly delays in project preparation and implementation and ensuring the long-term sustainability of the project.

(a) Procurement strategy: The Government of India was originally inclined to implement the project on the basis of a single Engineering, Procurement, Construction (EPC, "turnkey") contract. However, upon consideration of the poor international experience with the application of this model to hydropower projects, and the

unwillingness of reputable contractors to assume joint and several liability for all project components under a single joint-venture, it was decided to construct the project on the basis of two EPC contracts, one for civil works and hydro-mechanical equipment, and one for electro-mechanical equipment, with suitable arrangements for the interface between the two contractors and for the allocation of risks. This procurement packaging has made it possible to reduce the number of packages to the minimum practicable level while encouraging international competition.

(b) Pre-qualification of bidders: The Bank was involved in the pre-qualification of bidders for the main EPC contract for civil works and hydro-mechanical equipment from early in the process, and worked with THDC to ensure that rigorous financial and technical pre-qualification criteria were employed. This has proven to be particularly important in mitigating the risk of an applicant claiming the experience of parent or subsidiary companies for complex works that the applicant does not in fact possess.

(c) Risk allocation: Suboptimal allocation of risks between owners and contractors has been at the core of contract disputes that have plagued hydropower projects in the past, leading to significant cost- and time overruns. An essential component in the risk allocation has been the preparation of a Geo-technical Baseline Report (GBR), the first of its kind for a hydropower project in India. The GBR provides a common baseline of information, as distinct from the past practice of forcing bidders to make their own interpretations of the data provided, thus reducing the potential for disputes. The GBR has been issued to pre-qualified bidders as an attachment to the bid documents. For those risks that are not amenable to upfront mitigation, several measures have been adopted. These include: (i) a detailed Risk Register that defines various risks, identifies measures to be taken in case the risk materializes, and allocates the risk to the parties to the contract, allowing them to make better estimates of potential costs they could face, and to take account of the same in obtaining insurance coverage; (ii) provision for contingencies in underground works; (iii) engagement of the Design Review Consultant; and (iv) preparation of a Risk Management Manual.

(d) Contract management: Given the complexity of large infrastructure projects and the impossibility of anticipating all eventualities and possible risks that could bear on the implementation of the main contracts to implement the project, even in the most robustly designed contracts there is scope for conflicts to emerge between the Owner and the Contractor. Good contract management is, therefore, key to avoiding disputes with contractors that can be timely and costly. A large part of good contract management is encapsulated in the measures to optimize risk allocation, as described above, which will help prevent the emergence of disputes in the first place. When disputes or differences emerge, in addition to the usual contractual recourse of the Dispute Review Board, THDC may avail of the services of the Design Review Consultant to help resolve any differences between the Owner and the Contractors that may arise during implementation of the Project. The Bank will also engage in a series of workshops and training with THDC on contract management at various stages of implementation.

(e) Sediment handling: The high sediment load of the Himalayan rivers is one of the most intractable operational problems of hydropower plants operating on these rivers. The sediment erodes the turbine runners and other mechanical parts, greatly reducing generation efficiency. A sediment handling optimization study was carried out to

optimize the techno-economic configuration of the sediment handling arrangements and has been included as part of the bid documents for the civil works and hydro-mechanical equipment contract.

(f) Tunneling technology: at 13.4 km, the headrace tunnel is one of the single largest components of the cost of VPHEP. Consequently, the actual tunneling rates achieved during project construction will be a significant determinant of the final project costs. Because of concerns about “geological surprises”, conventional drill and blast method (DBM) has been used more extensively in the Himalayas than the alternative technology based on the use of a tunnel-boring machine (TBM). However, TBM technology offers the possibility of a much faster tunneling rate than DBM. In addition, TBM offers other advantages, such as reduced vibration (one of the major sources of disturbance of local communities) and the environmental advantage of improved muck control. In order to avail of the technical, social and environmental advantages of TBM, THDC has opted for TBM as the primary tunneling method (12 km of the 13.4 headrace tunnel will be driven by TBM), which it considers a measured choice given the high quality of geo-technical information gathered for the Geo-technical Baseline Report and the advances in TBM technology over the last decade that remedy certain shortcomings of TBM as identified in past projects.

(g) Need for adequate resettlement planning, consultation and monitoring. One of the most sensitive aspects of hydropower development is the social impact of the development. While the negative social impacts of VPHEP are comparatively low (there is only small pondage and the project’s land acquisition needs are not great), there will be a small level of displacement and the project impacts during construction will be experienced over a wide area. A detailed Social Impact Assessment has been carried out and its findings confirmed through a house-by-house verification exercise. In order to augment its limited capacity for managing social impacts, THDC has engaged two social workers who are posted at site, and has engaged a reputed NGO whose staff speak the local language, Garhwali, to facilitate the implementation of the Resettlement Action Plan.

(h) Project Management. THDC recognizes the value of an effective, results-oriented, project management framework. A Monitoring and Project Services (MPS) department within THDC is responsible for ensuring that these functions are carried out. The MPS department will also be tasked with determining the appropriate key performance indicators (KPIs) to monitor the implementation of the project. Close coordination is envisaged between the project team on site and the corporate office in the monitoring and evaluation of the agreed KPIs. The indicators will be monitored on a regular basis and thus serve as a dynamic tool for stakeholders, providing real-time data on the overall success and performance of the project. This will also allow THDC to identify performance shortfalls and make informed decisions on remedial actions and recovery plans. The objective of the monitoring and evaluation system will be to measure project performance in terms of cost, time, quality of deliverables and adherence to social and environmental safeguards. The specified indicators will focus on multiple attributes of design inputs (drawings) and construction including, but not limited to, progress of works against established milestones and completion dates, overall project cost taking into account variations (claims, through exception reports). This will *inter alia* include (a)

quality of deliverables in line with the specifications and design intent to be taken care of by the Project QA unit in co-ordination with the Corporate QA department with exception reports to the MPS department, (b) adherence to social and environmental safeguards to be taken care of by the Project S&E unit in co-ordination with the Corporate S&E department with exception reports to the MPS department, and (c) compliance with the safeguard measures for safety and accident prevention by the project safety unit with periodic reports to the MPS department.

10. ***Approach to GAAP Analysis:*** The governance and accountability action plan (GAAP) is a summary of governance-related issues and actions that have been distilled from risk identification and mitigation measures proposed by specialists in various areas (technical, procurement, environment and social safeguards, communications etc.) and agreed in consultation with THDC.

11. The GAAP has been structured to address issues at the project, entity and policy level. This structure is seen as appropriate for highlighting (i) project-level issues, (ii) medium-term capacity-strengthening at the entity level, and (iii) policy-level issues (which pertain primarily to the state government and in some cases to the central government).

12. Many of the risks mitigation measures identified under the GAAP are being implemented in the course of project design and preparation.

Table-1: Key Governance Risks and Mitigation Steps

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
Project Level Risks		
<i>Technical Design</i>		
Possible inaccuracy or incompleteness of survey and geological investigations and consequent difficulty of accurately defining technical specifications in the bid documents and assessing project costs and project completion time, which may later lead to numerous variations / delays at the execution stage and higher costs.	<ul style="list-style-type: none"> • Preparation of Geo-technical Baseline Report (GBR) to gather best-possible geo-technical information to help understand and manage geological risks. • Execution of sediment handling optimization study to identify optimal technical parameters for sediment handling. • Training in core technical areas. • Formation of Project Review Panel (including Dam Safety) consisting of Indian and international experts. <p>Residual risk: All large hydropower projects in the Himalayas are inherently risky projects, as explained above. Even after adoption of the extensive risk mitigation measures that reflect best international practice, it is considered that the residual risk remains high. This is consistent with the assessment of the Ministry of Power, Government of India.</p>	<ul style="list-style-type: none"> • GBR has been prepared under oversight of international expert and included in bid documents for main EPC contract. • Sediment handling optimization study completed with participation of international and Indian experts, and recommendations incorporated into design. • Training provided in rock mechanics/geo-technical aspects of hydropower projects at Rocscience (Toronto, Canada), a leading institute in this area. Additional training needs to be identified as part of capacity-building program. • Training provided in numerical modeling of geo-technical engineering by National Institute of Rock Mechanics. • PRP has been formed and has carried out three visits to site (Feb 08, March 09, April 2010).
<i>Contract Management</i>		
Contractual disputes due to changes in scope of work, delays on part of supplier (in supplies or works) or the client (decision making in event of unforeseen circumstances) and performance demonstration etc.	<ul style="list-style-type: none"> • The GBR and detailed Risk Register to be included in the bid documents that are sent to pre-qualified bidders to provide maximum available information upfront, allowing bidders to make better estimates of potential costs and to take account of risks in insurance cover. • The Dispute Resolution Mechanism will be specified in bid documents/contract. 	<ul style="list-style-type: none"> • Issuance of the bid documents for the main EPC contract for civil work and hydro-mechanical equipment works, including provisions for dispute resolution, and GBR and Risk Register as attachments, was a trigger for Appraisal.

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
	<ul style="list-style-type: none"> Engagement of Design Review Consultant (DRC) who will be responsible for the detailed hydraulic and geo-technical design; for reviewing the detailed designs and drawings submitted by the two EPC contractors; and for advising and assisting THDC to carry out its Project management functions and to help to resolve any differences between the Owner and the Contractors that may arise during implementation of the Project (without resorting to the Dispute Review Board). Review of THDC systems governing contract management (corporate-level procedures for decision-making and staffing strength) to be carried out by a Contracts Specialist and recommendations put forward to enhance THDC capacity in this area. 	<ul style="list-style-type: none"> The DRC is expected be appointed three months prior to the arrival of the EPC contractor for civil & HM works. Training in contract management was provided by Bank in June 2009 and is planned to be held after the award of the main civil works contract. Additional training and other forms of knowledge transfer will be provided as appropriate throughout the implementation phase in support of THDC contract management function.
<i>Procurement</i>		
<p>Limited experience with Bank procurement procedures and limited capacity to prepare complicated procurement documentation could lead to protracted procurement process.</p> <p>Poor competition due to unwillingness of reputable contractors to assume joint and several liability for all project components under a single joint venture.</p>	<ul style="list-style-type: none"> Close supervision by Bank team. Training in Bank procurement. Appraisal only after bid documents for the EPC contract for civil works and hydro-mechanical equipment works was issued. Establishment of dedicated procurement cell. Design procurement strategy to reduce the number of packages to the minimum practicable level while encouraging international competition. 	<ul style="list-style-type: none"> Decision taken in July 2007 to construct the project on the basis of two EPCs contracts. Procurement oversight on-going. Dedicated Cell for VPHEP created and managed by AGM under the overall superintendence of ED (Contracts) THDC to augment procurement capacity, as required, by engaging additional procurement specialists who will receive GOI-offered training in Bank procurement.
<i>Implementation</i>		
Inadequate supervision and quality assurance may lead to sub-standard implementation	<ul style="list-style-type: none"> Training in project management Design Review Consultancy will provide training in project management software (e.g. PRIMAVERA software) 	<ul style="list-style-type: none"> Training of 80 THDC officers in project management has been provided by Project Management Associates (July and October 2008).

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
A challenge for THDC will be to ensure that it has the necessary manpower and skills to implement and operate VPHEP while it is simultaneously undergoing rapid transition and growth, and developing several other projects.	<ul style="list-style-type: none"> • Institutional Strengthening and Capacity-Building component of loan which will focus on Human resources aspects (staffing, training, retention and succession) and Management systems (policies, information management systems, performance management system). 	<ul style="list-style-type: none"> • Design Review Consultancy under procurement. DRC shall be engaged three months prior to arrival of EPC contractor for civil & HM works. • An appropriate set of KPIs will be developed and monitored by THDC for sustainable performance management. • THDC to engage a specialized consulting firm to carry out a skill-gap analysis as the initial diagnostic for the Institutional Strengthening and Capacity-Building component. Consultant expected to be engaged by January 2012.
Entity Level Risks		
<i>Corporate Governance & Financial Management</i>		
Gaps in compliance with prudent financial management and corporate governance practices. Particular risks in the area of internal audit, enterprise resource planning, staffing and skill mix.	<ul style="list-style-type: none"> • An action plan for strengthening Corporate Governance and Financial Accountability (CGFA) has been agreed by THDC to further develop FM capabilities. • Key areas <ul style="list-style-type: none"> ○ Internal Audit ○ ERP (with modules as required; full-scale ERP not required by THDC at this stage) ○ Staffing and the Skill mapping 	<ul style="list-style-type: none"> • Implement the agreed time-bound action plan. • Several actions have been completed such as induction of independent directors in the board of THDC, constitution of an audit committee with independent directors with defined scope and coverage; and actions agreed for converting THDC into a public limited company, strengthening internal audit function and developing capabilities for in-year financial reporting.
<i>Safeguards</i>		
Inadequate assessment of social impacts and risks induced by project. Limited capacity to manage social aspects of project implementation may	<ul style="list-style-type: none"> • Conduct comprehensive Social Impact Assessment to identify and quantify project impacts and risks for communities and households in project zone. • The project-specific Resettlement and Rehabilitation Policy for VPHEP is an important mitigation measure. 	<ul style="list-style-type: none"> • Social impact assessment has been completed by an independent agency in which the impacts have been identified and quantified. THDC has also prepared the Resettlement Action Plan (RAP) that details out mitigation measures for the

Risk Description <i>(Level of Risk)</i>	Mitigation Steps <i>(Level of Residual Risk)</i>	Actions/ Timeline / Status
<p>cause undue social stress, which in turn could lead to larger project implementation problems (delays due to protests, legal challenges, etc.).</p> <p>Inadequate implementation of the Resettlement Action Plan (RAP).</p>	<ul style="list-style-type: none"> • Effective consultation and two-way communications between THDC and project stakeholders will help build trust and collaboration which in turn should lead to better project design and smoother implementation. • NGO will generate aggregate monthly reports with village specific information on the status of land acquisition and resettlement, compensation payments and assistance, and information on grievance redress. • An external agency will be hired for mid term and end term evaluation of RAP implementation. 	<p>impacts identified.</p> <ul style="list-style-type: none"> • THDC has adopted a project specific Resettlement and Rehabilitation Policy in February 2009 which meets and exceeds the requirements of the National Resettlement and Rehabilitation Policy (NRRP) of 2007 • In line with the NRRP, 2007, the state government has appointed an Administrator for land acquisition, resettlement, and rehabilitation (LA/R&R) – who is responsible for implementation of RAP and disbursement of compensation. • Grievance redress mechanism is in place. THDC has appointed a retired CEO of Zilla Parishad as Head of the project-level Grievance Redressal Committee (GRC). THDC has also requested state government to appoint a grievance Ombudsman as the final arbiter of grievances. • In order to augment its capacity for managing social impacts, THDC has taken the following steps- <ul style="list-style-type: none"> ○ Deployed a social mitigation team (a Manager – Social and two social workers) and has created a new cadre for people with social background with a dedicated GM for social & environment. 10 staff members with social sector background have been identified for longer term training (9-12 mos) at leading institutes in India. ○ Prior to the establishment

Risk Description <i>(Level of Risk)</i>	Mitigation Steps <i>(Level of Residual Risk)</i>	Actions/ Timeline / Status
		<p>of the permanent THDC office, two Project Information Centres (PIC) were established to address queries from the public. A consolidated PIC is in operation at the THDC permanent site office.</p> <ul style="list-style-type: none"> ○ Contracted a reputed locally based NGO whose staff speaks the local language, to facilitate the implementation of the Resettlement Action Plan (RAP). ○ Organized training in community relations and public communications for its staff. <ul style="list-style-type: none"> ● This is an ongoing process. The social workers of THDC and NGO hired for the implementation of RAP will continue the consultation with the affected community till the entire process of R&R is completed. The PICs have been upgraded and displays the FAQs and salient features of R&R. ● The implementation of Community Development activities identified under Corporate Social Responsibility has begun. THDC has also created an NGO to implement CSR activities. The RAP has been finalized and an independent agency for mid-term evaluation is expected to be selected by July 2010. The end term evaluation will be carried out at the end of RAP implementation.
Inadequate channels	● RTI	● RTI

Risk Description <i>(Level of Risk)</i>	Mitigation Steps <i>(Level of Residual Risk)</i>	Actions/ Timeline / Status
of information about the project leading to a lack of trust and collaboration between the project and the host community.	<ul style="list-style-type: none"> ○ As a public sector undertaking, THDC is mandated to comply with the disclosure provisions of the Right to Information Act. Public Information officers have been duly appointed at the Project and the corporate levels; the company is conducting regular RTI training for its staff; and meeting its suo moto disclosure obligations as well as its mandated feedback requirements. ● Site level information dissemination and public communications <ul style="list-style-type: none"> ○ THDC has set up a Project Information Center in the site office that is stocked with all relevant information/documentation about the project and also addresses any queries raised. ○ THDC has also retained a local NGO to facilitate its ongoing communications and consultations with project-affected people. ○ Project staff currently includes one staff from the PR functional stream. As the project moves into operational phase, PR capacity at the site need to be strengthened, preferably with a more senior officer posted there. ● Web dissemination <ul style="list-style-type: none"> ○ All relevant documents and information about the project will also be posted on THDC's website as and when they become available. ○ The corporate website is also being upgraded to make it more user-friendly. While the comprehensive upgradation of the THDC site has been scheduled for later in the year, THDC has agreed to upgrade the pages pertaining to VPHEP in the immediate future. ○ A web committee has been set up 	<ul style="list-style-type: none"> ○ The Bank carried out a diagnostic review of THDC's RTI compliance on Section 14 of the RTI Act and found that the company is meeting its mandatory obligations effectively. ○ THDC will provide RTI awareness to the various stakeholders in the VPHEP project area. ● Site <ul style="list-style-type: none"> ○ A qualified PR person has been recruited and posted at site. ○ Ongoing focus on strengthening PIC as frontline vehicle for information sharing and addressing concerns/issues raised by PAPs. ● Web <ul style="list-style-type: none"> ○ The VPHEP pages on the corporate website have been upgraded and now contain all relevant documentation and details about the Project. ○ The upgradation of the THDC corporate website will be conducted over the course of 2011. ○ Establish a systematic and streamlined process of content management with a focus on content generation as well as information flows. ○ Engage a professional web consultant on a long-term retainer basis who can help fashion content for the website.

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
	<p>in the THDC corporate office to oversee content management for the web. Although systems of information flow have been largely addressed, the sustained generation of user-friendly, updated content remains an issue given the shortage of requisite professional communication skills in-house.</p> <p>○</p>	
<p>Inadequate assessment of environmental impacts of project, limited capacity at THDC to review the Environmental Assessment and Environmental Management Plan.</p> <p>Limited capacity to manage the environmental aspects of the project during the construction and operation phases.</p> <p>Inadequate provisions for safety during construction and operation.</p>	<ul style="list-style-type: none"> • Preparation of a comprehensive Environmental Assessment and Management Plan (EA/EMP) that meets Indian national standards and Bank standards. • Institutional strengthening and capacity building at THDC to improve environmental management capacity. • Introduction of 3rd party monitoring of activities under the EMP on half-yearly basis. • Adoption of a Corporate environmental mission statement and environment policy. • Preparation and implementation of a Safety Assurance Plan for safety of THDC workers and staff; contractors' workers; communities living in the project zone. 	<ul style="list-style-type: none"> • The original EA prepared for THDC was disclosed before the formal public hearing, with assistance from the State Pollution Control Board. This EA was found on review to possess a number of gaps in the areas of terrestrial biodiversity, archeology, managed river flow and environmental measures for advanced construction sites of the project. THDC commissioned additional studies from another consulting firm to close the identified gaps and to prepare a consolidated EA. The Consolidated EA has been prepared and disclosed. Moreover, following the completion of a cumulative impact assessment commissioned by MOEF, the minimum flow requirement has been increased to 15.65 cumecs from 3 cumecs as stipulated in the original MOEF environmental clearance. • THDC has established a dedicated Environment & Social Cell headed by a General Manager at the Corporate level. On the project level, an environmental professional is included in THDC's project team. The

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
		<p>cell shall be strengthened through recruitment of two environmental engineers at Corporate level and one at project level.</p> <ul style="list-style-type: none"> • The consolidated EA incorporates a detailed training plan which includes training of the staff of the environmental cell, training of contractors' staff, as well as training of the corporate and project level managerial staff on environmental management. • THDC to engage a 3rd party for monitoring of activities under the EMP by Nov 2011 for twice-yearly monitoring during construction phase and as needed during the operation phase. • THDC regularly avails of the services of an environmental expert who advises THDC on environmental issues. An Environmental & Social Panel of Experts has been constituted for VPHEP and has made three site visits (Feb 2008, March 2009 and April 2010). • THDC has adopted an Environment Policy based on existing country systems. This will be revised in keeping with the recommendations of the cumulative impact assessment commissioned by MoEF. • A Safety Assurance Plan has been prepared in-house by THDC. Safety obligations of the contractors are detailed in the bid documents. • The Environmental Management Plan will be implemented over the course of project construction and operation.

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
		<ul style="list-style-type: none"> THDC has taken the lead in creating an Alaknanda Developers' Forum and will continue these efforts to build the Forum's potential for becoming an effective voice for the developers in their interactions with the State Government, including with the State Forest Department on matters of compensatory afforestation.
<p>Inadequate afforestation / utilization of Compensatory Afforestation Management and Planning Authority (CAMPAs) funds; implementation of Catchment Area Treatment Plan</p> <p>Hydro developers are required to pay funds for afforestation by way of compensation for forest land that is diverted for non-forest purposes. To date, these funds have been deposited by state forest departments in the central CAMPAs pending resolution of a decision on the mechanism for using these funds.</p> <p>In addition, developers are required to transfer funds to GOI at the time of project clearance to cover the costs of the implementation of the</p>	<p>Mitigation of these risks is beyond the scope of developer, as under Indian law, access to forest lands is a State monopoly, but the risk impacts the sustainability of development efforts. As per decision of Supreme Court, State has constituted state CAMPAs and will be responsible for fund allocation to various works received from GoI, implementation and monitoring of works associated with CAMPAs funds. The likelihood of satisfactory implementation of effectiveness and sustainability of the afforestation and catchment area treatment plans can be increased through:</p> <ul style="list-style-type: none"> On-going dialogue with the State Government; Ministry of Power, GOI; civil society interested in environmental issues. Continued encouragement of the strengthening of the Developers' Forum, which includes representatives of developers of projects on the Alaknanda River. Independent verification of the CAT/compensatory afforestation and other environmental measures. 	<p>In the case of the Tehri Dam Project, the independent Indian Council of Forestry Research & Education (ICFRE) was engaged by THDC to verify the CAT works carried out by the State. THDC will replicate this good experience for VPHEP.</p>

Risk Description (Level of Risk)	Mitigation Steps (Level of Residual Risk)	Actions/ Timeline / Status
<p>Catchment Area Treatment Plan. The implementation of the CAT Plan is the responsibility of the State Forest Department (SFD). GOI transfers funds to the SFD only after submission by the SFD of an acceptable CAT Plan for the concerned river. Weak capacity of the SFD has led to significant delays in the preparation of CAT Plan and in the implementation of the same once the funds are transferred from GOI.</p> <p>The delay in the implementation of the CAT Plan poses an operational risk for the developer and a potential reputational risk for the Bank.</p>		
<p>Deficiencies in river basin planning, particularly with respect to hydro power projects</p>	<p><i>This risk is beyond scope of project but impacts the sustainability of development efforts</i></p> <ul style="list-style-type: none"> • The Bank team has engaged state government officials in a sustained dialogue on policy-level issues relevant to the hydro sector (e.g. river basin planning; benefits-sharing etc). • Under the Electricity Act (2003), the Central Electricity Authority (CEA) is responsible for ensuring that adequate studies have been carried out to determine the optimal location of dams and other river works before giving concurrence to hydroelectric projects. In addition, the National Hydro Policy (2008) stipulates that the CEA is 	<ul style="list-style-type: none"> • The World Bank has also supported Government of Uttarakhand (GOUK) through a technical assistance, financed by Public Private Infrastructure Advisory Facility or PPIAF, in preparing river basin development optimization strategies for the Alaknanda basin. • In addition, in consultation with the state government, the Bank commissioned an analysis of the possible impacts of the cumulative development of multiple

Risk Description <i>(Level of Risk)</i>	Mitigation Steps <i>(Level of Residual Risk)</i>	Actions/ Timeline / Status
	responsible for river basin optimization studies with the support of the Central Water Commission.	hydropower projects on the river. This study was completed in November 2009 and disseminated to the Government of India, Government of Uttarakhand and other interested parties.

Annex 13: Documents in the Project File
INDIA: Vishnugad Pipalkoti Hydroelectric Project

- 1.** Project Concept Note
- 2.** Integrated Safeguard Data Sheet
- 3.** Project Information Document
- 4.** List of Factual Technical Documents
 - a.** Studies that are part of the Tender Document:
 - i. Geological Baseline Report
 - ii. Seismic Analysis of Dam & Foundation System
 - iii. Sediment Handling Optimisation Studies
 - iv. Risk Assessment & Risk Register
 - b.** Studies which are not part of Tender Document:
 - i. Detailed Project Report
 - ii. Hydraulic Model Studies
 - iii. Transient Studies for Water Conductor System
 - iv. Geotechnical Data Report
 - v. Design Seismic Parameters for VPHEP
 - vi. Stress-Strain Analysis of Major Underground Caverns i.e. Machine Hall-Transformer Hall Complex & De-Silting Chambers Complex
 - vii. Assessment of Quality & Quantity of Construction Materials in Various Quarries.
 - viii. Slope Stabilisation and Induced Effects of Blasting during Construction
 - ix. Dam-Break Analysis
 - x. Downstream Impact Analysis of Vishnugad Pipalkoti Hydro Electric Project (in connection with OP 7.50)
 - xi. Comprehensive Environment Impact Assessment
 - xii. Social Impact Assessment

Annex 14: Statement of Loans and Credits
INDIA: Vishnugad Pipalkoti Hydroelectric Project

Project ID	FY	Purpose	Original Amount in US\$ Millions				Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF			Orig.	Frm. Rev'd
P107649	2011	Karnataka State Highway Improv Proj II	350.00	0.00	0.00	0.00	0.00	350.00	0.00	0.00
P108258	2011	E-Delivery of Public Services in India	150.00	0.00	0.00	0.00	0.00	150.00	0.00	0.00
P102624	2011	Kerala Local Govt. & Service Delivery	0.00	200.00	0.00	0.00	0.00	202.36	0.00	0.00
P102329	2011	Rajasthan Rural Livelihoods Project	0.00	162.70	0.00	0.00	0.00	162.91	0.00	0.00
P120836	2011	Maharashtra Agricultural Competitiveness	0.00	100.00	0.00	0.00	0.00	97.42	-4.50	0.00
P121515	2011	NHAI Technical Assistance Project	45.00	0.00	0.00	0.00	0.00	44.89	0.00	0.00
P122096	2011	Bihar Kosi Flood Recovery Project	0.00	220.00	0.00	0.00	0.00	216.15	-20.00	0.00
P124639	2011	PMGSY Rural Roads Project	500.00	1,000.00	0.00	0.00	0.00	1,512.83	0.00	0.00
P089985	2010	Dam Rehabilitation & Improvement	175.00	175.00	0.00	0.00	0.00	345.97	4.00	0.00
P105990	2010	West Bengal PRI	0.00	200.00	0.00	0.00	0.00	186.83	-17.31	0.00
P110051	2010	Haryana Power System Improv Project	330.00	0.00	0.00	0.00	0.00	233.71	86.55	-95.47
P110371	2010	Sustainable Urban Transport Project	105.23	0.00	0.00	0.00	0.00	97.44	28.72	0.00
P101650	2010	A. P. RWSS	0.00	150.00	0.00	0.00	0.00	132.09	6.00	0.00
P091031	2010	CBldg for Indus Poll Mgt	25.21	38.94	0.00	0.00	0.00	60.53	-4.14	0.00
P092217	2010	National Cyclone Risk Mitigation Project	0.00	255.00	0.00	0.00	0.00	259.23	0.00	0.00
P100954	2010	AP Water Sector Improvement Project	450.60	0.00	0.00	0.00	0.00	409.47	-30.00	0.00
P102771	2010	IIFCL - India Infrs Finance Company Ltd	1,195.00	0.00	0.00	0.00	0.00	1,175.44	-16.57	0.00
P096021	2010	AP Road Sector Project	320.00	0.00	0.00	0.00	0.00	296.59	31.39	0.00
P097985	2010	Integrated Coastal Zone Management Proje	0.00	221.97	0.00	0.00	0.00	216.27	8.31	0.00
P071250	2010	Andhra Pradesh Municipal Development	300.00	0.00	0.00	0.00	0.00	279.07	-4.18	0.00
P119043	2010	Microfinance-Scaling Up Sustnble & Resp	200.00	100.00	0.00	0.00	0.00	205.44	-63.62	0.00
P102549	2010	Tech Engr Educ Quality Improvement II	0.00	300.00	0.00	0.00	0.00	280.04	-1.13	0.00
P115566	2010	POWERGRID V	1,000.00	0.00	0.00	0.00	0.00	943.93	55.93	0.00
P113028	2010	Mumbai Urban Transport Project-2A	430.00	0.00	0.00	0.00	0.00	428.93	0.00	0.00
P100735	2009	Orissa Community Tank Management Project	56.00	56.00	0.00	0.00	35.06	70.04	11.70	0.00
P096023	2009	Orissa State Roads	250.00	0.00	0.00	0.00	0.00	235.36	51.49	0.00
P112033	2009	UP Sodic III	0.00	197.00	0.00	0.00	0.00	180.67	-9.51	0.00
P094360	2009	National VBD Control&Polio Eradication	0.00	521.00	0.00	0.00	0.00	417.03	182.52	0.00
P100101	2009	Coal-Fired Generation Rehabilitation	180.00	0.00	0.00	0.00	0.00	179.55	40.50	0.00
P093478	2009	Orissa Rural Livelihoods Project	0.00	82.40	0.00	0.00	0.00	75.16	13.99	0.00
P102331	2009	MPDPIP-II	0.00	100.00	0.00	0.00	0.00	86.29	-16.41	0.00
P095114	2008	Rampur Hydropower Project	400.00	0.00	0.00	0.00	0.00	223.79	72.29	0.00

Project ID	FY	Purpose	Original Amount in US\$ Millions				Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF			Orig.	Frm. Rev'd
P102547	2008	Elementary Education (SSA II)	0.00	1,350.00	0.00	0.00	0.00	504.56	-243.64	152.14
P101653	2008	Power System Development Project IV	1,000.00	0.00	0.00	0.00	0.00	244.98	-196.77	105.73
P100789	2007	AP Community Tank Management Project	94.50	94.50	0.00	0.00	0.00	144.95	80.06	0.00
P071160	2007	Karnataka Health Systems	0.00	141.83	0.00	0.00	0.00	43.55	3.39	0.00
P075060	2007	RCH II	0.00	360.00	0.00	0.00	0.00	180.54	151.50	0.00
P078538	2007	Third National HIV/AIDS Control Project	0.00	250.00	0.00	0.00	0.07	122.21	107.77	0.00
P078539	2007	TB II	0.00	170.00	0.00	0.00	0.00	53.68	-6.61	0.00
P083187	2007	Uttaranchal RWSS	0.00	120.00	0.00	0.00	0.00	80.65	59.96	48.36
P090585	2007	Punjab State Roads Project	250.00	0.00	0.00	0.00	0.00	115.62	54.57	0.00
P090592	2007	Punjab Rural Water Supply & Sanitation	0.00	154.00	0.00	0.00	0.23	122.61	105.91	-0.09
P090764	2007	Bihar Rural Livelihoods Project	0.00	63.00	0.00	0.00	0.00	25.48	-31.51	1.18
P090768	2007	TN IAM WARM	335.00	150.00	0.00	0.00	0.00	312.84	162.87	0.00
P096019	2007	HP State Roads Project	220.00	0.00	0.00	0.00	0.00	145.57	65.12	0.00
P102768	2007	Stren India's Rural Credit Coops	300.00	300.00	0.00	0.00	0.00	220.18	179.71	0.00
P099047	2007	Vocational Training India	0.00	280.00	0.00	0.00	0.00	162.61	40.07	0.00
P078832	2006	Karnataka Panchayats Strengthening Proj	0.00	120.00	0.00	0.00	0.00	35.93	-48.08	0.00
P079675	2006	Karn Municipal Reform	216.00	0.00	0.00	0.00	0.00	146.47	135.47	0.00
P079708	2006	TN Empwr & Pov Reduction	0.00	274.00	0.00	0.00	0.00	164.52	-5.27	0.00
P083780	2006	TN Urban III	300.00	0.00	0.00	0.00	0.64	112.48	113.12	22.52
P086414	2006	Power System Development Project III	400.00	0.00	0.00	0.00	0.00	3.80	3.80	0.00
P093720	2006	Mid-Himalayan (HP) Watersheds	0.00	60.00	0.00	0.00	0.00	17.99	7.86	0.00
P092735	2006	NAIP	0.00	200.00	0.00	0.00	0.00	97.56	36.40	0.00
P084632	2005	Hydrology II	104.98	0.00	0.00	0.00	0.00	69.18	69.18	57.31
P084790	2005	MAHAR WSIP	325.00	0.00	0.00	0.00	0.00	129.43	118.43	0.00
P084792	2005	Assam Agric Competitiveness	0.00	154.00	0.00	0.00	0.00	38.51	29.63	9.84
P094513	2005	India Tsunami ERC	0.00	465.00	0.00	0.00	68.99	264.88	316.41	95.85
P086518	2005	SME Financing & Development	520.00	0.00	0.00	0.00	0.00	128.39	-270.61	69.39
P073370	2005	Madhya Pradesh Water Sector Restructurin	394.02	0.00	0.00	0.00	6.62	233.13	239.75	0.00
P073651	2005	DISEASE SURVEILLANCE	0.00	68.00	0.00	0.00	8.31	38.97	42.11	5.86
P077977	2005	Rural Roads Project	99.50	300.00	0.00	0.00	0.00	11.99	3.44	0.00
P077856	2005	Lucknow-Muzaffarpur National Highway	620.00	0.00	0.00	0.00	0.00	25.59	25.59	0.00
P075058	2005	TN HEALTH SYSTEMS	0.00	228.53	0.00	0.00	20.06	104.15	0.78	-8.16
P050655	2004	RAJASTHAN HEALTH SYSTEMS DEVELOPMENT	0.00	89.00	0.00	0.00	0.00	22.32	17.37	3.54
P078550	2004	Uttar Wtrshed	0.00	77.60	0.00	0.00	0.00	15.10	-4.44	0.00
P050649	2003	TN ROADS	398.70	0.00	0.00	0.00	0.00	33.48	-17.09	0.00
P071272	2003	AP RURAL POV REDUCTION	0.00	315.03	0.00	0.00	0.00	48.78	-136.28	33.35
P071033	2002	KARN Tank Mgmt	32.00	130.90	0.00	0.00	25.07	95.42	32.96	12.08
P040610	2002	RAJ WSRP	0.00	159.00	0.00	0.00	25.84	49.07	16.37	-15.88

Project ID	FY	Purpose	Original Amount in US\$ Millions				Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF			Orig.	Frm. Rev'd
P050668	2002	MUMBAI URBAN TRANSPORT PROJECT	463.00	79.00	0.00	0.00	1.88	121.74	110.51	123.51
P050653	2002	KARNATAKA RWSS II	0.00	301.60	0.00	0.00	16.40	149.64	-18.90	0.00
P050647	2002	UP WSRP	0.00	149.20	0.00	0.00	40.11	22.87	33.80	-16.56
Total:			12,534.74	10,684.20	0.00	0.00	249.28	14,416.85	1,790.73	604.50

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STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2005	ADPCL	39.50	7.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	AHEL	0.00	5.08	0.00	0.00	0.00	5.08	0.00	0.00
2005	AP Paper Mills	35.00	5.00	0.00	0.00	25.00	5.00	0.00	0.00
2005	APIDC Biotech	0.00	4.00	0.00	0.00	0.00	2.01	0.00	0.00
2002	ATL	13.81	0.00	0.00	9.36	13.81	0.00	0.00	9.36
2003	ATL	1.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00
2005	ATL	9.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	Atul Ltd	16.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	BHF	10.30	0.00	10.30	0.00	10.30	0.00	10.30	0.00
2004	BILT	0.00	0.00	15.00	0.00	0.00	0.00	15.00	0.00
2001	BTVL	0.43	3.98	0.00	0.00	0.43	3.98	0.00	0.00
2003	Balrampur	10.52	0.00	0.00	0.00	10.52	0.00	0.00	0.00
2001	Basix Ltd.	0.00	0.98	0.00	0.00	0.00	0.98	0.00	0.00
2005	Bharat Biotech	0.00	0.00	4.50	0.00	0.00	0.00	3.30	0.00
1984	Bihar Sponge	5.70	0.00	0.00	0.00	5.70	0.00	0.00	0.00
2003	CCIL	1.50	0.00	0.00	0.00	0.59	0.00	0.00	0.00
2006	CCIL	7.00	2.00	0.00	12.40	7.00	2.00	0.00	12.40
1990	CESC	4.61	0.00	0.00	0.00	4.61	0.00	0.00	0.00
1992	CESC	6.55	0.00	0.00	14.59	6.55	0.00	0.00	14.59
2004	CGL	14.38	0.00	0.00	0.00	7.38	0.00	0.00	0.00
2004	CMScomputers	0.00	10.00	2.50	0.00	0.00	0.00	0.00	0.00
2002	COSMO	2.50	0.00	0.00	0.00	2.50	0.00	0.00	0.00
2005	COSMO	0.00	3.73	0.00	0.00	0.00	3.73	0.00	0.00
2006	Chennai Water	24.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	DQEL	0.00	1.50	1.50	0.00	0.00	1.50	1.50	0.00
2005	DSCL	30.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00
2006	DSCL	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	Dabur	0.00	14.09	0.00	0.00	0.00	14.09	0.00	0.00

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2003	Dewan	8.68	0.00	0.00	0.00	8.68	0.00	0.00	0.00
2006	Federal Bank	0.00	28.06	0.00	0.00	0.00	23.99	0.00	0.00
2001	GTF Fact	0.00	1.20	0.00	0.00	0.00	1.20	0.00	0.00
2006	GTF Fact	0.00	0.00	0.99	0.00	0.00	0.00	0.99	0.00
1994	GVK	0.00	4.83	0.00	0.00	0.00	4.83	0.00	0.00
2003	HDFC	100.00	0.00	0.00	100.00	100.00	0.00	0.00	100.00
1998	IAAF	0.00	0.47	0.00	0.00	0.00	0.30	0.00	0.00
2006	IAL	0.00	9.79	0.00	0.00	0.00	7.70	0.00	0.00
1998	IDFC	0.00	10.82	0.00	0.00	0.00	10.82	0.00	0.00
2005	IDFC	50.00	0.00	0.00	100.00	50.00	0.00	0.00	100.00
	IHDC	6.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	IHDC	7.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	Indecomm	0.00	2.57	0.00	0.00	0.00	2.57	0.00	0.00
1996	India Direct Fnd	0.00	1.10	0.00	0.00	0.00	0.66	0.00	0.00
2001	Indian Seamless	6.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00
2006	JK Paper	15.00	7.62	0.00	0.00	0.00	7.38	0.00	0.00
2005	K Mahindra INDIA	22.00	0.00	0.00	0.00	22.00	0.00	0.00	0.00
2005	KPIT	11.00	2.50	0.00	0.00	8.00	2.50	0.00	0.00
2003	L&T	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
2006	LGB	14.21	4.82	0.00	0.00	0.00	4.82	0.00	0.00
2006	Lok Fund	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	MMFSL	7.89	0.00	7.51	0.00	7.89	0.00	7.51	0.00
2003	MSSL	0.00	2.29	0.00	0.00	0.00	2.20	0.00	0.00
2001	MahInfra	0.00	10.00	0.00	0.00	0.00	0.79	0.00	0.00
	Montalvo	0.00	3.00	0.00	0.00	0.00	1.08	0.00	0.00
1996	Moser Baer	0.00	0.82	0.00	0.00	0.00	0.82	0.00	0.00
1999	Moser Baer	0.00	8.74	0.00	0.00	0.00	8.74	0.00	0.00
2000	Moser Baer	12.75	10.54	0.00	0.00	12.75	10.54	0.00	0.00
	Nevis	0.00	4.00	0.00	0.00	0.00	4.00	0.00	0.00
2003	NewPath	0.00	9.31	0.00	0.00	0.00	8.31	0.00	0.00
2004	NewPath	0.00	2.79	0.00	0.00	0.00	2.49	0.00	0.00
2003	Niko Resources	24.44	0.00	0.00	0.00	24.44	0.00	0.00	0.00
2001	Orchid	0.00	0.73	0.00	0.00	0.00	0.73	0.00	0.00
1997	Owens Corning	5.92	0.00	0.00	0.00	5.92	0.00	0.00	0.00
2006	PSL Limited	15.00	4.74	0.00	0.00	0.00	4.54	0.00	0.00
2004	Powerlinks	72.98	0.00	0.00	0.00	64.16	0.00	0.00	0.00
2004	RAK India	20.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00
1995	Rain Calcining	0.00	2.29	0.00	0.00	0.00	2.29	0.00	0.00
2004	Rain Calcining	10.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
2005	Ramky	3.74	10.28	0.00	0.00	0.00	0.00	0.00	0.00
2005	Ruchi Soya	0.00	9.27	0.00	0.00	0.00	6.77	0.00	0.00
2001	SBI	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	SREI	3.21	0.00	0.00	0.00	3.21	0.00	0.00	0.00
2000	SREI	6.50	0.00	0.00	0.00	6.50	0.00	0.00	0.00
1995	Sara Fund	0.00	3.43	0.00	0.00	0.00	3.43	0.00	0.00

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2004	SeaLion	4.40	0.00	0.00	0.00	4.40	0.00	0.00	0.00
2001	Spryance	0.00	1.86	0.00	0.00	0.00	1.86	0.00	0.00
2003	Spryance	0.00	0.93	0.00	0.00	0.00	0.93	0.00	0.00
2004	Sundaram Finance	42.93	0.00	0.00	0.00	42.93	0.00	0.00	0.00
2000	Sundaram Home	0.00	2.18	0.00	0.00	0.00	2.18	0.00	0.00
2002	Sundaram Home	6.71	0.00	0.00	0.00	6.71	0.00	0.00	0.00
1998	TCW/ICICI	0.00	0.80	0.00	0.00	0.00	0.80	0.00	0.00
2005	TISCO	100.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00
2004	UPL	15.45	0.00	0.00	0.00	15.45	0.00	0.00	0.00
1996	United Riceland	5.63	0.00	0.00	0.00	5.63	0.00	0.00	0.00
2005	United Riceland	8.50	0.00	0.00	0.00	5.00	0.00	0.00	0.00
2002	Usha Martin	0.00	0.72	0.00	0.00	0.00	0.72	0.00	0.00
2001	Vysya Bank	0.00	3.66	0.00	0.00	0.00	3.66	0.00	0.00
2005	Vysya Bank	0.00	3.51	0.00	0.00	0.00	3.51	0.00	0.00
1997	WIV	0.00	0.37	0.00	0.00	0.00	0.37	0.00	0.00
1997	Walden-Mgt India	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
2006	iLabs Fund II	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
Total portfolio:		956.52	249.41	42.30	536.35	604.74	175.91	38.60	236.35

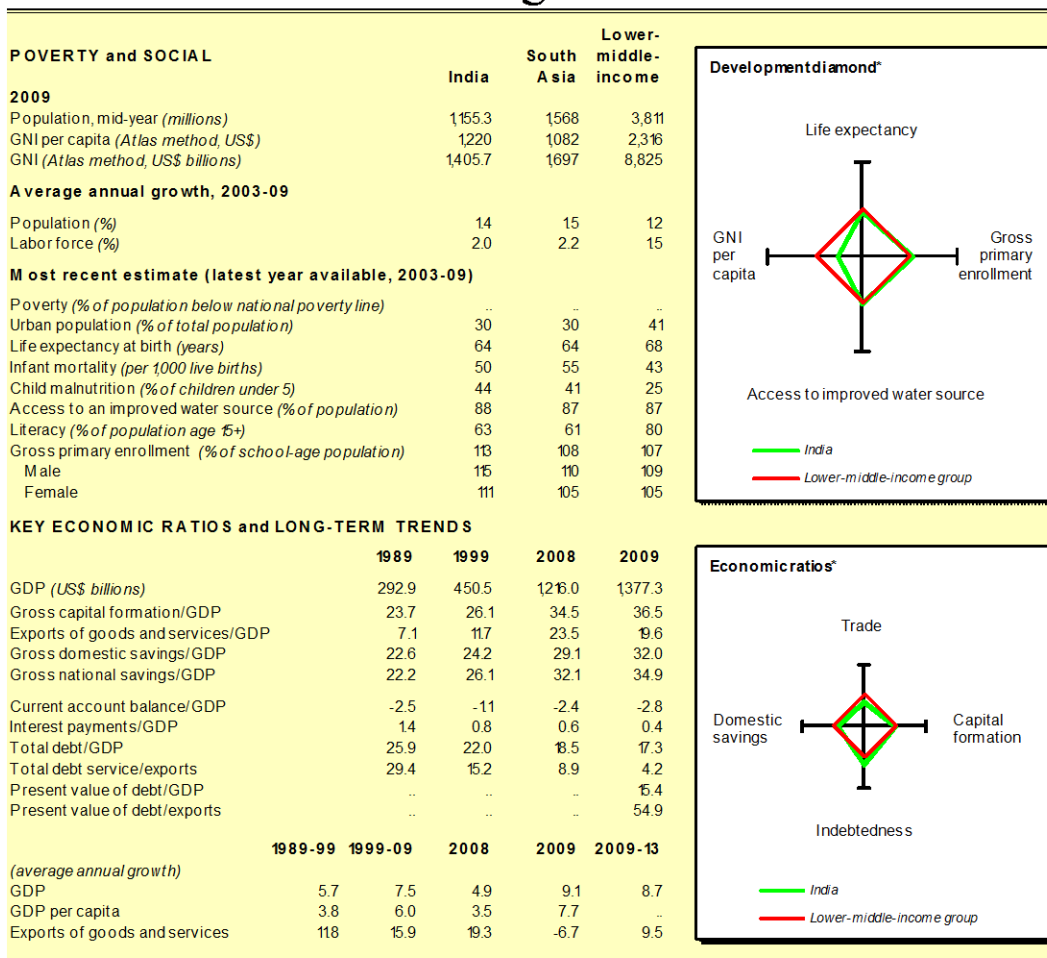
FY Approval	Company	Approvals Pending Commitment			
		Loan	Equity	Quasi	Partic.
2004	CGL	0.01	0.00	0.00	0.00
2000	APCL	0.01	0.00	0.00	0.00
2006	Atul Ltd	0.00	0.01	0.00	0.00
2001	Vysya Bank	0.00	0.00	0.00	0.00
2006	Federal Bank	0.01	0.00	0.00	0.00
2001	GI Wind Farms	0.01	0.00	0.00	0.00
2004	Ocean Sparkle	0.00	0.00	0.00	0.00
2005	Allain Duhangan	0.00	0.00	0.00	0.00
Total pending commitment:		0.04	0.01	0.00	0.00

Annex 15: Country at a Glance

INDIA: Vishnugad Pipalkoti Hydroelectric Project

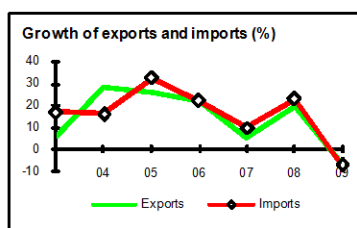
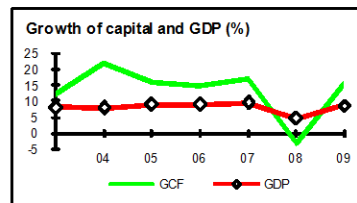
India at a glance

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STRUCTURE of the ECONOMY

	1989	1999	2008	2009
(% of GDP)				
Agriculture	29.2	25.0	17.6	17.8
Industry	26.9	25.3	28.2	27.0
Manufacturing	17.0	14.8	15.5	14.8
Services	43.8	49.7	54.2	55.3
Household final consumption expenditure	65.5	62.9	59.9	56.0
General gov't final consumption expenditure	11.9	12.9	11.0	12.0
Imports of goods and services	8.2	13.6	28.9	24.0
	1989-99	1999-09	2008	2009
(average annual growth)				
Agriculture	3.3	2.7	-0.1	0.4
Industry	6.0	8.2	4.4	8.0
Manufacturing	6.5	8.3	4.2	8.8
Services	7.4	9.2	10.1	10.1
Household final consumption expenditure	5.7	6.0	12.4	17
General gov't final consumption expenditure	5.9	5.1	10.7	16.4
Gross capital formation	7.0	12.2	-3.1	16.0
Imports of goods and services	14.5	15.3	23.0	-7.3



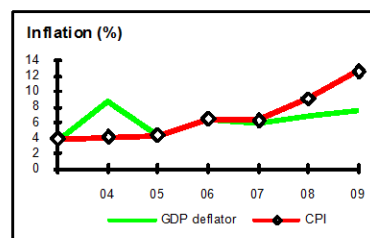
Note: 2009 data are preliminary estimates.

This table was produced from the Development Economics LDB database.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

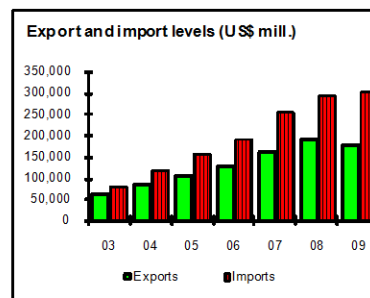
PRICES and GOVERNMENT FINANCE

	1989	1999	2008	2009
Domestic prices				
(% change)				
Consumer prices	4.7	3.4	9.1	12.5
Implicit GDP deflator	8.4	3.8	6.7	7.5
Government finance				
(% of GDP, includes current grants)				
Current revenue	19.2	17.3	19.9	17.4
Current budget balance	-3.6	-6.0	-7.4	-7.3
Overall surplus/deficit	-	-9.8	-8.8	-9.0



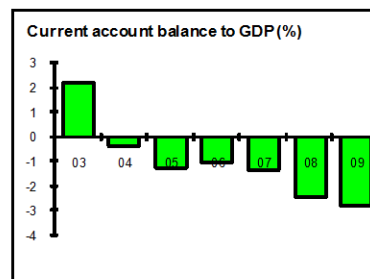
TRADE

	1989	1999	2008	2009
(US\$ millions)				
Total exports (fob)	16,955	36,822	190,000	177,452
Tea	413	1,183	-	-
Iron	1,031	916	-	-
Manufactures	11,972	29,714	108,281	103,256
Total imports (cif)	24,411	55,383	296,614	303,113
Food	556	2,417	-	-
Fuel and energy	3,768	12,611	-	-
Capital goods	5,288	8,966	71,237	79,420
Export price index (2000=100)	-	81	161	165
Import price index (2000=100)	-	100	182	166
Terms of trade (2000=100)	-	81	89	99



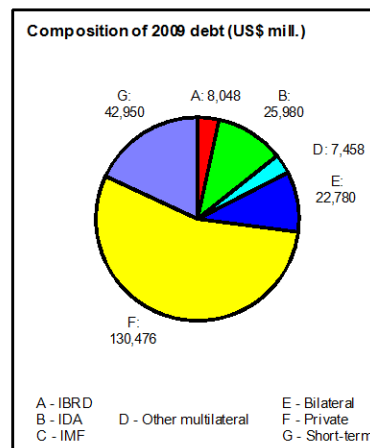
BALANCE of PAYMENTS

	1989	1999	2008	2009
(US\$ millions)				
Exports of goods and services	21,201	53,251	290,679	275,955
Imports of goods and services	27,934	67,028	359,698	359,077
Resource balance	-6,733	-13,777	-69,019	-83,122
Net income	-2,928	-3,559	-4,507	-7,403
Net current transfers	2,820	12,638	44,799	52,114
Current account balance	-7,380	-5,080	-28,959	-38,469
Financing items (net)	6,640	11,222	8,880	5,190
Changes in net reserves	740	-6,142	20,079	-13,441
Memo:				
Reserves including gold (US\$ millions)	3,962	38,036	351,259	375,970
Conversion rate (DEC, local/US\$)	16.6	43.3	45.9	47.6



EXTERNAL DEBT and RESOURCE FLOWS

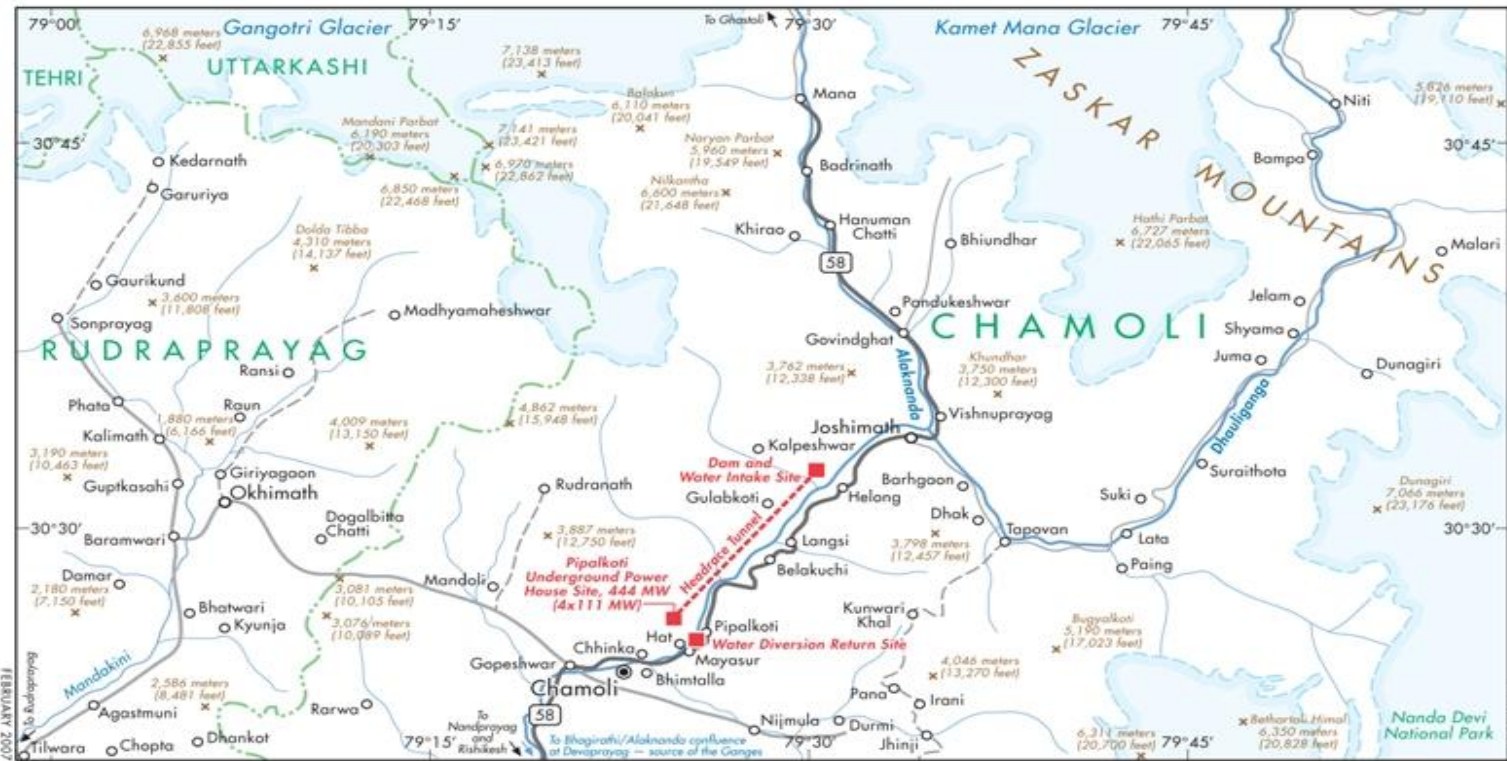
	1989	1999	2008	2009
(US\$ millions)				
Total debt outstanding and disbursed	75,941	99,128	224,713	237,692
IBRD	6,615	7,815	7,429	8,048
IDA	12,568	18,930	25,365	25,980
Total debt service	6,961	10,098	30,936	16,150
IBRD	881	1,389	703	656
IDA	188	469	965	982
Composition of net resource flows				
Official grants	698	475	1,169	1,118
Official creditors	2,497	1,048	2,683	1,886
Private creditors	2,890	-1,499	112,17	10,165
Foreign direct investment (net inflows)	252	2,169	41,169	34,577
Portfolio equity (net inflows)	0	2,317	-15,030	21,111
World Bank program				
Commitments	2,987	999	1,200	6,866
Disbursements	2,011	1,460	2,083	2,378
Principal repayments	449	1,228	1,154	1,251
Net flows	1,562	232	928	1,127
Interest payments	619	630	513	386
Net transfers	942	-398	415	740



Note: This table was produced from the Development Economics LDB database.

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INDIA: Vishnugad Pipalkoti Hydroelectric Project



Annex 17: Communications, Consultations and Public Disclosure

INDIA: Vishnugad Pipalkoti Hydroelectric Project

1. Recent experience in the infrastructure sector in India has shown the importance of taking into account the real and perceived concerns of stakeholders. Several projects, including some very large development initiatives, have been derailed due to opposition from some stakeholder groups, especially project-affected communities. Effective communications between the project agency and its stakeholders helps build trust and collaboration which in turn contributes to better project design and implementation. Although the incorporation of these aspects in infrastructure projects is evolving in India, several forward-looking developers – including some in the hydropower sector – have begun to adopt higher levels of public communications, driven by enlightened self-interest. This has raised the bar in the infrastructure sector, creating challenges especially for those developers slow to build up the professional skills required to respond to the greater expectations of stakeholders, especially project-affected communities.

2. Although it handled the resettlement and rehabilitation of a large population at Tehri (estimated at 10,000 families), THDC's internal capacity to deal with complex social issues was somewhat limited, especially in the fast changing socio-political dynamic of infrastructure development in India. The need for proactive public communications took on a heightened importance in the socio-political context in which the Vishnugad Pipalkoti Hydroelectric Project (VPHEP) is located. The state of Uttarakhand has traditionally had a strong civil society movement and its strong and rooted NGO networks, coupled with a literate population, have forged a strong sense of community especially around matters of common natural resources. The district in which the project is sited, Chamoli, was the focal point of the anti-logging Chipko movement of the 1970s. This experience, together with the relatively strong representation of environmentally and socially oriented NGOs in the area, has contributed to a high awareness among locals of their rights over their natural resources. The region has also a long history of decentralized community control over forest resources, vested in the villagers through the *van panchayats* (literally 'forest village councils') that were first formed in the 1920s. The area is also part of a larger religio-cultural landscape that encompasses a string of Hindu shrines along the Alaknanda river up to the Badrinath Temple, some 70 km upstream of VPHEP. While the project area of VPHEP itself does not contain any significant temple or shrine, this aspect poses a challenge for the state whose development plans envisage several hydro projects along the Alaknanda, which is a tributary of the Ganges, and its tributaries.

3. THDC's initial community interactions and consultations for VPHEP were limited by the composition of the team that was first posted to site for initial investigations and that did not include specialists who could handle complex social, environmental and communication issues. The first public hearing on the proposed Project – a statutory requirement linked to the environmental clearance process in India – was held in October 2006 under the stewardship of the local district authorities. The hearing was adjourned amid concerns voiced by local villagers (and some outside NGOs) about the levels of information available about the Project, its expected impacts and the proposed mitigation and compensation measures. The public hearing process was completed at a second public hearing held in January 2007, by when THDC had begun to take additional steps to help improve its communications and disclosure at the grassroots level.

4. A Project Information Center (PIC) was set up in November 2006 at the temporary site office in Pipalkoti and a Communications Needs Assessment (CNA) was commissioned to allow THDC to identify information-gaps existing among various stakeholder groups relevant to the VPHEP. The CNA confirmed the need to enhance the availability of information available among stakeholders, highlighting the need for proactive communication with the project-affected communities. Based on the findings of the CNA, a Communications Approach was drawn up to meet the following objectives:

- To help ensure smooth and timely project implementation by anticipating and addressing concerns and misapprehensions of local communities and other civil society organizations that may impact the Project.
- To ensure transparency around the VPHEP by meeting the requirements of the Right to Information Act, and upholding best practices in transparency and disclosure.
- To establish and maintain an effective and credible two-way channel of communication with stakeholders in general and project-affected communities in particular throughout the implementation of VPHEP.
- To help build a positive profile for THDC as one of the country's premier hydro developers, especially in the wake of growing competition in the sector.

5. Recognizing that the information-deficit could translate into a trust-deficit, THDC sought to shore up its capacity to handle public consultations and communications by hiring two trained social workers, including a woman who has better access to the village women, who are a vocal and empowered constituency in this region where male out-migration is high. The company then launched a process of structured consultations facilitated by the formation of village level representative committees. The simultaneous launch of the Social Impact Assessment allowed THDC to open an ongoing dialogue with the Project-affected people through household meetings and focus group discussions.

6. A second PIC was set up in mid-2007 in the village Haat, the site of the proposed powerhouse to allow easier access to Project-related information⁶⁸. Although the Project design originally called for the acquisition of less than 6 hectares of private land in Haat and for the relocation of some 17 households in a village of 306 households, the villagers had early on expressed concerns about the disproportional impacts of the Project on the entire village. These included reduced access to *van panchayat* (community forest) land; disruption and pollution from construction works; and a perceived threat to privacy and safety caused by the ingress of a large outside workforce into the village precincts. THDC, in January 2008, invited its three-member Panel of Experts (Social & Environmental) to visit Haat and, on its considered recommendation, agreed to facilitate the relocation of all those who wished to move out of the village to lands they owned across the river.

7. Given the challenge of maintaining an ongoing dialogue with far-flung villages, THDC also hired a reputed Uttarakhand NGO, the Shri Bhuvaneshwari Mahila Ashram, to act as its interface with Project-affected communities. The NGO is leading the grassroot-level

⁶⁸ The PICs at Haat and Pipalkoti have since been shut down and a consolidated PIC opened at Siyasain (near Haat) where THDC has established its permanent project office and administrative colony.

communication effort aimed at informing Project-affected families about the likely impacts and garnering their feedback to inform the design and implementation of the resettlement and rehabilitation framework and to help lead livelihood restoration initiatives. Their direct interaction with Project-affected communities in Garhwali, the local language, helped bridge the information gap that once existed.

8. Over the last four years, THDC has conducted wide-ranging and detailed consultations with project-affected communities as part of its project preparation process. Some 109 formal consultation sessions; five Project-wide public meetings (including two statutory public hearings that are part of the environmental clearance process); 11 meetings focused on environment issues and; innumerable informal meetings with Project-affected persons have been held. Details of most of the formal consultation sessions can be found in the PIC at Siyasain.

9. THDC has also used a range of creative information aids to help disseminate information about the Project to local villagers. A three-dimensional model of the Project installed at the PIC helps people from the affected villages get a visual understanding of the Project layout and infrastructure. Posters depicting village-wise impacts of Project infrastructure have also been placed in the PIC and hoardings detailing the salient features of the R&R Policy were put up at high-visibility locations to allow people easier access to its details. THDC has also posted a trained public relations officer at site to handle stakeholder communications at the project level.

10. At the corporate level, THDC has organized training in community relations and public communications for its staff – both from VPHEP as well as other projects -- with the Indian Institute of Mass Communications in New Delhi. This will help build the company's institutional capacity for improving its communications and disclosure. THDC is also planning to retain a professional firm to handle corporate-level public relations and communications with wider audiences.

11. In a bid to make information about the Project easily accessible to external stakeholders, THDC has upgraded its corporate website for the VPHEP. All relevant documents, reports and studies regarding the Project have been posted online in a user-friendly format at www.thdc.gov.in.

12. As a public sector entity, THDC is mandated to comply with the provisions of the Right to Information legislation. A brief diagnostic of its *suo moto* disclosure obligations as laid out in Section 4 of the RTI Act shows that THDC maintains a commendable level of information pertaining to its mandated obligations. Public Information officers have been duly appointed at the Project and corporate levels; the company is conducting regular RTI training for its staff; and plans to conduct RTI Awareness camps for the general public as well.

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