ECONOMIC ANALYSIS

A. Economic Analysis

1. **Overview.** An economic analysis was prepared for the Phuentsholing Township Development Project in accordance with the Guidelines for the Economic Analysis of Projects of the Asian Development Bank (ADB).[1] The guidelines describe four basic steps to analyze a project's economic viability: (i) identify economic costs and benefits, (ii) quantify economic costs and benefits (comparing with- and without-project scenarios for each alternative), (iii) value economic costs and benefits, and (iv) compare costs and benefits.

2. **Identification and quantification of economic costs and benefits.** The project's incremental economic costs and benefits were identified and quantified for 2018–2052, including the 30-year implementation period following construction completion in 2022. All costs and benefits were initially expressed in March 2017 economic prices (at the time of approval of the initial project) and updated using 2020 prices. This includes physical contingencies but excludes transfer payments (such as taxes, duties, and subsidies). The economic cost–benefit analysis was conducted at the world price level (world price numeraire), and from the perspective of Bhutan (benefits accruing to India were ignored).

3. **Valuation of economic costs and benefits.** A shadow exchange rate factor (SERF) of 1.01 was applied to all non-tradable goods.[2] The SERF is relatively low because of low import duties and Bhutan's free trade agreement with India. A shadow wage rate of 1.0 was applied, as there is a shortage of unskilled labor in Bhutan and most unskilled construction workers are temporary migrant workers from India. As the SERF is low and the project's financial cost is largely tax exempt, financial costs exceed economic costs only slightly.

4. **Comparison of economic costs and benefits.** A project is deemed economically feasible if the economic net present value of the project's discounted (net) benefit streams is at least zero, or if the economic internal rate of return (EIRR) of these benefit streams exceeds the economic opportunity cost of capital (EOCC) employed to finance the project. The assumed EOCC was 9%.

1. Economic Costs

5. **Incremental economic investment cost.** This cost consists of the investment cost of the proposed infrastructure for the project, including implementation support and technical assistance, and the cost of buildings to be constructed by the private sector.[3] The economic present value of the cumulated costs of the project was estimated at $78.8 million, increased from $69.7 million before the additional financing. The difference is a result of cost overruns; the first civil works package (CW-01) has been awarded and costs have been revised for the next civil works packages. To reflect benefits that may accrue after the end of the project's economic lifetime in 2052, the project's residual value was set at 50% of the economic investment cost.

6. **Incremental economic management, operation, and maintenance cost**. This is the incremental cost of two items:

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[1] ADB. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.
[2] Source: Latest ADB estimates 2014–2018.
[3] The Construction Development Corporation Limited estimated the cost of buildings to be constructed by the private sector at Nu1,500 per square foot of built-up area. ADB adopted this estimate for this analysis.

(i)   Management cost is the overhead cost of the authority (the Phuentsholing Township Development Corporation [PTDC]) that manages the new township. The annual management cost was estimated at 3% of the PTDC's lease revenue.

(ii)   The operation and maintenance (O&M) cost covers the river training works and common infrastructure. The annual O&M cost was estimated at 1%–2% of the project's total investment cost.

2.   Economic Benefits

7.   The project's quantifiable economic benefits consist of benefits from increased land values, increased value of public infrastructure services, and avoided damage to infrastructure.

8.   **Economic benefits from increased land values.** According to ADB's Guidelines for the Economic Analysis of Projects (footnote 1), the value of land is best determined through its opportunity cost. In a relatively competitive rental market such as in Bhutan, lease rates generally provide a good estimate of this cost.[4] The project is expected to increase lease rates (and therefore the economic value of the underlying land) in Zone A and adjacent areas.[5] This land operation has been discussed since 2015 between ADB and the government so its implications have been carefully considered on both sides.[6] Phuentsholing is a key economic hub for Bhutan, bordering with India and with a flatter land thus increased land planning options. Further, significant private investments have been mobilized for this project, hence a reliable demand analysis.

9.   The economic value of land in Zone A is currently negligible, as it is either under water or frequently inundated. The project is therefore expected to boost the economic value of the entire leasable area, estimated at 660,000 square meters in the "business-induced scenario." The Construction Development Corporation Limited (CDCL) estimated end-user lease rates for residential housing at 3.54 times the lease rates payable to the PTDC; this ratio was 2.28 for commercial and retail space.[7] It was assumed that end-user lease rates would reflect the willingness to pay (WTP) of the township's future tenants, and these rates were used to estimate the value of leasable land in Zone A. The WTP of social housing occupants, who will be exempt from paying lease rates, was estimated at 50% of the WTP for residential housing.[8] Some residential buildings near (but not inside) Zone A will also benefit from the river protection provided by the project; these economic benefits were quantified separately.

10.   **Incremental benefits from water and power supply.** An important secondary economic benefit of the project is the improved quality of public infrastructure services in Zone A. The following quantifiable benefits were identified:

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[4] In this case the use of rents leads to a conservative estimate (the equivalent economic streams for land value would require a 11.2 price–rent ratio, well below the expected benchmark in this context, which is likely to be in the 15.0–30.0 range).

[5] Economic Assessment (available from the list of supplementary documents in Appendix 2 of the report and recommendation of the President).

[6] The project aligns with key strategies of the Eleventh Five-Year Plan, 2013–2018 and Phuentsholing Thromde, volume III: local government plans which support ADB's ongoing projects in Phuentsholing to develop the area as an economic hub through the urban, transport, and trade sectors.

[7] These ratios are computed in the worksheet "Rent Economics" in a Microsoft Excel spreadsheet prepared by the CDCL and shared with ADB on 2 December 2016.

[8] This may be considered a conservative estimate for social housing programs, where demand exceeds supply are often subsidized for less than 50% (compare with the, Council of Europe, 2008. *Housing policy and vulnerable social groups.* Strasbourg Cedex.). The extent to which the demand aligns with the program eligibility criteria depends on its specific features.

(i)   **Incremental benefits from water supply services.** On completion of all residential buildings in Zone A in 2029, the project will provide treated piped water to some 16,000 people. The incremental cost of producing this water (about Nu1.0 per cubic meter [m^3]) is far lower than its expected WTP (about Nu 16.2 per m^3).[9] The incremental benefits from project-financed water supply services will be $0.29 million from 2029 for a yearly production of 1 million m^3 of water.

(ii)   **Incremental benefits from power supply services.** The project will also invest in power transmission and distribution systems to serve Zone A. The incremental cost of delivering this power (about Nu0.02 per kilowatt-hour generated) is far lower than the expected WTP for power (about Nu5.50 per kilowatt-hour received).[10] The incremental benefits from project-financed power supply services from 2029 onward were estimated at $11.2 million.

11.   **Benefits from avoided damage to infrastructure.** Another economic benefit of the project is improved protection of existing infrastructure from flooding of the Amochhu River. The following quantifiable benefits were identified:

(i)   **Avoided dredging costs.** The *thromde* (local government) of Phuentsholing recognizes the need for flood protection in the area where Zone A will be located but lacks the financial resources to build a permanent flood defense scheme. Thus, it regularly funds low-cost, temporary measures such as dredging or construction of gabion walls. The project-financed river training works will free the *thromde* from these expenditures, yielding estimated savings of $1 million every 5 years.

(ii)   **Avoided flood defense repair costs.** In 2002–2003, ADB financed training works at the confluence of the Amochhu and Omchhu rivers, including gabion walls and reinforced concrete walls. As these measures fail every 2–3 years, the *thromde* spends about $50,000 equivalent on repairs each year. Once the project is completed, the training works will be protected and no longer need periodic repairs.

(iii)   **Avoided damage to sewage treatment works.** The most valuable asset that will be protected is the existing sewage treatment plant at Phuentsholing. Without the project, it is assumed that the *thromde* would need to spend on average $250,000 every 10 years to repair damage to the wall.

(iv)   **Reduced cost of constructing the Phuentsholing–Chamkuna road.** The Phuentsholing–Chamkuna road is an ADB-financed road about 3.1 kilometers long that will be located just east of Zone A. The Department of Roads in charge of implementing the road project estimated that the river training induced by the project will save about Nu352 million ($4.8 million equivalent).[11] ADB assessed that this figure as overestimated and used a lower estimate of $2.5 million instead.

3.   Results

12.   **Assessment of economic feasibility.** The project's economic net present value (ENPV) (discounted by the EOCC of 9%) is now estimated at $7.3 million (Ta**Error! Reference source not found.** 1), meaning that the project is considered economically feasible. Likewise, the project's EIRR is now estimated at 9.87% and is above the minimum required rate of 9%. When the ongoing project was approved, these figures were estimated at $18.0 million for the ENPV

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[9]   An ADB survey in 2006 led to Nu7.9, which is Nu16.2 in 2020 prices. This is consistent with (and slightly below) an estimate of a more recent study: Ngawang Dendup Kuenzang Tshering, Sandee. 2015. Demand for Piped Drinking Water and a formal Sewer System in Bhutan. *Working Paper No. 97–15, July 2015.* Manila.

[10]   Bhutan Power Corporation Limited. 2016. *Resubmission of Tariff Revision Proposal July 2016 to June 2019.*

[11]   Egis International et al. 2016. *Detailed Design and Procurement Assistance for the Phuentsholing–Chamkuna Road Project: Report on Alignment Option B*. Thimphu.

and 11.28% for the EIRR. The additional financing covers extra costs yielding to the same amount of expected benefits, hence the decrease of both the ENPV and EIRR.

13.   **Composition of economic benefits.** As expected, the increased land value in Zone A is the most important source of quantifiable economic benefits, accounting for 75% of the total benefits. Incremental benefits from water and power supply services account for 20% and avoided damages for 5% of the benefits.

14.   **Sensitivity analysis.** Sensitivity tests were conducted by varying the additional financing's investment cost, management, operation, and maintenance (MOM) cost; and benefits. While the additional financing economic feasibility is sensitive to small variations of costs or benefits, switching values seem beyond likely ranges of variations, inasmuch as the project builds on an initial financing of the ongoing project, hence uncertainties on costs have plummeted. Similarly, the assessment of benefits is thought to be conservative. The EIRR falls below 9% if the investment cost increases by 10.20% or benefits decrease by 8.54% from the base case. The project's EIRR is less sensitive to MOM cost variations (switching value of 101.4%).

15.   **Risk management.** The most important risk that may adversely affect the project's economic viability is lower-than-expected demand for leasable land. This risk has been mitigated by (i) providing low-cost funding to the executing agency (in the form of a grant and long-term loan at favorable conditions), which will allow the executing agency to offer competitive lease rates; and (ii) reserving funds to appoint a reputable firm to attract investors and provide transaction advisory services. The risk will further be mitigated if the Government of Bhutan approves an ambitious package of financial and regulatory incentives, including (i) permitting the mortgaging of land development rights, (ii) removing restrictions on lease terms (currently limited to 30 years), (iii) providing a 10 year income tax holiday for real estate developers in the project area, and (iv) exempting the project from land and enterprise income taxes during the implementation period. Other risks identified by the risk management plan were deemed *moderate* or *low*.[12]

16.   **Distribution of project benefits to stakeholder groups.** To quantify the distribution of project benefits by stakeholder group, it is necessary to allocate the present value of the economic costs and benefits to each group. The difference is the net gain (or loss) of the project to that group. The stakeholder groups gains and losses are summarized as follows:

(i)   **Government.** The government will finance the investment and MOM costs of the project. These costs will be partially recovered from lease payments and user charges. The government also benefits from avoided damage to infrastructure. Since the present value of the revenue and avoided damage is lower than the economic cost (discounted by the EOCC), this stakeholder incurs a net loss.

(ii)   **Businesses.** The project will provide commercial, retail, and industrial businesses with land in Zone A. The benefits assigned to this stakeholder are valued as the lease revenue for these stakeholders (i.e., excluding households lease). Costs are the investments incurred by the private sector (i.e., excluding government) to build all rented premises (including that to households).

(iii) **Households.** Occupants of residential and social housing are assumed to value the new land that they occupy at higher lease rates than would be payable to the government. They are also expected to benefit from superior water and power

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[12] Risk Assessment and Risk Management Plan (available from the list of linked documents in Appendix 2 of the report and recommendation of the President).

supply services. Thus, the project will also benefit households. Gains are further increased by benefits from the increased value of land outside Zone A.

17.   The poverty impact ratio was estimated assuming a national poverty rate of 12% and urban poverty rate of 5%. It was furthermore assumed that the poverty rate of people living in social housing complexes was 100%, because nonpoor households would not qualify for a lease rate exemption. The poverty impact ratio was estimated at 4.1%.

Table 1: Economic Analysis of the Phuentsholing Township Development Project
($ million in constant 2020 prices)

| Year | Economic Costs | | | | Economic Benefits | | | | Cash Flow After Tax |
	Capital	Management	O&M	Total	Land Value Increase	Incr Water and Power	Avoided Damage	Total	
2018	2.8	0	0	2.8	0	0	0	0	(2.8)
2019	14.7	0	0	14.7	0	0	0	0	(14.7)
2020	11.4	0	0	11.4	0	0	0	0	(11.4)
2021	21.9	0	0	21.9	0	0	2.6	2.6	(19.4)
2022	18.3	0	0	18.3	0	0	0.1	0.1	(18.3)
2023	10.3	0.1	1.0	11.3	2.7	0.4	1.3	4.4	(6.9)
2024	9.6	0.1	1.0	10.7	5.0	1.3	0.1	6.3	(4.4)
2025	7.5	0.1	1.0	8.5	6.8	1.8	0.1	8.6	0.1
2026	7.1	0.1	1.0	8.2	8.3	2.3	0.1	10.7	2.5
2027	3.7	0.1	1.0	4.8	8.9	2.6	0.1	11.5	6.7
2028	3.7	0.1	1.0	4.8	11.4	2.9	1.1	15.3	10.5
2029	3.7	0.1	1.0	4.8	11.9	3.2	0.1	15.2	10.3
2030	0.9	0.1	1.0	2.0	11.7	3.2	0.1	15.0	13.0
2031	0.1	0.1	1.0	1.2	11.3	3.2	0.1	14.6	13.3
2032	0.1	0.1	1.0	1.2	10.9	3.2	0.1	14.2	13.0
2033	0.1	0.1	1.0	1.2	12.8	3.2	1.3	17.3	16.1
2034	0.1	0.1	1.0	1.2	12.4	3.2	0.1	15.7	14.4
2035	0.1	0.1	1.0	1.2	12.0	3.2	0.1	15.2	14.0
2036	0.1	0.1	1.0	1.2	11.6	3.2	0.1	14.8	13.6
2037	0	0.1	1.0	1.1	11.2	3.2	0.1	14.4	13.3
2038	0	0.1	1.0	1.1	13.1	3.2	1.1	17.3	16.2
2039	0	0.1	1.0	1.1	12.6	3.2	0.1	15.9	14.8
2040	0	0.1	1.0	1.1	12.2	3.2	0.1	15.4	14.3
2041	0	0.1	1.0	1.1	11.7	3.2	0.1	15.0	13.9
2042	0	0.1	1.0	1.1	11.3	3.2	0.1	14.6	13.5
2043	0	0.1	1.0	1.1	13.3	3.2	1.3	17.8	16.7
2044	0	0.1	1.0	1.1	12.8	3.2	0.1	16.1	15.0
2045	0	0.1	1.0	1.1	12.3	3.2	0.1	15.6	14.5
2046	-	0.1	1.0	1.1	11.9	3.2	0.1	15.2	14.1
2047	0.2	0.1	1.0	1.3	11.6	3.2	0.1	14.8	13.5
2048	0.2	0.1	1.0	1.3	13.6	3.2	1.1	17.9	16.5
2049	0.2	0.1	1.0	1.3	13.2	3.2	0.1	16.4	15.1
2050	0.2	0.1	1.0	1.3	12.8	3.2	0.1	16.0	14.7
2051	0.2	0.1	1.0	1.3	12.4	3.2	0.1	15.6	14.3
2052	(58.6)	0.1	1.0	57.5)	12.0	3.2	0.1	15.3	72.8
								ENPV	**7.3**
								EIRR	**9.87%**

() = negative, EIRR = economic internal rate of return, ENPV = economic net present value, EOCC = economic opportunity cost of capital, O&M = operation and maintenance.   **EOCC   9.0%**
Source: Asian Development Bank estimates.