

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* (2017) of the Asian Development Bank (ADB). 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 the period 2018–2052, inclusive of the 30-year implementation period following construction completion in 2022. All costs and benefits were expressed in April 2018 economic prices, including physical contingencies but excluding 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 standard conversion factor (SCF) of 0.98, calculated as a proportion of total import and export values to total import and export values and trade-related duties, was applied to all non-tradable goods. The SCF is relatively high due to low import duties and Bhutan's free trade agreement with India. A shadow wage rate of 1.0 was applied, there is a shortage of unskilled labor in Bhutan and most unskilled construction workers are temporary migrant workers from India. As the SCF is high 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

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.² The total economic investment cost of the project was estimated at \$114.9 million. 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:

- (i) Management cost is the overhead cost of the authority (the Amochhu Land Development and Township Corporation [ALDTC]) that will manage and further develop the new township. The annual management cost was estimated at 3% of the ALDTC'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

¹ On 28 February 2017, ADB lowered its benchmark social discount rate from 12% to 9%.

² The Construction Development Corporation Limited (CDCL) 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.

project's total investment cost.

2. Economic Benefits

7. The project's quantifiable economic benefits comprise benefits from (i) increased land values, (ii) increased value of public infrastructure services, and (iii) avoided damage to infrastructure.

8. **Economic benefits from increased land values.** According to ADB's *Guidelines for the Economic Analysis of Projects* (2017) (Chapter 4.D), 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. The project is expected to increase lease rates (and therefore the economic value of the underlying land) in Zone A and adjacent areas. As the expected impact on lease rates differs in each zone, this will be discussed separately.

9. The economic value of land in the project area is currently negligible, as it is either underwater or frequently inundated. The project is therefore expected to boost the economic value of the entire leasable area, estimated at 660,000 square meters (m²) in the "business-induced scenario." In this scenario, lease rates are payable to the ALDTC by the owners of large-scale developments (such as apartments or shopping malls),³ not by the project's final beneficiaries, who will need to pay substantially higher lease rates to cover the owners' construction and financing costs. The Construction Development Corporation Limited (CDCL) estimated end-user lease rates for residential housing at 3.54 times the lease rates payable to the ALDTC; this ratio was 2.28 for commercial and retail space.⁴ 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. The WTP of social housing occupants, who will be exempt from paying lease rates, was estimated at 50% of WTP for residential housing. Some residential buildings near (but not inside) the project area would 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 and the local area plan relative to such services available elsewhere in Bhutan. The following quantifiable benefits were identified:

- (i) **Incremental benefits from water supply services.** The project will invest in water production and distribution systems to provide piped treated water to residents in and near the project area. Upon completion of all residential buildings in 2029, these systems will provide piped water to approximately 25,000 persons (16,000 in the project area and the remaining 9,000 in the local area plan). The incremental cost of producing this water (about Nu1.0 per square meter) is far lower than the expected WTP level for piped water (about Nu7.9 per square meter). The incremental benefits from project-financed water supply services would amount to \$0.14 million from 2029.
- (ii) **Incremental benefits from power supply services.** The project will also invest in power transmission and distribution systems. The incremental cost of delivering this power (about Nu0.02 per kilowatt-hour generated) is far lower than the expected WTP level for power (about Nu5.4 per kilowatt-hour received). The incremental benefits from project-financed power supply services from 2029 onward were estimated at more than \$3.3 million (these benefits are far higher than those

³ These lease rates are listed in Financial Analysis (accessible from the list of linked documents in Appendix 2).

⁴ These ratios are computed in the worksheet "Rent Economics" in an Excel spreadsheet prepared by the CDCL and shared with ADB on 2 December 2016 (Amochhu II IDPR financial economic analysis -01122016-v1.xlsm).

generated by the improved water supply, mainly because the incremental costs of power provision in Bhutan are extremely low and WTP levels are higher for power supply services than for water).

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, (ii) avoided flood defense repair costs, (iii) avoided damage to sewage treatment works, and (iv) the reduced cost of constructing the Phuentsholing–Chamkuna road. These benefits are discussed individually below.

- (i) **Avoided dredging costs.** The local government (*thromde*) of Phuentsholing recognizes the need for flood protection in the project area, but lacks the financial resources to build a permanent flood defense scheme. Thus, it regularly funds low-cost, temporary measures, such as dredging or the 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, at times, 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 by the project-financed river training works is the existing sewage treatment plant at Phuentsholing. Gabion spurs currently protect the riverside boundary wall but may need to be replaced periodically. 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 the project area. The cost of constructing the road will be higher without the project than with it because the project-financed river training works would not protect the road from the Amochhu River. The Department of Roads in charge of implementing the road project estimated the savings at about Nu352 million.⁵ ADB believes that this figure overestimates the savings on the gabion walls (one of which would still be needed), and incorrectly considers the cost of cross-drainage training works as a savings. ADB therefore used a lower estimate of \$2.5 million for the economic analysis.

3. Results

12. **Assessment of economic feasibility.** The project's economic net present value (discounted by the EOCC of 9%) is estimated at \$18.0 million (Table), meaning that the project is considered economically feasible. This is similarly indicated by the project's EIRR, which is estimated at 11.3%, well above the minimum required rate of 9%. It should be noted that the project (Zone A) is the first part of a much larger development program project comprising five development zones (Zones A to E), which is expected to generate much higher economic benefits per invested dollar than this project alone. This is because the river training works for the project is relatively costly compared to the size of the area of the newly created land, the main driver of the project benefits.

⁵ Egis International et al. 2016. *Detailed Design and Procurement Assistance for the Phuentsholing–Chamkuna Road Project: Report on Alignment Option B*. 18 November.

13. **Composition of economic benefits.** As expected, the increased land value in the project area is the most important source of quantifiable economic benefits, accounting for about 76% of total benefits. Incremental benefits from water and power supply services account for most of the remainder.

14. **Sensitivity analysis.** Sensitivity tests were conducted by varying the project's investment cost, MOM cost, and benefits. The test results indicate that the project's economic feasibility is relatively insensitive to unfavorable changes to the investment cost and economic benefits. The EIRR falls below 9% only if the investment cost increases by 30%, or benefits decrease by 22% from the base case. The project's EIRR is even less sensitive to changes in the MOM cost.

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) the provision of low-cost funding to the executing agency (in the form of a grant and long-term loan at favorable conditions), which would allow the executing agency to offer competitive lease rates, and (ii) the reserving of 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, but not limited to, (i) permitting the mortgaging of land development rights, (ii) removing restrictions on lease terms (currently limited to 30 years), (iii) 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."⁶

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. Three stakeholder groups were considered: the government, businesses, and households. Their gains and losses can be 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. As end-user lease rates (which reflect WTP levels) are substantially higher than the lease rates payable to the government, this stakeholder experiences net gains.
- (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 supply services. Thus, the project will also benefit households. Gains are further increased by benefits from the increased value of land outside the project area.

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 persons living in social housing complexes was 100%, because non-poor households would not qualify for a lease rate exemption. The poverty impact ratio was estimated at 5.2%, slightly higher than the urban poverty rate in Phuentsholing.

⁶ See the detailed Risk Assessment and Risk Management Plan (available from the list of linked documents in Appendix 2).

Economic Analysis of the Phuentsholing Township Development Project, 2018–2052
(\$ million, constant April 2018 prices)

Year	Economic Costs				Economic Benefits				Net Economic Benefits
	Capital Investment	Management	O&M	Total Economic Costs	Land Value Increase	Water and Power Benefits	Avoided Infrastructure Damage	Total Economic Benefits	
2018	8.0	–	–	8.0	–	–	–	–	(8.0)
2019	19.2	–	–	19.2	–	–	–	–	(19.2)
2020	12.3	–	–	12.3	–	–	–	–	(12.3)
2021	4.2	–	–	4.2	–	–	2.6	2.6	(1.6)
2022	6.6	–	–	6.6	–	–	0.1	0.1	(6.5)
2023	11.8	0.1	0.7	12.6	2.7	0.4	1.3	4.4	(8.2)
2024	11.2	0.1	0.7	12.0	5.0	1.4	0.1	6.5	(5.6)
2025	8.4	0.1	0.7	9.2	6.7	1.9	0.1	8.7	(0.4)
2026	8.0	0.1	0.7	8.8	8.2	2.5	0.1	10.7	1.9
2027	4.2	0.1	0.7	5.0	8.7	2.8	0.1	11.5	6.6
2028	4.2	0.1	0.7	5.0	11.5	3.2	1.1	15.7	10.7
2029	4.2	0.1	0.7	5.0	12.0	3.5	0.1	15.5	10.5
2030	1.0	0.1	0.7	1.8	11.7	3.5	0.1	15.2	13.4
2031	0.2	0.1	0.7	1.0	11.2	3.5	0.1	14.7	13.7
2032	0.2	0.1	0.7	1.0	10.7	3.5	0.1	14.2	13.2
2033	0.2	0.1	0.7	1.0	13.0	3.5	1.3	17.8	16.8
2034	0.2	0.1	0.7	1.0	12.5	3.5	0.1	16.0	15.0
2035	0.2	0.1	0.7	1.0	12.0	3.5	0.1	15.5	14.5
2036	0.2	0.1	0.7	1.0	11.5	3.5	0.1	15.0	14.0
2037	–	0.1	0.7	0.8	11.0	3.5	0.1	14.5	13.7
2038	–	0.1	0.7	0.8	13.4	3.5	1.1	17.9	17.1
2039	–	0.1	0.7	0.8	12.8	3.5	0.1	16.3	15.5
2040	–	0.1	0.7	0.8	12.2	3.5	0.1	15.8	14.9
2041	–	0.1	0.7	0.8	11.7	3.5	0.1	15.2	14.4
2042	–	0.1	0.7	0.8	11.2	3.5	0.1	14.7	13.9
2043	–	0.1	0.7	0.8	13.7	3.5	1.3	18.4	17.6
2044	–	0.1	0.7	0.8	13.1	3.5	0.1	16.6	15.8
2045	–	0.1	0.7	0.8	12.5	3.5	0.1	16.1	15.2
2046	–	0.1	0.7	0.8	12.0	3.5	0.1	15.5	14.7
2047	0.3	0.1	0.7	1.1	11.6	3.5	0.1	15.1	14.0
2048	0.3	0.1	0.7	1.1	14.1	3.5	1.1	18.7	17.6
2049	0.3	0.1	0.7	1.1	13.6	3.5	0.1	17.1	16.0
2050	0.3	0.1	0.7	1.1	13.1	3.5	0.1	16.6	15.5
2051	0.3	0.1	0.7	1.1	12.6	3.5	0.1	16.1	15.0
2052	(52.4)	0.1	0.7	(51.6)	12.2	3.5	0.1	15.7	67.3
								ENPV @ EOCC 9.0%	18.0
								EIRR	11.3%

() = negative, EIRR = economic internal rate of return, ENPV = economic net present value, EOCC = economic opportunity cost of capital, O&M = operation and maintenance.

Source: Asian Development Bank estimates.