

**PHUENTSHOLING TOWNSHIP DEVELOPMENT PROJECT**

**ECONOMIC ASSESSMENT**

**MAY 2018**

## ABBREVIATIONS

ADB	–	Asian Development Bank
DHI	–	Druk Holding and Investments Limited
EIRR	–	economic internal rate of return
ENPV	–	economic net present value
EOCC	–	economic opportunity cost of capital
GDP	–	gross domestic product
LAP	–	local area plan
MOM	–	management, operations and maintenance
O&M	–	operations and maintenance
PPTA	–	project preparatory technical assistance
PTDP	–	Phuentsholing Township Development Project
SCF	–	standard conversion factor
Nu	–	Ngultrum
WTP	–	willingness to pay

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## I. INTRODUCTION

1. **Scope.** This appendix contains an analysis of the economic costs and benefits of the Phuentsholing Township Development Project (PTDP). PTDP involves the development of “Zone A” along the eastern shore of the Amochhu River near Phuentsholing. To develop this zone, which will have a land area of about 66 hectares, the project will finance river training works, common infrastructure (such as roads, water supply systems, sewerage collection and treatment, and other utilities), project implementation support and related technical assistance.

2. **Structure.** The remainder of the appendix is structured as follows. Section II validates the economic rationale of undertaking PTDP. Section III first gives an overview of the methodology that was used to estimate the economic costs and benefits of the project. It then presents estimates of investment costs and incremental management, operations and maintenance costs, expressed in economic prices, followed by estimates of quantifiable economic benefits from: (i) increased economic value of land, (ii) supply of water and electricity to the zone, and (iii) improved river protection. Section IV compares quantifiable economic cost and benefits, and presents sensitivity analyses. Section V contains a distribution and poverty analysis.

## II. ECONOMIC RATIONALE

3. **Macroeconomic assessment.** In recent years, Bhutan has witnessed rapid economic growth. From 2010 to 2016, the gross domestic product (GDP) increased by over 5% per annum in real terms, and is expected to increase by 6.1% in 2017. The poverty head count dropped from 23.3% in 2007 to 12.0% in 2012, and is now among the lowest in the region. The Bhutanese economy is dominated by the hydropower industry, which accounts for over 40% of total GDP. To diversify the economy, the government actively promotes the development of the services sector in general, which accounts for about 38% of GDP, and supports the development of small enterprises. From 2009 to 2013, the share of total employment in the services sector increased from 28.2% to 32.8% of the labor force, indicating its increasing significance to the Bhutanese economy. The sector is especially important in the southwestern town of Phuentsholing, which is Bhutan’s second largest city and its largest trading center (over 60% of Bhutan’s imports flows through the city).

4. **Sector assessment.** During 2000-2010, the urban population of Bhutan increased at 5.7% per annum, the highest rate in Southeast Asia. At the current rate of urbanization, more than half of the country’s population will reside in urban areas by 2030.<sup>1</sup> In the absence of comprehensive planning and adequate investment budgets, rapid urbanization has left urban areas with inadequate and unsustainable infrastructure and put severe pressure on service delivery. Thus, water shortages, water pollution, and flooding are now affecting many of Bhutan’s towns. The Bhutan National Urbanization Strategy of 2008 designates the country’s southern east-west corridor, of which Phuentsholing is the most important urban center, as a development area for industries focusing on medium and high-end processing and manufacturing. To create an enabling environment for these activities, and increasing the living environment of the urban population, it is necessary to provide sustainable infrastructure, especially roads, water supply and sanitation facilities, and flood control systems.

5. **Demand analysis.** Because of its unique geographical features, Bhutan has always had a shortage of flat land. This has not only constrained agricultural development, but also makes

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<sup>1</sup> For a detailed sector assessment, refer to Linked Document 4.

the provision of urban infrastructure and services relatively costly. The shortage of land that is suitable for residential and commercial development is especially pressing in Phuentsholing, where a scarcity of land severely limits the further socio-economic development of the city and, because of its importance of the national economy, of Bhutan. Because most areas that are currently underdeveloped are either steep, prone to landslides, or frequently flooded, there is limited scope for further expansion. As a result of these constraints, rents have rapidly increased in recent years and many low-income households from Bhutan now live across the border in Jaigaon, where the cost of living is lower.<sup>2</sup> On the other hand, surveys show that land prices and lease rates in Phuentsholing for both commercial and residential land remain substantially lower than in cities of comparable size within a 150-kilometer radius (rates in Siliguri, Jalpaiguri and Alipurduar are 200% to 400% higher).<sup>3</sup> An important explanation for suppressed lease rates is the relatively unfavorable legal and regulatory environment for real estate development (see also para 32). For these reasons, there appears to exist a substantial unmet demand for land in Phuentsholing, not only from Bhutanese citizens on both sides of the border, but potentially also from cross-border investors.

6. The population of Phuentsholing was estimated at about 34,200 in 2012, and is expected to increase to about 54,500 by 2032, shortly after the completion of all leasable land to be provided by the project (except for a relatively small portion of industrial land).<sup>4</sup> Assuming a natural population growth rate of 1.5% p.a., about 60% of the increase of (54,500 – 34,200 =) 20,300 would be caused by natural increases and the remaining 40% by immigration. During 2023-2030, the project would provide 408,000 square meters (m<sup>2</sup>) of leasable area for residential housing and 40,000 m<sup>2</sup> for social housing. Assuming an average space requirement per person of 30 m<sup>2</sup> for residential housing, 12.5 m<sup>2</sup> for social housing, and a 90% occupancy ratio, this area would accommodate about 16,800 persons. This implies that demand for residential housing area is about 20% higher than the area supplied by the project.

7. **Rationale.** Through PTDP, the government will develop new land in a city where land is becoming increasingly scarce. Although the private sector is, in principle, also able to develop the project and recoup the required investment from the sale or lease of land, this is unlikely to happen for various reasons. First and foremost, demand risk is substantial. A financial analysis of the project shows that ALTDP is only feasible under optimistic assumptions, including the assumption that the government will approve an ambitious package of financial and regulatory incentives. A public investor such as the Druk Holding and Investments Limited (DHI) would presumably be in a better position to manage this risk than a private investor. Secondly, the government requires the project to adhere to Bhutanese planning standards (notably the six-story limit) and allocate part of the newly developed land to social housing. These measures will further erode the financial feasibility of the project, and therefore more difficult to justify from a commercial perspective. Thirdly, the project will generate positive externalities in the form of avoided damage to infrastructure and increases in value to land adjacent to Zone A, which cannot be captured by a private investor. Without some form of public intervention, the market will therefore develop less (or no) land in Phuentsholing than is optimal from a societal point of view. To address this market failure, government intervention is proposed in the form of capital grants and financial and regulatory incentives.

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<sup>2</sup> In 2005, the latest year, for which data are available, about 5,400 Bhutanese lived in Jaigaon. This was equivalent to over 25% of the population of Phuentsholing in that year (which was about 20,500).

<sup>3</sup> Integrated Detailed Project Report for Phuentsholing Township Development Project (PTDP) - Annexure 08 - Financial Analysis. HCP Design, Planning & Management Pvt. Ltd., July 2017.

<sup>4</sup> Integrated Detailed Project Report for Phuentsholing Township Development Project (PTDP) – Main Report. HCP Design, Planning & Management Pvt. Ltd., July 2017. The estimate presented in this report is between the low-end estimate (43,188) and high-end estimated (63,446) prepared by the *thromde* of Phuentsholing.

8. **Project alternatives.** The government originally proposed a much larger project to ADB, which would involve the development of new township with a population of about 50,000 in four zones (A, B, C and E) on both sides of the Amochhu River. A preliminary analysis suggested that the project would be economically and financially viable. However, the total cost of \$210 million (equivalent to over 10% of Bhutan's GDP) exceeded the government's available funding sources by a large margin. For this reason, it was proposed to develop the four zones sequentially instead of all at once. Based on planning and economic considerations, it was decided to start with the development of Zone A. This zone is located just north of the existing town of Phuentsholing, on the eastern shore of the Amochhu River. Starting the development at any of the other zones would result in unnecessarily high infrastructure costs to connect the existing town with the new township. Zone A also offers economic benefits that other zones cannot provide to the same degree, namely improved protection of existing infrastructure from river floods.

### III. METHODOLOGY AND DATA

9. **Overview.** An economic analysis of was prepared for PTDP in accordance with ADB's *Guidelines for the Economic Analysis of Projects* (2017). The guidelines describe four basic steps to analyzing the economic viability of a project. These steps are:

- (i) identify economic costs and benefits,
- (ii) quantify economic costs and benefits (comparing with-project and without-project situations for each alternative),
- (iii) value economic costs and benefits, and
- (iv) compare benefits and costs

10. **Identification and quantification of economic costs and benefits.** The project's incremental economic costs and benefits were identified and (to the extent possible) quantified for the period 2018-2052 (30-year implementation period from completion of construction 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.<sup>5</sup>

11. **Valuation of economic costs and benefits.** A standard conversion factor (SCF) of 0.98 was applied to convert all non-tradable goods, which was calculated as a proportion of total import and export values to total import and export values and trade-related duties for another ADB-financed project in Bhutan, which was prepared in 2014.<sup>6</sup> This relatively high SCF is due to the low import duties and Bhutan's free trade agreement with India. A shadow wage rate of 1.0 was applied, since unskilled labor is in short supply in Bhutan and most unskilled workers at construction sites are temporary migrant workers from India. Because of the high SCF, and because the financial cost of the project is largely tax-exempt, economic costs are only slightly lower than financial costs.

12. **Comparison of economic benefits and costs.** A project is deemed economically feasible if the economic net present value (ENPV) of the project's discounted (net) benefit streams is at least zero, or if economic internal rate of return (EIRR) of these benefit streams

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<sup>5</sup> Although the project-financed river training is likely to benefit neighboring Jaigaon in India, these benefits would not accrue to Bhutan and are therefore ignored in the economic analysis.

<sup>6</sup> South Asia Subregional Economic Cooperation Road Connectivity Project.

exceeds the economic opportunity cost of capital (EOCC) that was employed to finance the project. For assessing the economic viability of the project, the assumed EOCC was 9%.<sup>7</sup>

## A. Economic Costs

13. **Types of economic costs.** An assessment of the economic costs and benefits of a project should only consider costs and benefits that would not arise without that project. The incremental economic costs of the proposed PTDP consist of the project's:

- (i) incremental economic investment cost of the infrastructure; and
- (ii) incremental economic cost of management, operations and maintenance (MOM) of this infrastructure during the project's economic lifetime.

14. The economic cost of adverse environmental impacts was deemed negligible, and the economic investment cost already contains a provision for environmental mitigation. The economic cost of adverse social impacts was also considered negligible; the project will reclaim land that is currently occupied by the river and there are no permanent settlements in the project area bordering the river.

15. **Incremental economic investment cost.** This cost consists of the investment cost of the proposed infrastructure for PTDP, including consulting services for project implementation support and technical assistance and the cost of buildings to be constructed by the private sector.<sup>8</sup> The total economic investment cost of PTDP was estimated at \$114.9 million. As described in para 10, all economic costs are expressed in March 2017 economic prices including physical contingencies. The cost of civil works and equipment was estimated by the project's implementing agency, Construction Development Corporation Limited (CDCL), and adjusted based on reviews by ADB. The cost of other items, which mainly consisted of the cost of consulting services, was prepared by ADB. The economic lifetime of the project was conservatively estimated at 30 years from completion of construction in 2022. To reflect the benefits that may accrue after the end of the project's economic lifetime in 2052, the residual value of the project was set at 50% of the economic investment cost.

16. **Incremental economic MOM cost.** This is the incremental cost of two items:

- (i) **Management.** This is the overhead cost of the authority that will manage and further develop the new township (the Amochhu Land Development and Township Corporation or ALDTC). The annual management cost and was estimated at 3% of the lease revenue of ALDTC, and is about Nu.7 million (in constant March 2017 prices) in 2030, when most of the newly developed land will have been leased out.
- (ii) **Operations and maintenance (O&M).** This is the O&M cost of the river training works and the common infrastructure. The annual O&M cost of river training works was estimated at 1% of the economic investment cost. The O&M cost of common infrastructure was based on estimates prepared by CDCL, but converted into constant 2017 economic prices. At the end of the operations period, these O&M costs will account for about 2% of the total investment cost of

the project.

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<sup>7</sup> On 28 February 2017, ADB lowered its benchmark social discount rate from 12% to 9%.

<sup>8</sup> The cost of buildings to be constructed by the private sector was estimated by CDCL at Nu1,500 per square foot of built-up area, and this estimate was adopted by ADB for this analysis.



## B. Economic Benefits

17. **Types of economic benefits.** The PTDP will finance investments in infrastructure that will result in the creation of 66 hectares of new land that is ready for development. In addition, the construction of river trainings will better protect existing infrastructure from the Amochhu River. The following quantifiable economic benefits were considered:

- (i) **Economic benefits from increased value of land.** The project is expected to increase the economic value of land in Zone A, and land immediately adjacent to it.
- (ii) **Economic benefits from increased value of public infrastructure services.** The project will provide future residents of Zone A and its surrounding areas with water supply and power supply at lower tariffs than estimated willingness-to-pay levels for these services.
- (iii) **Economic benefits from avoided damage to infrastructure.** The project will reduce the cost of protecting the existing town of Phuentsholing from the Amochhu River, and reduce damage to existing and planned infrastructure (notably the sewage treatment plant and the proposed road from Samtse).

### 1. Economic Benefits from Increased Value of Land

18. **Overview.** Per Chapter V.D of ADB's *Guidelines for the Economic Analysis of Projects* (2017), the value of land is best determined through its opportunity cost. In a relatively competitive rental market, as presently exists in Bhutan, lease rates are generally a good estimate of the opportunity cost. The project is expected to increase lease rates (and therefore the economic value of the underlying land) in Zone A and the adjacent areas. The expected impact on lease rates is different in each zone, and will therefore be discussed separately.

19. **Increased value of land in Zone A.** At present, the economic value of land in Zone A is negligible, as it is either under water level or frequently inundated. The project is therefore expected to result in an increase in the economic value of the entire leasable area, which is estimated at 660,000 m<sup>2</sup> in the Business-Induced Scenario. This scenario also assumes a schedule of lease rates for various types of developments: residential housing, social housing, retail, commercial, industrial and the heliport (refer to the Financial Analysis for details). These lease rates are payable by owners of large-scale developments (such as apartments of shopping malls) to ALDTC. They are not the lease rates payable by the final beneficiaries of the project. These beneficiaries will need to pay substantially higher lease rates to cover the construction and financing costs of the owners. CDCL estimates end-user lease rates for residential housing at 3.54 times the lease rates payable to ALDTC; for commercial and retail space, the ratio is 2.28.<sup>9</sup> The end-user lease rates were assumed to reflect willingness-to-pay (WTP) levels of the future tenants of the township, and used for the estimation of the value of leasable land in Zone A. Willingness-to-pay levels for occupants of social housing, who would be exempt from paying lease rates, were estimated at 50% of WTP for residential housing.

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<sup>9</sup> The computation of these ratios is in the worksheet "Rent economics" in an Excel spreadsheet prepared by CDCL, which was shared with ADB on 2 December 2016. The name of the spreadsheet is "Amochhu II IDPR financial economic analysis -01122016-v1.xlsm".

20. **Increased value of land in areas adjacent to Zone A.** At present, there are 3-4 multi-story residential buildings in the area to the east of Zone A (also known as Local Area Plan or LAP), which is prone to flooding. Most of these buildings are occupied by low-income households. In the same part of the LAP, another 8 to 10 multi-story buildings are currently under construction. Most, though not all, of these buildings will be adequately protected from the Amochhu River once the proposed road from Samtse is completed. The increase in value of land of these multi-story buildings was based on the following assumptions:

- (i) 3 of the 11-14 multi-story buildings will benefit from river protection offered by the project, and
- (ii) each building is occupied by 30 families, which each pay an end-user lease rate of Nu10,000 per month.

Because of lack of data, increases in the value of land occupied by existing workshops or future residential buildings in the LAP were not estimated.

## 2. Economic Benefits from Increased Value of Public Infrastructure Services

21. **Overview.** An important secondary economic benefit of PTDP is improved provision of public infrastructure services (compared to the quality of such services available elsewhere in Bhutan) in Zone A and the LAP. The following quantifiable benefits were identified:

- (i) incremental benefits from improved water supply, and
- (ii) incremental benefits from improved power supply.

22. **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 around Zone A. Upon completion of all residential buildings in Zone A 2029, the systems would provide piped water to approximately 25,000 persons (16,000 in Zone A and the remaining 9,000 in the LAP). Assuming a non-revenue water rate of 15% of production and a per capita water consumption of 150 liters per capita per day, the systems would produce over 64 million m<sup>3</sup> per year once Zone A is fully occupied. The incremental cost of producing this water (approximately Nu.1.0/m<sup>3</sup>) is far lower than the expected willingness-to-pay (WTP) level for piped water (about Nu.7.9/m<sup>3</sup>).<sup>10</sup> The incremental benefits from project-financed water supply services are expected to increase from about \$0.02 million in 2023, the first year of operation, to \$0.14 million in 2029 and after.

23. **Incremental benefits from power supply services.** The project will also invest in power transmission and distribution systems to serve the Zone A population (16,000 by 2029). Assuming system losses of 10% of production and a per capita power consumption of 2,625 kWh per year, the systems would deliver approximately 47 million kWh per year to Zone A from 2029 onwards. The incremental cost of delivering this power (about Nu.0.02 per kWh generated) is far lower than the expected willingness-to-pay level for power (about Nu.5.4 per kWh received).<sup>11</sup> The incremental benefits from project-financed power supply services would increase from about \$0.4 million in 2023 to over \$3.3 million in 2029 and after (about 25 times higher than the economic benefits from improved provision of water supply; the difference is

<sup>10</sup> This estimate was based on an ADB-financed WTP survey that was undertaken in Thimphu and Phuentsholing in 2006. In that year, average WTP was Nu160 per household per month. Assuming an average household size of 4.5 and an average consumption of 150 liters per capita per day, WTP per m<sup>3</sup> is equivalent to Nu.7.9.

<sup>11</sup> Taken from Bhutan Power Corporation Ltd.'s tariff revision proposal 2013. The unsubsidized average cost of supply for low voltage is Nu.5.4 per kWh which is used as a proxy for WTP.

mainly caused by the extremely low incremental costs of power provision in Bhutan and higher WTP levels for power supply than for piped water).

### 3. Economic Benefits from Avoided Damage to Infrastructure

24. **Overview.** An additional economic benefit of PTDP is improved protection of existing infrastructure from the 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) reduced cost of construction of Phuentsholing-Chamkuna road.

Each of these benefits will be discussed in turn.<sup>12</sup>

25. **Avoided dredging costs.** The local government (*thromde*) of Phuentsholing recognizes the need for flood protection in the area where Zone A will be located, but does not have the financial resources to build a permanent flood defense scheme. It therefore regularly spends funds on low-cost temporary measures, such as dredging or the construction of gabion walls. Once the project-financed river training is in place, the *thromde* must no longer spend these sums. The savings to the local government were estimated at \$1 million per 5 years.

26. **Avoided flood defense repair costs.** In 2002/2003, ADB financed training works at the confluence of the Amochhu and Omchhu rivers. These works comprise gabion walls and, at times, reinforced concrete walls. Because they fail once every 2 to 3 years, the *thromde* spends about \$50,000 equivalent per year on repairs. Once PTDP has been completed, the training works would be protected and no longer need periodic repairs.

27. **Avoided damage to sewage treatment works.** The most value asset that would be protected by the project-financed river training works is the existing sewage treatment plant of Phuentsholing. At present, gabion spurs are in place to protect the riverside boundary wall, but these spurs may need to be replaced periodically. It was assumed that, in the “without project” case, the *thromde* would need to spend on average \$250,000 once every 10 years to repair damage to the wall.

28. **Reduced cost of construction of Phuentsholing-Chamkuna road.** This is an ADB-financed ring road with a length of about 3.1 kilometers that will be located just east of Zone A. Without PTDP, the construction cost of the road will be higher than would otherwise be the case, because it would not be protected from the Amochhu River by the river training works provided by the project.<sup>13</sup> The consultant in charge of the preparation of the road estimated the savings at about Nu352 million (approximately \$5.2 million).<sup>14</sup> ADB believes that this figure overestimates the savings on gabion walls (one of which would still be needed) and incorrectly considers the

<sup>12</sup> CDCL also identified economic benefits from reduced spending in overseas health and educational facilities. Because the land use plan for Zone A does not provide land such facilities, these benefits were ignored. The same argument applies to benefits from tourism (no hotels or other tourism facilities are planned in Zone A).

<sup>13</sup> Note that the analysis presented here (with PTDP vs. without PTDP) is different from an analysis presented to the Ministry of Public Works on 20 January 2017. This analysis concerned the cost implications of relocating the proposed road given that PTDP would be implemented.

<sup>14</sup> *Detailed Design and Procurement Assistance for the Phuentsholing-Chamkuna Road Project: Report on Alignment Option B.* Egis International et al. (18 November 2016).

cost of cross drainage training works as a savings. A lower cost saving of \$2.5 million was therefore used for the economic analysis.

#### IV. RESULTS

29. **Assessment of economic feasibility.** The ENPV (discounted at the economic opportunity cost of 9%) of the project is estimated at \$18.0 million. This means that PTDP is considered economically feasible. The same conclusion can be derived from the project's EIRR which is estimated at 11.3%, higher than the minimum required rate of 9%. It should be noted that Zone A is the first part of a much larger project (also consisting of Zones B, C and E), that is expected to generate much higher economic benefits per invested \$ than Zone A by itself. This is because the river trainings for Zone A are relatively costly compared to the size of the area of newly created land (which is the main driver of the project's benefits).

30. **Composition of economic benefits.** As expected, the increased value of land in Zone A is the most important source of quantifiable economic benefits, accounting for about 70% of total benefits (Table 12). Incremental benefits from water and power supply account for most of the remainder.

**Table 1: Composition of Quantifiable Economic Benefits of PTDP**

Economic Benefit	Present Value of Benefits	
	\$ million	% Total
1. Increased value of land, Zone A	90.8	67.8
2. Increased value of land, other	9.3	6.9
3. Increased value from water and power supply	28.7	21.4
4. Avoided damage to infrastructure	5.2	3.9
<b>Total</b>	<b>133.9</b>	<b>100.0</b>

Source: Asian Development Bank estimates.

31. **Sensitivity analysis.** Sensitivity tests were conducted by varying the project's investment cost, MOM cost and benefits (Table 2). The results of the tests indicate that the economic feasibility of PTDP is relatively insensitive to unfavorable changes to the investment cost and economic benefits. If the investment cost is about 30% higher, or benefits are 22% lower) than in the base case, the EIRR will fall below 9%. The project's EIRR is far less sensitive to changes in the MOM cost. A Monte Carlo simulation indicates that the likelihood of the EIRR dropping below 9% is negligible (Figure 1).

**Table 2: Sensitivity of Project EIRR to Changes in Selected Variables<sup>a</sup>**

	Change to Base case	ENPV <sup>b</sup> (\$ million)	EIRR (percent)	Switching Value (percent)
<b>Base case</b>	-	<b>18.0</b>	<b>11.3</b>	-
Investment cost	+20%	6.2	9.7	+29.7
MOM cost	+20%	18.1	11.3	+425.5
Benefits	-20%	4.4	9.6	-21.7
Combination of the above		-9.3	7.9	N/A

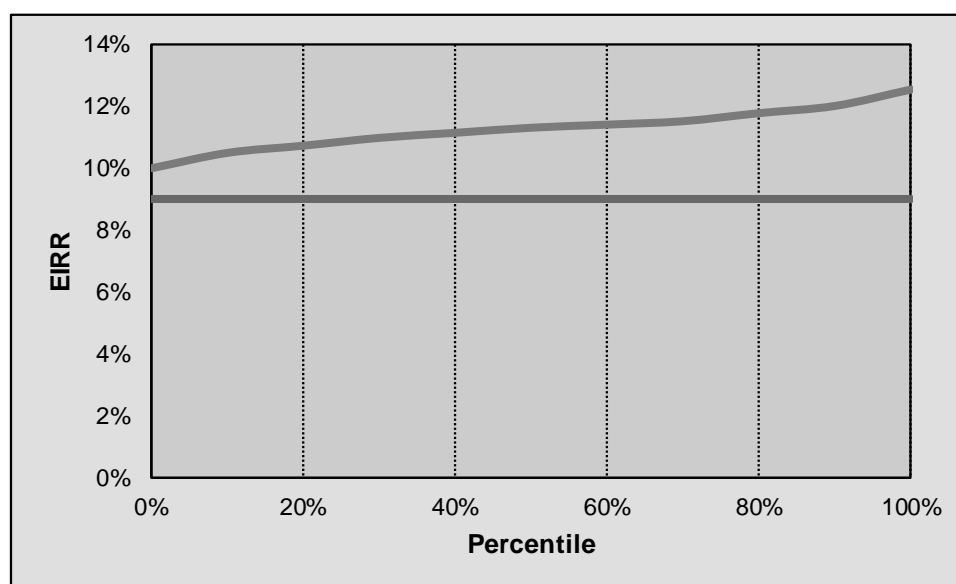
<sup>a</sup> ENPV: economic net present value, EIRR: economic internal rate of return.

<sup>b</sup> Computed based on assumed economic opportunity cost of capital of 9%.

Source: Asian Development Bank estimates.

32. **Risk analysis.** The most important risk that may adversely affect the economic viability of the project is lower-than-expected demand for leasable land. This risk has been mitigated by the provision of low-cost funding to DHI (in the form of a grant and a long-term loan at favorable conditions), which would allow the executing agency to offer competitive lease rates, and by reserving funds for the appointment of a reputable firm for attracting investors and providing transaction advisory services. The risk will further be mitigated if the government would approve an ambitious package of financial and regulatory incentives, including but not limited to permitting the mortgaging of land development rights, removing restrictions on lease terms (which presently cannot exceed 30 years), a 10-year income tax holiday for real estate developers in the project area, and exempting ALDTC from land tax and enterprise income tax during the project implementation period. Other risks identified by the risk management plan were deemed “moderate” or “low”.<sup>15</sup>

**Figure 1: Results of Monte Carlo Simulation of EIRR of ALTDP**



Source: Asian Development Bank estimates.

## V. DISTRIBUTION AND POVERTY ANALYSIS

33. **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 benefits and economic costs to each group. The difference is the net gain (or loss) of the project to that stakeholder group. Three stakeholder groups were considered: government, businesses and households. Their gains and losses can be summarized as follows (Table 3):

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

<sup>15</sup> For a detailed risk assessment and risk management plan, refer to Linked Document 13.

- (ii) **Businesses.** The project will provide commercial, retail and industrial businesses with land in Zone A. As end-user lease rates (which reflect WTP levels) is substantially higher than 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 they occupy at higher lease rates than would be payable to the government. In addition, they are expected to benefit from superior water supply and power supply services (the economic value of would exceed to the tariff payable to the operator). Thus, households will also gain from the project. Gains are further increased by benefits from the increase in the value of land outside Zone A.

34. The poverty impact ratio (PIR) was estimated, assuming a national poverty rate of 12%, and an urban poverty rate of 5%. It was furthermore assumed that the poverty rate of persons living in social housing complexes was 100% (for the simple reason that non-poor households would not qualify for a lease rate exemption). The PIR was estimated at 5.2%, slightly higher than the urban poverty rate in Phuentsholing (Table 3).

**Table 3: Distribution of Economic Benefits of ALTDP**  
(\$ million in constant April 2018 prices)

<b>Present Value of:</b>	<b>Government</b>	<b>Businesses</b>	<b>Households</b>	<b>TOTAL</b>
<b>Economic benefits</b>				
- Increased value of land, Zone A	5.0	46.5	31.3	90.8
- Increased value of land, other	-	-	9.3	9.3
- Increased value of water and power			28.7	28.7
- Avoided damage to infrastructure	5.2	-	-	5.2
<b>Economic costs</b>	<b>-78.9</b>	<b>-37.0</b>	<b>-</b>	<b>-115.9</b>
<b>GAINS AND LOSSES</b>	<b>-68.8</b>	<b>9.6</b>	<b>77.3</b>	<b>18.0</b>
Benefits to poor <sup>a</sup>	-8.3	0.5	14.7	6.9
<b>Poverty Impact Ratio</b>				<b>5.2%</b>

<sup>a</sup> Assumed poverty rates: national 12%, social housing dwellers 100%, other residential housing dwellers 5%.  
Source: Asian Development Bank estimates.