

ECONOMIC AND FINANCIAL ANALYSES

A. Economic Analysis

1. Bhutan currently has one international airport at Paro, and two domestic airports at Bumthang and Yonphula. Drukair, the national airline, provides international flights to and from Paro. It serves eight airports in India, Nepal, and Thailand. As a result of a recent government initiative to develop domestic air services, two domestic airports were opened in December 2011, one at Bumthang in the central region and one at Yonphula in the east near Trashigang. Domestic air services are provided by Drukair, using a single 48-passenger ATR42 aircraft, and by a new airline, Tashi Air, operating an 8-seat Pilatus PC-12 aircraft. Both domestic services link Bumthang and Yonphula to Paro on a regular basis, although present flight frequency is limited. Work on a third domestic airport at Gelephu in the southern region is under way with the runway and small terminal building expected to be completed and operating by mid-2012.

2. The Bumthang and Yonphula airports were planned and constructed on the assumption that they would be used by small aircraft carrying up to 19 passengers. With the national airline, Drukair, acquiring a larger 48-passenger ATR42 aircraft for use on its regional and domestic air services, the 1,200 meter runways at the domestic airports are now too short for use of this aircraft with full passenger loads; weight restrictions therefore apply. Similarly, the passenger terminals are too small for the number of passengers anticipated with a full passenger complement. Improvements in terms of safety, security, and capacity are necessary to accommodate operation of the aircraft used for domestic services so that the airlines are not restricted in the number of passengers that can be carried in or out of the new domestic airports. While extension of the Bumthang airport runway is needed, the immediate requirement is to complete paving of the runway (additional asphalt wearing course). Other safety and compliance issues have been identified for both airports, which require improvements to meet the safety standards necessary to properly support tourism and regional development.

3. At the Gelephu airport, the initial development stage is under way with a 1,500-meter runway intended to serve the performance needs of Drukair's ATR42 aircraft. This is proceeding on the basis of its use under visual flight procedures and for Code 2C aircraft operations, reflecting use of the airport by ATR42 (and smaller) aircraft. The present ongoing construction is for a 1,500-meter runway, but the development of a functional airport is not fully funded.

4. Domestic air services between Paro, Bhutan's only international airport located in the western region, and the three domestic airports will significantly improve overall transport connectivity within Bhutan as well as other regional international destinations. The mountainous terrain of Bhutan is a major constraint for road transport. For instance, travel time between Paro and Bumthang is about 10 hours by road, but only 38 minutes by air. Travel by road to the eastern region of the country presently takes more than 20 hours from Paro, but only about 50 minutes by air. This has discouraged tourists from venturing further than Paro Valley and the country's capital, Thimphu. Tourism plays a major role in Bhutan's economy and tourist arrivals form a major part of international air passenger arrivals (66.5% in 2010). Bhutan had 40,873 international visitors in 2010. The government has established aggressive tourism targets with the goal of increasing the number of tourists to 100,000 by 2012. The government's tourism targets are achievable only if a wider range of tourist attractions is made available in areas other than Paro. This requires improving accessibility to other parts of Bhutan by establishing domestic air services.

5. The capital expenditure program will include upgrading works and equipment at the Bumthang and Yonphula airports, and additional works and equipment required for the Gelephu airport, aiming to improve the safety of aircraft operations and capacity of the air transport system and facilities. These improvements will help ensure safety, security, and capacity essential to meet the projected air travel demand, and support the tourism and regional development goals.

1. Traffic Forecast

6. The traffic demand estimates for domestic airport services are based on discussions with industry stakeholders about the domestic aviation potential for each of the regions served by the new airports, demand estimates by the air service operators (Drukair and Tashi Air), and tourist growth projections. Of the three domestic airports, the Bumthang airport is expected to attract the most domestic demand. Most domestic travel activity is expected to be generated between Paro International Airport (PIA) and the three domestic airports, with international tourists making up most of the domestic passenger load. In the forecast, as much as one third of the trips by tourists traveling on the domestic services could potentially be between the three domestic airports, particularly between Bumthang and Yonphula. While initially the domestic air services are planned to operate on a point-to-point basis to and from PIA, domestic flights between the three domestic airports are expected to develop fairly quickly as tour operators create multistop tourist packages, and as the airlines strive to fill the available seats on the aircraft. Most, but not necessarily all, domestic operations will be operated by aircraft such as the ATR-42-500, which can also operate profitably to international destinations. As such, the average aircraft size operated on some domestic routes, such as flights to Gelephu and Yonphula, may be larger than justified by the demand generated on these routes alone, leading to the possibility of multistop operations. In the near term, flight frequency (the number of flights operated each week) is anticipated to be low; but, in the longer term, frequency will increase as tour operators begin to market opportunities for tourists to visit other regions of Bhutan.

7. As much of the domestic air traffic generated for Bumthang, Gelephu, and Yonphula airports will be carried to and from PIA, the effect of the airport upgrading projects at Bumthang, Yonphula, and Gelephu on passenger traffic will also be to increase passenger traffic handled at PIA. Therefore, all domestic air traffic handled at PIA can, like the traffic generated at Bumthang, Yonphula, and Gelephu, be attributed in some measure to the investment in upgrading the domestic airports. At the same time, given the price of air tickets for domestic air services, most domestic air passengers flying to and from PIA will likely be international travelers. Based on estimates prepared by Tashi Air, Bhutanese will generate about 10% of domestic airline traffic. Table 1 shows the portion of international passenger traffic forecast for PIA directly attributed to domestic air services and, therefore, to the upgrading projects.

Table 1: Passenger Traffic Forecast for Paro International Airport

| Category | Forecast Passenger Round Trips | | |
|---|--------------------------------|-----------|-----------|
| | Year 2015 | Year 2020 | Year 2030 |
| Domestic passengers | 26,100 | 59,900 | 159,600 |
| International passengers | 280,000 | 431,300 | 755,500 |
| International attributed to domestic airports | 23,490 | 53,910 | 143,640 |

Source: Asian Development Bank estimates.

8. The passenger traffic forecasts for the three domestic airports are in Table 2. With the investments already made by the government, operations have commenced with a weekly flight to Bumthang and Yonphula. The project investment will complete the terminal and runway facilities, and safety and security measures to enable operation of the aircraft required to meet the air traffic forecast.

Table 2: Summary Traffic Forecast Results

| Airport | Forecast Passenger Round Trips | | |
|----------|--------------------------------|-----------|-----------|
| | Year 2015 | Year 2020 | Year 2030 |
| Bumthang | 23,490 | 53,870 | 143,600 |
| Gelephu | 7,830 | 17,960 | 47,870 |
| Yonphula | 7,830 | 17,960 | 47,870 |

Source: Asian Development Bank estimates.

2. Costs

9. The government has, with its own funding, initiated the construction of the three domestic airports. However, significant additional investment is needed to provide all the facilities required to enable aircraft operations at the three airports for ATR42 aircraft. Air service has partially commenced with the facilities created, but they do not fully meet the safety and capacity requirements and a sustainable operation is not feasible without additional investment.

10. The construction of the airports commenced with government funding in 2010. The total investment by the government as committed (incurred so far and planned to incur in 2012) is estimated at \$6.1 million for civil works. According to the project preparatory studies, additional investment to meet the forecast traffic demand of the three domestic airports in terms of safety, security, and capacity is estimated at approximately \$14.461 million. The additional investment needs prioritized for implementation and the works selected for implementation under the project with Asian Development Bank (ADB) financing are estimated to cost about \$6.92 million for civil works, equipment, physical and price contingencies, and consulting services. Project implementation is planned to commence in 2012 and finish in 2015.

11. The project is essential for sustainable air service operation with ATR42 aircraft with full passenger capacity. To support commercially viable operation, the airlines are planning multistop operation to provide more frequent flights essential to grow the traffic. The economic analysis was, therefore, carried out for the three domestic airports as a whole. The investment for the construction of airports by the government has facilitated partial operation to Bumthang and Yonphula airports and the project investments will upgrade these two airports and complete the Gelephu airport. The investment required beyond 2015 as described in para. 10 is not included in the analysis but will be required by 2020 and, therefore, costs and benefits associated with traffic increase beyond 2020 are not included in the analysis. The operation and maintenance (O&M) costs for the airport operation were estimated on the basis of cost parameters developed by the consultant and include cost of airport operation (staff, utilities, and related expenses) and cost of airport maintenance. The passenger airline operations are owned by the government and private commercial airlines and are not included in the analysis.

3. Benefits

12. Economic benefits are derived from the additional air traffic as a result of the project. The availability of the domestic air services will improve accessibility to the regions and support government efforts to significantly increase tourist arrivals. Domestic passengers will benefit from faster access to more distant tourist attractions, while business and government travelers will benefit in terms of productivity. Increased accessibility will result in economic development benefits for the regions. The increased air connectivity is also expected to contribute to increased international tourist arrivals representing a benefit to the economy through the additional export of tourist services. This comprises spending on goods and services such as lodging, food, arts and crafts, and related tourist services. A 10% increase in international tourist traffic is estimated with full domestic air service providing access to more regions.

13. The project is expected to generate several types of economic benefits. The benefits to passengers are captured from their willingness to pay for the services, and are derived from aeronautical and commercial revenues from the new traffic received by the domestic airports as well as PIA. The passenger surcharge is the most important passenger-based revenue generator among the aeronautical charges. A fixed fee of Nu225 is assumed for each departing domestic passenger. The additional international tourist traffic will generate revenue from the fixed fee charged at present at Nu800 per departing international passenger. Other aeronautical charges include landing and parking charges.

14. The benefit from increased tourist arrivals and extended stay, with options to travel to different regions without the very long and tedious road journeys, is estimated from net tourist spending. Typically, tourists to Bhutan spend an average of \$880 each and stay an average of 7.6 days.¹ With improved air connectivity, tourists traveling to the region are assumed to stay and spend an additional 10%. To estimate the benefit from tourist spending, the gross tourist spending was netted for the production cost of goods and services sold to tourists, estimated to be upward of 60%, and the remaining constitutes an economic benefit. For the present analysis, a very conservative 20% net saving on tourist spending is considered. The net tourist benefit was estimated for additional international tourists and increased stay of those visiting other regions.

15. Drukair is planning to use ATR-42 aircraft to serve regional international destinations as well as domestic airports; it has already acquired one. The project will allow better utilization of these aircraft. The benefit of improved aircraft utilization is estimated based on the cost of owning the aircraft and assuming domestic operation for one third of the time and international operation for two thirds. In the with-project scenario, utilization of aircraft for one third of the time is possible whereas in the without-project scenario, aircraft will be utilized for much less time and the benefit from improved utilization is estimated and included in the benefit stream.

16. In addition, benefits include induced impact. The induced impact of an airport project is the off-airport impact beyond the combined direct and indirect impacts, where successive rounds of spending create additional income, also known as the multiplier effect. Benefits from induced impacts are calculated based on multipliers derived from economic and statistical models of the general economy of an area. Typical multipliers range from 1.5 to 3.0. The results of this are that for all direct benefits at the airport, another 1.5 to 3.0 times that revenue can be assumed for the regional economy. This benefit is not included in the base analysis.

¹ Tourism Council of Bhutan. 2010. *Bhutan Tourism Monitor*. City.

4. Economic Analysis

17. The economic analysis of the construction of three domestic airports compares the with-project and without-project scenarios. The with-project scenario involves the upgrading of the three airports to facilitate domestic air service as planned with ATR42 aircraft. The without-project scenario considers the domestic airport constructed with government funding. Though limited air service has commenced to Bumthang and Yonphula, sustainable operation is not feasible without the project. With the project investment, the safety and immediate capacity needs can be met for the projected demand until at least 2020. The safety and compliance issues in the without-project scenario will discourage use of the service by international visitors, thus reducing the travel demand and affecting operating plans of airline operators. Therefore, in the without-project scenario, air traffic will be much lower than projected, and in the analysis is assumed as only 40% of the projected traffic. The project will accelerate the growth in passenger traffic as airport upgrading is completed starting in 2014 and is expected to reach the projected level for 2020.

18. The cost and benefit streams are estimated for 20 years including the 4-year implementation period. The residual value after 20 years is assumed to be zero. All costs and benefits used for the analysis are in nominal 2011 values and the costs considered do not include price contingencies. The benefits are kept the same beyond 2020, as additional investment will be needed to meet incremental demand beyond 2020. All costs and benefits are valued in monetary terms and expressed in economic prices. In calculating the economic costs of construction, operation, and maintenance, a standard conversion factor of 0.9 is used to derive economic costs from the estimated financial costs. The benefits considered (net additional spending of tourists and aeronautical revenue) require no adjustment. The economic internal rate of return (EIRR) for the with-project scenario is estimated at 18.7%, well above the acceptable 12%. The incremental cost–benefit stream for the with-project scenario is given in Table 3. The analysis including a conservative level of induced benefits (multiplier of 1.5) indicates that the EIRR will increase to 31.9% showing the large positive economic benefit of the project.

19. A sensitivity analysis was carried out to test the effects of possible unfavorable changes in key parameters that determine the project costs and benefits. The analysis indicates that the economic viability of the project would remain satisfactory even under adverse scenarios. Switching values were also calculated under which the project EIRR would fall below the opportunity cost of capital with the unfavorable change. Based on the analysis, a cost increase of 53% or a decrease in benefits of 30% would be required to reach a cut-off EIRR of 12% providing high confidence for the economic viability of the project. Table 4 summarizes the EIRRs for the base case and sensitivity cases.

Table 3: Economic Internal Rate of Return
(Nu)

| Year | Incremental Costs | | Incremental Benefits | | | Net Benefits |
|------|-------------------|--------------------------------|----------------------|----------------------|-------------------------------|---------------|
| | Capital Costs | Operation and Maintenance Cost | Tourist Spending | Aeronautical Revenue | Improved Aircraft Utilization | |
| 2011 | | | | | | |
| 2012 | 14,487,750 | | | | | (14,487,750) |
| 2013 | 101,414,250 | | | | | (101,414,250) |
| 2014 | 101,414,250 | 1,454,230 | 5,110,501 | 5,655,465 | 2,750,000 | (89,352,514) |
| 2015 | 72,438,750 | 2,908,460 | 10,221,001 | 11,310,930 | 5,500,000 | (48,315,279) |
| 2016 | | 4,883,300 | 18,620,637 | 15,651,301 | 6,050,000 | 35,438,638 |
| 2017 | | 6,858,139 | 27,020,273 | 19,991,671 | 6,600,000 | 46,753,805 |
| 2018 | | 8,832,979 | 35,419,909 | 24,332,042 | 7,150,000 | 58,068,972 |
| 2019 | | 10,807,818 | 43,819,545 | 28,672,412 | 7,700,000 | 69,384,139 |
| 2020 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2021 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2022 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2023 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2024 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2025 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2026 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2027 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2028 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2029 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2030 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| 2031 | | 12,782,658 | 52,219,181 | 33,012,782 | 8,250,000 | 80,699,306 |
| | | | | | EIRR | 18.7% |
| | | | | | ENPV | 99,904,687 |

() = negative; EIRR = economic internal rate of return, ENPV = economic net present value.
Source: Asian Development Bank estimates.

Table 4: Sensitivity Analysis Results

| Item | Change (%) | EIRR (%) | ENPV (\$ million) | Switching Value (%) |
|---|------------|----------|-------------------|---------------------|
| Base case | ... | 18.7 | 2.0 | ... |
| Initial capital costs 20% higher | 15 | 16.4 | 1.3 | 53 |
| Total benefits decrease 20% | (15) | 15.6 | 0.9 | (30) |
| Including induced impact | | 31.9 | 7.6 | |
| Increase in capital costs and reduction in benefits | 15:(15) | 13.4 | 0.4 | 19:(19) |

... = not available, () = negative, EIRR = economic internal rate of return, ENPV = economic net present value.
Sources: Asian Development Bank estimates.

B. Financial Analysis

20. Financial analysis was carried out to assess the viability of the project investment based on the capacity of the Department of Civil Aviation to generate sufficient revenues from the domestic airport construction to cover the capital and operating costs of the project. The analysis is based on the following considerations and assumptions:

- (i) Capital costs are based on the incremental capital expenditure with the investment program with ADB funding for 2012–2015 (\$6.92 million).
- (ii) The government funding for creating the base facilities during 2010–2012 was from budget allocation. ADB funding is through grant assistance.
- (iii) The revenue stream considered for the financial viability analysis of domestic airports was derived by calculating revenues from the projected air traffic demand due to the domestic terminal development through passenger facility charges, aircraft landing fees, and air navigation charges. The revenue due to the project is derived from (a) all domestic traffic from the three airports and at PIA, and (b) additional international tourist traffic attributed to improved regional connectivity.
- (iv) For revenue estimation, the traffic scenario in the without- and with-project scenarios as presented in the economic analysis is considered.
- (v) O&M costs are based on current organization structure with adjustments to meet the requirements of domestic airport operations.
- (vi) Inflation of the O&M cost is assumed at 5% per annum and the fees charged will increase at 4% per annum.
- (vii) The revenue and cost streams are compared for 20 years. However, air traffic growth until 2020 is considered only for revenue calculation (air traffic is kept constant beyond 2020) as further investment will be needed beyond 2020.

21. The average cost of capital to the Department of Civil Aviation for project investment in the three domestic airports is zero as the funds are from the government budget and ADB grant assistance. The government borrows from the market through treasury bills for its short-term needs; cost ranged from 2% to 6% in the last 4 years.² This is used as a benchmark for financial viability. The financial internal rate of return estimated for the domestic airport operation for the projected traffic scenario is 2.9% considering the project investment and the incremental traffic with traffic growth frozen at the 2020 level; further investment will be needed to meet long-term traffic growth. The analysis indicates that the domestic airport project will generate sufficient revenue to meet the operating costs and generate a small rate of return. The social and economic importance of the project and the large tourist revenue potential were demonstrated through the economic analysis. Thus, overall, the project is considered viable. The income statement and cash flow are in Table 5.

22. Sensitivity analysis was carried out considering the project investment with ADB funding to test the effects of possible adverse changes in key parameters that determine the project's costs and revenues. The results are shown in Table 6. The domestic airport operation, including the revenue generated at PIA from domestic operation, generates sufficient revenue to meet O&M costs and is financially sustainable with capital investment made from a budgetary allocation and/or grant.

² Royal Monetary Authority of Bhutan. 2012, *Annual Report 2010/11*. Thimphu.

Table 5: Cash Flow Statement, Total Investment
(Nu)

| Year | Project Investment from ADB Financing | Incremental Cash Flow from Operations | Net Cash Flow from the Project Investment |
|-----------|---------------------------------------|---------------------------------------|---|
| 2011 | | | |
| 2012 | 17,300,000 | | (17,300,000) |
| 2013 | 121,100,000 | | (121,100,000) |
| 2014 | 121,100,000 | 4,608,032 | (116,491,968) |
| 2015 | 86,500,000 | 9,549,635 | (76,950,365) |
| 2016 | | 12,550,049 | 12,550,049 |
| 2017 | | 15,722,339 | 15,722,339 |
| 2018 | | 19,072,548 | 19,072,548 |
| 2019 | | 22,606,770 | 22,606,770 |
| 2020 | | 26,331,132 | 26,331,132 |
| 2021 | | 27,177,813 | 27,177,813 |
| 2022 | | 28,048,034 | 28,048,034 |
| 2023 | | 28,942,219 | 28,942,219 |
| 2024 | | 29,860,785 | 29,860,785 |
| 2025 | | 30,804,137 | 30,804,137 |
| 2026 | | 31,772,669 | 31,772,669 |
| 2027 | | 32,766,761 | 32,766,761 |
| 2028 | | 33,786,776 | 33,786,776 |
| 2029 | | 34,833,059 | 34,833,059 |
| 2030 | | 35,905,933 | 35,905,933 |
| 2031 | | 37,005,700 | 37,005,700 |
| FIRR | | | 2.9% |
| FNPV @ 6% | | | (65,568,520) |

() = negative, FIRR = financial internal rate of return, FNPV = financial net present value.

Source: Asian Development Bank estimates.

Table 6: Sensitivity Analysis

| Item | Change (%) | Project investment with ADB Funding, FIRR (%) |
|---------------------------------|------------|---|
| Base case | | 2.9 |
| Passenger traffic | (10) | 0.8 |
| Project costs | 10 | 1.9 |
| Operation and maintenance costs | 10 | 2.0 |

() = negative, FIRR = financial internal rate of return.
Source: Asian Development Bank estimates.