

ECONOMIC AND FINANCIAL ANALYSES

A. Economic Analysis

1. Bhutan currently has one international airport (at Paro) and three domestic airports (at Bumthang, Gelephu, and Yonphula). Drukair, the national airline, provides international flights to and from Paro. It serves ten airports in Bangladesh, India, Nepal, Singapore, and Thailand. Domestic air services are provided by Drukair, using a single 48-passenger ATR 42-500 aircraft. The Bumthang and Yonphula airports were planned and constructed by the government on the assumption that they would be used by small aircraft. With the anticipated travel demand on these routes, and to make the best utilization of aircraft with a combination of domestic and regional flight service, Drukair acquired the 48-passenger ATR 42-500 aircraft for use on its regional and domestic air services. The existing 1,200-meter runways at the domestic airports were too short for this aircraft with full passenger load and/or with weight restrictions. Similarly, the passenger terminals were too small for the number of passengers anticipated. Improvements in terms of safety, security, and capacity were 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. At the Gelephu airport, the initial development was taken up by the government with extension of the runway to 1,500 meters to meet the performance needs of the ATR 42-500 aircraft.

2. The government programs for the domestic airports were not fully funded for the development of functional airports catering to the demand and full utilization of the type of aircraft to be used. Asian Development Bank (ADB) funding for further development of the airports was sought in 2012, and funding was approved for a set of priority projects for the three domestic airports. With the support of ADB funding, improvement works including runway development have been implemented and domestic services to Bumthang and Gelephu have already started. Yonphula airport is suspending its flight operation due to runway rehabilitation and will resume operation upon completion of works by the end of 2016. Additional funding is now proposed to take up other priority works at these airports, including a terminal building and safety works, towards the goal of fully functional airports.

3. 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 and international destinations. The mountainous terrain of Bhutan is a major constraint on 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 (51% in 2014). Bhutan had 68,081 international visitors in 2014, of which 87% were tourists, and 65,399 regional visitors (including visitors from India, Bangladesh, and the Maldives), of which 74% were tourists. The total number of tourist arrivals (regional and international) in 2014 was 133,480.¹ The government has established aggressive tourism targets with the goal of increasing the number of tourists (both international and regional) to 150,000 by 2018² and also increasing the percentage of tourists visiting the east, south, and central circuits from 21.9% to 50.0%. The

¹ Bhutan Tourism Council. 2014. *Bhutan Tourism Monitor, Annual Report 2014*. Thimphu.

² Government of Bhutan, Gross National Happiness Commission. 2013. *Eleventh Five-Year Plan (2013-2018), Volume II, Program Profile*. Thimphu.

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.

4. The capital expenditure program under the ongoing project with ADB funding includes upgrading works and equipment at the Bumthang and Yonphula airports, and additional works and equipment required for the Gelephu airport, and has the aim of improving the safety of aircraft operations and capacity of the air transport system and facilities. Most of the works have been completed and works at Yonphula airport will be completed by the end of 2016. The additional financing will finance a new domestic terminal at Bumthang, security infrastructure at Gelephu, and safety equipment at Yonphula. Overall, 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

5. The traffic demand estimates for domestic airport services are based on (i) discussions with industry stakeholders about the domestic aviation potential for each of the regions served by the new airports, (ii) demand estimates by the air service operators (Drukair and Tashi Air), and (iii) tourist growth projections. Of the three domestic airports, Bumthang airport is expected to attract the most domestic demand. 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 on 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 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.

6. 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 the three domestic airports 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 fares 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 citizens will comprise about 10% of domestic airline traffic. The international passenger traffic at PIA increased from 127,181 in 2010 to 238,736 in 2014, indicating an annual growth rate of 17.1%.³ Table 1 shows the portion of international passenger traffic forecast for PIA directly attributed to domestic air services and, therefore, to the upgrading projects.

³ Government of Bhutan, Ministry of Information and Communications. 2015. *Annual Info-Comm and Transport Statistical Bulletin (6th Edition)*. Thimphu.

Table 1: Passenger Traffic Forecast for Paro International Airport

Category	Forecast Passenger Round Trips		
	2020	2025	2030
Domestic passengers	40,400	92,500	148,900
International passengers	431,300	593,400	755,500
International passengers attributed to domestic airports	36,360	83,250	134,010

Source: Asian Development Bank estimates.

7. 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 thrice-weekly flight to Bumthang and a weekly flight to Gelephu. 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		
	2020	2025	2030
Bumthang	36,350	83,200	133,990
Gelephu	12,120	27,735	44,670
Yonphula	12,120	27,735	44,670

Source: Asian Development Bank estimates.

2. Costs

8. The government has, with its own funding, initiated the construction of the three domestic airports. However, significant additional investment was needed to provide all the facilities required to enable operations at the three airports for ATR 42-500 aircraft. The construction of the airports commenced with government funding in 2010. The total investment by the government incurred prior to the ADB project 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 \$14.46 million. The investment needs were prioritized for implementation and the works selected for implementation under the original project were \$6.92 million. The original project scope was commenced in 2013, with the major part completed in 2015 and work at Yonphula expected to finish by the end of 2016. The proposed additional financing of \$4.0 million will take up a major part of the remaining prioritized works. The total investment cost with the original project and additional financing combined and government investment prior to the project is \$18.12 million, and the share of the project in the total investment is \$12.02 million or 66.3%. The economic analysis of the project considered 66.3% of the total benefits of the project.

9. The project is essential for sustainable air service operation with ATR 42-500 aircraft with full passenger capacity. To support commercially viable operation, the airlines are planning multistop operation to provide more frequent flights, which is essential to increase the traffic. The economic analysis was, therefore, carried out for the three domestic airports as a whole. The overall assessment indicates additional investment required beyond 2025 and, therefore, costs and benefits associated with traffic increase beyond 2025 are not included in the analysis.

The operation and maintenance costs for 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

10. 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.

11. 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, which is currently Nu800 per departing international passenger. Other aeronautical charges include landing and parking charges.

12. The benefit from increased tourist arrivals and longer stays, 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 \$930 each and stay an average of 6.4 days.⁴ Travel out of Paro to regional destinations by road takes 12–30 hours whereas by air it will be 30–60 minutes. Currently most tourists do not travel to the regional centers. With the availability of additional options with easy accessibility, more tourists will venture out to these regional centers and the length of tourist stay will increase. In the without-project scenario, the average stay is 6.4 days and in the with-project scenario the average stay is assumed to increase by 10%. With improved air connectivity, tourists traveling to the region are assumed to stay 10% longer and spend 10% more. 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 (40%) constitutes an economic benefit. For the present analysis, a conservative 20% of tourist spending is considered as economic benefit. The net tourist benefit was estimated for additional international tourists and increased stay length of those visiting other regions.

13. Drukair is using ATR 42-500 aircraft to serve regional international destinations as well as domestic airports. 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

⁴ Bhutan Tourism Council. 2014. *Bhutan Tourism Monitor, Annual Report 2014*. Thimphu.

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.

14. Domestic passengers will benefit from reduced travel time; it currently takes 12–30 hours by road to the three regional centers and this will be reduced to less than 3 hours. The value of time for domestic air passengers is taken as twice the per capita hourly income, considering 2,080 working hours per year. The value of time thus worked out is Nu140 per hour for 2015.

15. 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; this is 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 1.5–3.0 times that revenue can be assumed for the regional economy. This benefit is not included in the base analysis.

4. Economic Analysis

16. 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 ATR 42-500 aircraft. The without-project scenario considers the domestic airport facilities constructed with government funding which would have allowed only small aircraft; sustainable operation to support tourism development is not feasible without the project. With the project investment (original financing plus additional financing), the safety and immediate capacity needs can be met for the projected demand until at least 2025. 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 and is expected to reach the projected level.

17. The cost and benefit streams are estimated for 20 years after 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 constant 2015 values and the costs considered do not include price contingencies. The benefits are kept the same beyond 2025, as additional investment will be needed to meet incremental demand beyond 2025. 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 exchange rate used in the analysis is Nu66.9 = \$1.

18. The economic internal rate of return (EIRR) for the with-project scenario (original financing plus additional financing) is estimated at 15.5%, which is well above the acceptable 12.0%. The economic analysis shows that, with the costs allocated for the original financing and additional financing and the benefits allocated proportionately to the investment, the EIRR for the additional financing alone is estimated at 16.1%. The incremental cost–benefit stream for the with-project scenario is given in Table 3. The analysis, which includes a conservative level

of induced benefits (multiplier of 1.5), indicates that the EIRR will increase to 27.3%, 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 an unfavorable change. Based on the analysis, a cost increase of 52% or a decrease in benefits of 21% would be required to reach a cutoff 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.

B. Financial Analysis

20. A financial assessment was undertaken to assess the potential for capital recovery and availability of a revenue source for operation and maintenance of the three airport facilities developed. 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 to departing international passengers (Nu800). Other aeronautical charges include landing and parking charges. The financial analysis indicates that the revenue will mainly cover the operating and maintenance costs. The projected total revenue is Nu898 million, which is nearly double the projected recurrent operation and maintenance costs of Nu489 million for the analysis period. Based on the financial projections and evaluation, the project is financially sustainable and will generate sufficient revenue to meet the operation and maintenance expenditure and may also generate some resources for improvements. The economic analysis demonstrates the social and economic benefits from improved accessibility, including substantial tourism growth potential and local employment generation. Thus, overall, the project is considered viable.⁵

⁵ The use of an Asian Development Fund grant is appropriate as the rate of return on investment will not be significant, and overall social and economic benefits will accrue for the country.

Table 3: Economic Internal Rate of Return
(Nu)

Year	Incremental Costs		Value of Time Saving for Domestic Passengers	Incremental Benefits			Net Benefits
	Capital Costs	Operation and Maintenance Cost		Tourist Spending	Aeronautical Revenue	Improved Aircraft Utilization	
2013	31,486,311						(31,486,311)
2014	71,595,495						(71,595,495)
2015	86,071,890						(86,071,890)
2016	243,211,839	4,251,631	1,839,802	16,282,337	5,480,964	1,113,853	(222,746,514)
2017	158,374,125	7,490,736	2,713,707	26,325,865	8,808,864	2,227,706	(125,788,718)
2018		10,729,841	3,799,190	36,521,524	13,008,524	3,341,559	45,940,957
2019		13,968,945	5,318,866	48,731,419	16,534,848	4,455,413	61,071,601
2020		17,208,050	7,446,413	63,554,842	21,151,377	5,569,266	80,513,848
2021		18,584,694	8,786,767	72,928,934	24,064,776	6,237,578	93,433,360
2022		20,071,470	10,368,385	83,344,396	27,411,449	6,986,087	108,038,848
2023		21,677,187	12,234,695	94,951,429	31,264,133	7,824,417	124,597,486
2024		23,411,362	14,436,940	107,925,123	35,708,350	8,763,347	143,422,398
2025		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2026		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2027		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2028		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2029		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2030		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2031		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2032		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2033		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2034		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2035		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
2036		25,284,271	17,035,589	122,469,814	40,844,698	9,814,949	164,880,778
						EIRR	15.5%
						ENPV	101,476,656

() = 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	...	15.5	1.90	...
Capital costs becoming higher (excluding completed works)	10	14.8	1.54	52
Total benefits lower	(10)	13.9	0.99	(21)
Including induced impact		27.9	10.70	
Increase in capital costs and reduction in benefits	10:(10)	13.2	0.63	15:(15)

... = not available, () = negative, EIRR = economic internal rate of return, ENPV = economic net present value.

Source: Asian Development Bank estimates.