CHAPTER 7 ECONOMIC AND FINANCIAL ANALYSES

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7.1 General

Economic and financial analyses on the airport master plan were carried out for the facilities of the Phase II development assuming that the time span for project evaluation is 25 years.

Results of the analyses show that this project is feasible from the viewpoint of the national economy. According to the sensitivity analysis, in case where either the construction cost will increase or the air traffic demand will reduce, it is proven that this project yields a sufficient return on investment, and from this point, the project is, also, feasible.

On the other hand, results of the financial analysis show that only revenues based on the current airport charges system cannot cover the construction and maintenance costs. However, this conclusion is not attributable to project characteristics. Rather, it is common in airport development projects that it is difficult to establish financial self-sufficiency.

Therefore, introduction of soft loan or government subsides will be necessary in order to implement the project as a social infrastructure. It is also recommended that the airport charges should be increased step by step in order to cover the airport maintenance costs.

7.2 Economic Analysis

7.2.1 Objectives

The objectives of the economic analysis are to identify and estimate costs and benefits of a project from the national economic viewpoint in order to assess the exact contribution to national economy.

7.2.2 Methodolody

The methods and procedures used in this chapter are basically same as those described in the section, 10.5, "Economic Analysis for the Selection of Alternatives", Part I.

The economic analysis is made through a comparison of the costs and benefits of two cases, i.e., "with project" case and "without project" case ("WOP").

This is because the additional benefits to the national economy, which are firstly realized by investing or utilizing the additional capital are measured through the comparison with "WOP" case.

"WOP" case of this project has been established for the air traffic demand in 1994 as shown in Chapter 5, Part I.

(1) Conversion Factor of Financial and Economic Value

The economic costs and benefits should be valued at economic prices. In this study, conversion factors from financial value to economic value are assumed as 1.00 for the following reasons.

a) No excise tax is levied on Yen-Credit import

b) According to BAPPENAS, the conversion factors for the transportation sector are just 1.00 in Indonesia.

(2) Project Evaluation Period and Depreciation Period

The project evaluation period is set at 25 years and the depreciation period of the airport facilities is assumed as 40 years. Residual values of the facilities after the project evaluation period are calculated as those at the end of the project evaluation period.

(3) Cost

The costs are composed of the following:

- Construction Costs in Phases I and II (Investment)

- Renewal Cost (Investment)

- Operation and Maintenance Costs

a) The construction costs and renewal cost are shown in Table 6.7.1.

b) The operation cost is composed of personnel cost and, material and utility costs. The personnel cost is calculated by multiplying the number of DGAC staff estimated in the Chapter 6 by the average annual personnel cost.

The annual growth rate of personnel cost is assumed to be the same rate as that of GNP in Indonesia forecast in Part I.

The average annual personnel cost of the DGAC staff in the beginning year of the project is assumed to be 1,400,000 Rp./Year and the average annual growth rate is anticipated to be 4.5%.

Material and utility costs are estimated to be 70 % as the personnel cost.

c) The maintenance costs are estimated as the following:

- Civiland architectural facilities : 0.5% of the construction cost

- Instrument and Equipment: 1% of purchase prices

(4) Benefit

The composition of benefit items have been described in Chapter 10, Part I. Only direct tangible benefits are measured in the economic analysis, as follows:

- Benefit due to reduction of the operation and maintenance costs of the existing Yogyakarta airport

  660 million Rp./Year in 1995

- Benefit to airlines due to reduction of the operation cost of aircraft caused by introduction of larger aircraft (Refer to APPENDIX II-1-7)

- Benefit due to accommodation of overflowing passengers

  Benefit that reduction of trip time will create when overflowing passengers using bus as alternative transportation will utilize air traffic (Refer to APPENDIX II-1-7)

- Benefit due to utilization of the existing terminal facilities for

other purposes

1,580 million Rp. corresponding to the construction cost of the existing terminal facilities subtracted from the project cost.

By implementation of this project, the following benefits are expected besides above direct tangible benefit.

i) Direct Intangible Benefit

- Increase in air safety

- Compatibility with environs

ii) Indirect Tangible Benefit

- Expansion of regional income

iii) Indirect Intangible Benefit

- Reduction of road traffic due to conversion of road traffic to air traffic

- Development of regional economy

- Increase of employment opportunities

(5) Calculation

The economic benefit is composed of three types of savings as shown in the equation (7.2.1).

$$TEBt = MAEt + SCt + DIBt \qquad (7.2.1)$$

Where,

TEBt : Total economic benefit

MAEt : Maintenance cost of the existing airport or maintenance cost in "WOP" case

SCt : Saving in transportation cost of an airline company due to introduction of larger aircraft

DIBt : Total benefit of passengers who will divert from bus to air due to larger capacity of the air transportation

The suffixes in equations mean as follows:

t : Year

p : Zonal pair

ℓ : Route

All monetary figures are expressed in 1986 price.

As seen in the equation (7.2.5), the maintenance cost of the existing airport is recognized as the project cost, therefore it is regarded as a saving in its full amount.

$$SCt = \sum_{\ell} (WOPCt\ell - WPCt\ell) \qquad \text{----------} \qquad (7.2.2)$$

Where,

SCt : See the equation (7.2.1).

WOPCtℓ : Total passenger transportation cost of airline companies in "WOP" case (or the cost by smaller aircraft).

WPCtℓ : Total passenger transportation cost of airline companies in "With Project" case (or the cost by larger aircraft).

$$DIBt = \sum_{p} OVIPtp \cdot USBtp \qquad \text{----------} \qquad (7.2.3)$$

Where,

DIBt : See the equation (7.2.1).

OVIPtp : Domestic Passengers who will exceed the present capacity of the air transportation and inevitably use highway buses.

USBtp : User benefit of passengers who will divert from bus to air due to larger capacity of the air transportation

$$USBtp = (BSTp \cdot VTt + BSFp) - (ALTp \cdot VTt + ALFp) \quad \text{----} \quad (7.2.4)$$

Where,

USBtp : See the equation (7.2.3)

BSTp : Trip time by bus (or "WOP" case)

VTt : Time value

BSFp : Passenger fare by bus (or "WOP" case)

ALTp : Trip time by air (or "With Project" case)

ALFp : Passenger fare by air (or "With Project" case)

$$ECt = EKt + MAINTt \quad \text{----------} \quad (7.2.5)$$

Where,

ECt : Cost of the project

EKt : Project investment

MAINTt : Maintenance cost of the airport

7.2.3 Economic Cash Flow

The costs and benefits over the entire project period are shown in Table 7.2.1.

Table 7.2.1 Economic Cash Flow

Unit:Million Rp.

Year	Costs			Benefits				Net Benefit
	Const. Cost	O & M Cost	Total Cost	Saving O & M Cost	Saving Transp. Cost	Over Flow Pax.	Total Benefit	
1987	3698.	0.	3698.	0.	0.	0.	0.	-3698.
1988	5820.	0.	5820.	0.	0.	0.	0.	-5820.
1989	6913.	0.	6913.	0.	0.	0.	0.	-6913.
1990	4848.	0.	4848.	0.	0.	0.	0.	-4848.
1991	6379.	0.	6379.	0.	0.	0.	0.	-6379.
1992	19001.	0.	19001.	0.	0.	0.	0.	-19001.
1993	31576.	0.	31576.	0.	0.	0.	0.	-31576.
1994	21492.	0.	21492.	0.	0.	0.	0.	-21492.
1995	0.	1481.	1481.	660.	3587.	1411.	5658.	4177.
1996	869.	1557.	2426.	660.	3626.	3335.	7621.	5195.
1997	2036.	1655.	3691.	660.	3665.	5259.	9584.	5893.
1998	1632.	1736.	3368.	660.	3704.	7184.	11548.	8180.
1999	816.	1821.	2637.	660.	3743.	9108.	13511.	10874.
2000	11723.	1911.	13634.	660.	3782.	11032.	15474.	1840.
2001	6931.	2074.	9005.	660.	4527.	16251.	21438.	12433.
2002	0.	2219.	2219.	660.	5271.	21470.	27401.	25182.
2003	3791.	2329.	6120.	660.	6020.	26688.	33368.	27248.
2004	3798.	2486.	6284.	660.	6760.	31907.	39327.	33043.
2005	0.	2653.	2653.	660.	7505.	37126.	45291.	42638.
2006	0.	2784.	2784.	660.	8004.	44498.	53162.	50378.
2007	0.	2927.	2927.	660.	8502.	51870.	61032.	58105.
2008	0.	3078.	3078.	660.	9001.	59243.	68904.	65826.
2009	936.	3233.	4169.	660.	9499.	66615.	76774.	72605.
2010	0.	3411.	3411.	660.	9998.	73987.	84645.	81234.
2011	0.	3411.	3411.	660.	9998.	73987.	162913.	159502.

Discount Rate = 9. % B/C Ratio = 1.649 NPV = 55932.
Discount Rate = 12. % B/C Ratio = 1.208 NPV = 15026.
Discount Rate = 15. % B/C Ratio = 0.893 NPV = -6553.

EIRR = 13.869 %

7.2.4 Evaluation of the Project

The economic internal rate of return (EIRR), benefit cost ratio (B/C Ratio) and net present value (NPV) are shown in Table 7.2.2.

Table 7.2.2 Economic Assessment

EIRR (%)	B/C Ratio*	NPV (million Rp. 1986)
13.9	1.21	15,026

Note * : at discount rate of 12%

The results of the economic analysis show that the project is feasible because the EIRR of 13.9% is higher than 12% of the opportunity cost of capital in Indonesia.

Therefore, it is proven that Yogyakarta airport development project is a national project to be invested and implemented urgently.

7.2.5 Sensitivity Analysis

The sensitivity analysis is also made to provide a basis for probablistic judgement on the feasibility of the project. The EIRRs are calculated on the several projections and summarized in Table 7.2.3.

Table 7.2.3 Summary of Sensitivity Analysis

Projections		EIRR (%)
Base Case		13.9
Case I	Construction Cost Up by 10%	12.9
Case II	Traffic Demand Down by 10%	12.9
Case III	Construction Cost Up by 10% Traffic Demand Down by 10% (Simultaneously)	12.0

The results of the sensitivity analysis show that even in the worst projection (case III), the EIRR is 12%, and satisfies the opportunity cost of capital in Indonesia, and suggests that the project will yield a sufficient economic return on investment even in case of a substantial increase of the construction cost or reduction of air traffic demand.

7.3 Financial Analysis

7.3.1 Objectives

The financial analysis is to study financial viability of the project assuming the airport management and maintenance are an independent business. The analysis is generally carried out by investigating financial cost benefit analysis.

The financial benefits are composed of various airport charges and the financial costs are also composed of construction and maintenance costs.

7.3.2 Methodology

The financial benefits and costs to be measured and calculation methods are stated below.

(1) Financial Benefit (Revenue)

The revenues of an airport management organization are as follows:

a) Landing charge

Yogyakarta airport is classified as class-II. Landing charge of the class-II airports is stipulated in Table 7.3.1.

Table 7.3.1 Landing Charge of the class-II airports.

Aircraft Weight	Tariff
a) Up to 40,000 Kg	Rp. 550.- for each 1,000 Kg or its part.
b) Above 40,000 Kg to 100,000 Kg	Rp. 22,000.- + Rp. 730.- for each 1,000 Kg above 40,000 Kg or its part.
c) Above 100,000 Kg	Rp. 65,000 + Rp. 850.- for each 1,000 Kg above 100,000 Kg or its part.
d) Tariff of facility use for runway lamp :	
1) Domestic Flight	Rp. 9,000.-
2) Round Flight	Rp. 4,500.-
3) Training & Trial Flight	Rp. 2,000.-

source : DGAC

b) Air Passenger Service Charge

The air passenger service charge of domestic flights is stipulated for each airport class in Table 7.3.2.

Table 7.3.2 Air Passenger Service Charge

Airport Class	Air Passenger Service Charge (Rp./Pax.)
I	1,800
II	1,400
III	1,200
IV	800
V	500

According to Table 7.3.2, the charge at Yogyakarta airport is to be 1,400 Rp./Pax.

c) Rental Charge of Terminal Building Space

Airlines, restaurants etc., which do business in the passenger terminal building pay the charge on concessions to the airport management organization.

According to data of airlines which use the check-in counters at the existing Yogyakarta airport, the annual rental charge including utility charges is 90,000 Rp./sq.m.

Based on this data, the rental charge for the new terminal building is assumed to be 100,000 Rp./sq.m and the 40% area of the terminal building is assumed to be rented.

d) Vehicle Parking Fee

The existing vehicle parking makes no parking charge. However, after completion of the project, more revenue from the airport will be required in order to operate and maintain the larger new facilities.

Accordingly, the vehicle parking will be charged for. The fee is supposed to be 500 Rp./time · vehicle the same as that of Soekarno-Hatta airport.

(2) Financial Cost (Expenditure)

The expenditures of the airport management organization are composed of the following items:

a) Construction Cost

The construction cost has been shown in Table 6.7.1 including the renewal cost.

b) Operation and Maintenance costs

The operation and maintenance costs are the same as those described in the section of "7.2 Economic Analysis"

7.3.3 Financial Cash Flow

The financial cash flow over the entire project period is shown in Table 7.3.3.

Table 7.3.3 Financial Cash Flow

Unit:Million Rp.

Year	Costs			Incomes				Net Income
	Const. Cost	O & M Cost	Total Cost	Landing Charge	Service Charge	Rental Fee	Total Income	
1987	3698.	0.	3698.	0.	0.	0.	0.	-3698.
1988	5820.	0.	5820.	0.	0.	0.	0.	-5820.
1989	6913.	0.	6913.	0.	0.	0.	0.	-6913.
1990	4848.	0.	4848.	0.	0.	0.	0.	-4848.
1991	6379.	0.	6379.	0.	0.	0.	0.	-6379.
1992	19001.	0.	19001.	0.	0.	0.	0.	-19001.
1993	31576.	0.	31576.	0.	0.	0.	0.	-31576.
1994	21492.	0.	21492.	0.	0.	0.	0.	-21492.
1995	0.	1481.	1481.	187.	488.	567.	1242.	-239.
1996	869.	1557.	2426.	202.	518.	572.	1292.	-1134.
1997	2036.	1655.	3691.	217.	547.	578.	1342.	-2349.
1998	1632.	1736.	3368.	232.	577.	583.	1392.	-1976.
1999	816.	1821.	2637.	247.	606.	589.	1442.	-1195.
2000	11723.	1911.	13634.	262.	636.	594.	1492.	-12142.
2001	6931.	2074.	9005.	286.	685.	913.	1884.	-7121.
2002	0.	2219.	2219.	310.	734.	921.	1965.	-254.
2003	3791.	2329.	6120.	334.	783.	930.	2047.	-4073.
2004	3798.	2486.	6284.	358.	832.	939.	2129.	-4155.
2005	0.	2653.	2653.	383.	881.	948.	2212.	-441.
2006	0.	2784.	2784.	407.	930.	956.	2293.	-491.
2007	0.	2927.	2927.	431.	980.	965.	2376.	-551.
2008	0.	3078.	3078.	455.	1029.	974.	2458.	-620.
2009	936.	3233.	4169.	479.	1079.	982.	2540.	-1629.
2010	0.	3411.	3411.	503.	1128.	991.	2622.	-789.
2011	0.	3411.	3411.	503.	1128.	991.	2622.	-789.

7.3.4 Evaluation of the Project

The financial cash flow shows that the expected revenues will not cover the total of expenditures and will not be unable to cover even the operation and maintenance costs.

Generally speaking, it will be very difficult for the airport project to be established and balanced financially; however, it is desirable that the operation and maintenance costs be at least covered by the airport revenues.

As a result, it is recommended that the total airport revenue based on the current airport charge system should be raised by at least 30 %.

CONCLUSIONS AND RECOMMENDATIONS

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Part I "Formation of the Airports Development Concept" concluded that the long-term development of the major airports in Central Java province and D.I. Yogyakarta should be implemented by the following development policies:

- Development of the new Yogyakarta airport
- Redevelopment of the existing Surakarta airport
- Redevelopment of the existing Semarang airport after review of the master plan already prepared

The feasibility study on the new Yogyakarta airport development project was executed in Part II based on the above conclusion.

Based on the comprehensive study presented in Vol. 1, Part II, the construction project of the new airport which is located 2 Km east of the existing Yogyakarta airport is judged feasible both in terms of engineering and national economy of Indonesia.

The cost of the project is estimated to be approximately billion Rp. 104 and billion Rp. 30 in Phases I and II, respectively, and the economic internal rate of return (EIRR) is estimated to be 13.9 %, and net present value (NPV) to be approx. billion Rp. 15.

By the implementation of this project, the following beneficial impacts can be expected on the air transportation and the socio-economic situation;

- Unrestricted and flexible air transport services can be ensured to the increasing air traffic demand in future.
- Safe and efficient operation of aircraft can be promoted, especially for training aircraft and civil flights in the military training area.
- Aircraft noise influence to Yogyakarta city can be largely reduced.

- Implementation of this project will contribute to the airlines' profitability by means of introduction of medium and/or wide-body aircraft.

- Tourism development can be promoted by the accommodation of the direct flights from neighbouring countries.

- Implementation of this project will also contribute to the expansion of economic activities in the Yogyakarta region.

- Employment opportunity can be enlarged.

It is recommended that the following actions should be undertaken for the project implementation.

- Airspace above the new Yogyakarta airport should not be re-arranged solely in terms of new Yogyakarta airport but in relation with the redevelopment project of the existing Surakarta airport. To do so, DGAC should constitute a committee closely coordinate with the Indonesian Air Force are made.

- Land acquisition, compensation, topographic survey, soil investigation and detailed engineering services should be completed by mid 1991 so that the construction work for the Phase I project can be started in 1991 and the airport can inaugurate its operation in early 1995.

- By the time of inauguration of the new airport operation, DGAC and BAPPEDA in D.I. Yogyakarta should prepare the land use plan, which will require the consensus of the regional society, in the vicinity of the airport.

- Phase I facilities are to be designed to cope with the air traffic demand in 2000. The construction work for Phase-II project should be completed by around 2000 to cope with the air traffic demand in 2010.