CHAPTER 11

CONSTRUCTION SCHEDULE AND COST ESTIMATES

CHAPTER 11 CONSTRUCTION SCHEDULE AND COST ESTIMATES

11.1 Construction Conditions

11.1.1 Soil and Stormwater Condition

The soil conditions in and around the airport, (based on the results of site survey and soil data analysis) are expected to consist of sand and/or silty sand. The soil conditions in the area where the expansion of the runway at 27 side is planned to be constructed, consist of uncompacted sand at the sea bottom where the settlement will be taken by embankment works, as explained in previous section. The data are shown in the APPENDIX 9.4.1 and 11.1.1 - 4.

With regard to rainfall density, the rainfall density is about 70mm/h based on the results of data analysis. The detailed information is presented in the APPENDIX 9.4.2 and 9.4.3.

11.1.2 Construction Materials

Most of the materials to be used for the airport construction have been imported from other islands with the exception of sand, gravel, lime stone, brick, coconut timbers and bamboo. The required construction materials, therfore, shall be procured in advance in order to carry out smooth construction progress.

11.2 Civil Works

11.2.1 Temporary Works

Since there is ample space in the airport [illegible] it is easy to allocate the areas required [illegible] construction plant and other temporary areas [illegible] construction works for the development project. In order to separate vehicles engaged in construction works and those involved in general use, as much as possible, and at a convenient and close location to the site, the area east of the new fire

station has been designated to be used for temporary construction yards.
Reclamation works are anticipated in this development plan.

A large amount of sand fill is required to be brought from outside the airport area.

Bukit Badung is assumed to be the location for a borrow pit for this purpose. Bali Tourist Resort Link Highway will be used as a part of link road between the borrow pit and the airport. No traffic problem is foreseen on this highway section, however, the section from the borrow pit to the highway may require a partial widening of the existing road.

In the airport area, no special measures for a construction road will be required for maneuvering heavy construction equipment becuase the soil in the airport area consist of silty-sand and trafficability for such equipment can be maintained.

11.2.2 Earth Work

The first priority for earth work shall be the reclamation work in the area designated for extension of the runway. A loose silty sand layer exists at the sea bottom and about 60cm of settlement was observed under 4 meters of embankment. This was about the same for the required reclamation during the construction of the Bali Tourist Resort Link Highway located near the airport site. The silty sand layer has contributed to such settlement from sea bed down for a thickness of about 4 meters Standard penetration tests in this layer resulted in an N-value relationship of 1 to 2. The settlement time is not so long because the soil is sandy as shown in the APPENDIX 9.4.1.

It is recommended that the reclamation works be completed at the earliest possible time and that a surcharge load equivalent to the weight of pavement structure be placed to eliminate 95% of the anticipated settlement prior to the start of paving operations.

The required time period for the above-mentioned reclamation work including the settlement time for 95% of the settlement to occur will be within one year. This time period is therefore scheduled for the earth work.

11.2.3 Pavement Work

The pavement works shall be performed in such a way that there will be no interference with airport operations. It is intended that completed pavement areas will be utilized after construction has been completed. It is inevitable, however, that the extension of the runway and connecting areas between the runway and exit taxiways of the pavement works will be executed during limited airport operation hours at night.

The pavement work construction time schedule, and methodology and the areas in taxiways where utilization during the airport operating hours prohibited must be carefully studied.

11.3 Architectural Works

Since the existing terminal buildings are still in operation, the construction method for work in the existing terminal buildings should be studied carefully in order not to influence use of the existing buildings during the construction period. Details are explained in the APPENDIX 11.3.1 - 6 .

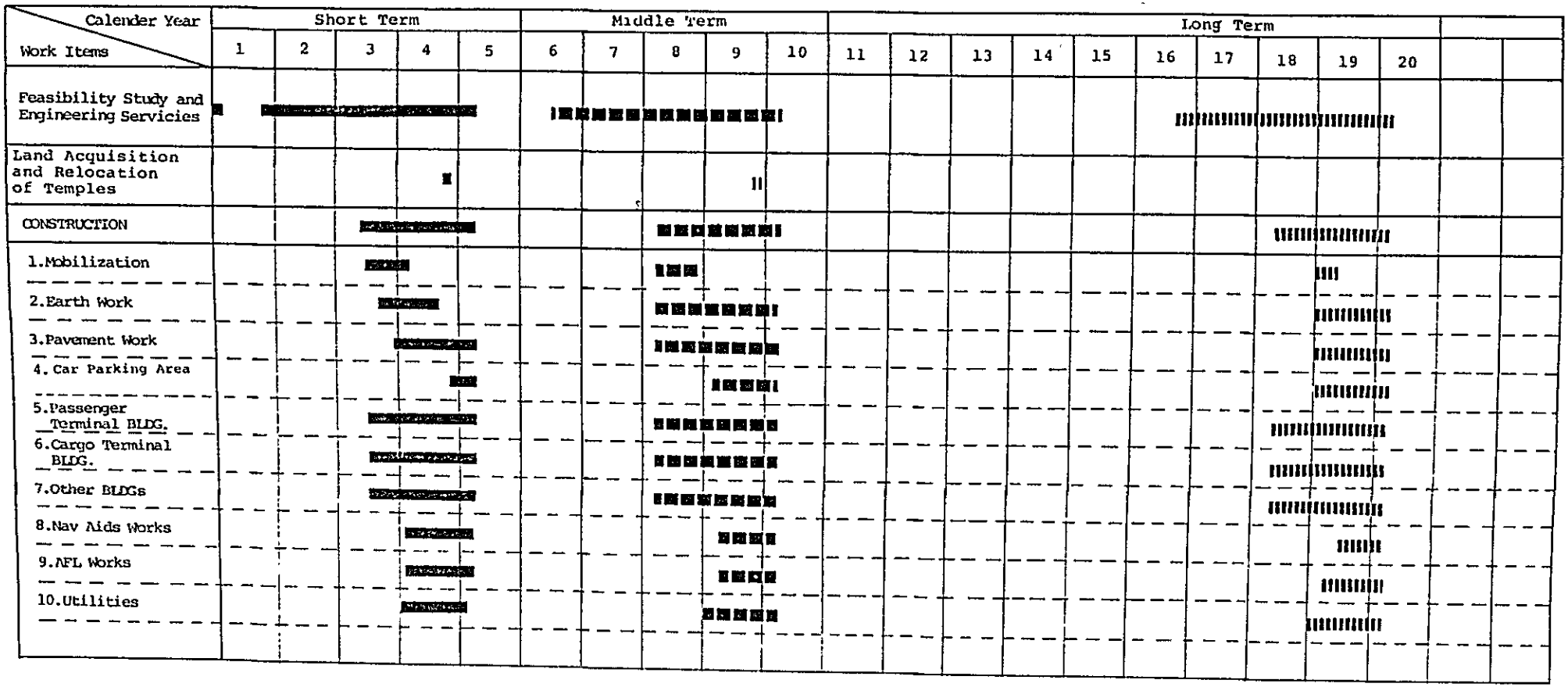
Temporary architectural work should be considered to provide sufficient safety precaution not only for the passengers and relevant airport employees but also for construction staff and workers during the construction

period. Preparing an area for temporary work such as storage for construction materials and plants and site offices should also be examined in order to confirm those items which have no influence on passenger and traffic flows on the landside. The area north of the airport for temporary work is recommended for use. With regard to temporary housing for construction staff and workers, it is recommended that the location for such housing be established south of the airport. The necessary safety barriers should be installed in order not to affect airport operations.

11.4 Construction Schedule

The construction schedul is summarized in Table 11.4.1. Each development plan requires for its implementation, approximately 6 to 8 months to select the planning consultant and complete drawings, and also about 20 to 24 months for selecting the contractor and for the construction. Therefore, the preparations should begin about 4 to 5 years in advance for each construction completion target year.

Table 11.4.1 CONSTRUCTION SCHEDULE



11.5 Construction Cost

Table 11.5.1 shows the approximate construction cost for each development plan based on the following conditions.

(1) Although oil prices were increased in January 1982 by 60% in the area involved affecting the local price index, the estimate of construction cost has been based on the price index as of the end of December, 1981, without taking those factors into consideration.

(2) Exchange rate is: US 1 dollar = 644 Rupia = 220.10 Yen.

(3) The contingency ratio was established as 10% of the total construction cost.

(4) All construction costs are assumed to be tax exempt.

(5) Out of the total construction cost, the following costs are to be paid in foreign currency.

  i) Procurement costs for the imported construction equipments (excluding the tariff).

  ii) Procurement costs for imported materials such as asphalt, equipments and the building construction materials (excluding the tariff).

  iii) The general expenses and the profit for the contractor are paid in foreign currency.

  iv) Wages for foreign laborers.

(6) The following costs have been allocated for payment in domestic currency.

  i) The operating expenses for the construction equipment (including fuel, lubrication etc.)

ii) The procurement costs of the construction materials which are available locally such as steel, cement, gravel and so on.

iii) The transportation costs for the materials and the laborers.

iv) The contractors' expenses and profits, for both the foreign and the local, for the amounts paid in domestic currency.

v) Wages for the native laborers.

vi) The acquisition costs of the land for construction.

Table 11.5.1 ESTIMATED CONSTRUCTION COST

Unit: Million Rupiah

Item			Short Term			Middle Term			Long Term			TOTAL		
			Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total
Civil Work	Pavement Work	Runway	1,367	844	2,211	-	-	-	-	-	-	1,367	844	2,211
		Taxiway	1,337	852	2,189	1,212	774	1,986	-	-	-	2,549	1,626	4,175
		Apron	1,016	648	1,664	1,425	911	2,336	152	96	248	2,593	1,655	4,248
		Car parking Area	126	79	205	91	55	146	102	67	169	319	201	520
	Drainage Work		245	456	701	82	152	234	-	3	3	327	611	938
	Earth Work		1,121	748	1,869	2,733	1,822	4,555	3,212	2,140	5,352	7,066	4,710	11,776
	Miscellaneous		272	166	438	9	6	15	6	6	12	287	178	465
	SUB TOTAL		5,484	3,793	9,277	5,552	3,720	9,272	3,472	2,312	5,784	14,508	9,825	24,333
Architectural Work	International PAX B L D G		6,097	4,065	10,162	1,840	1,226	3,066	3,451	2,301	5,752	11,388	7,592	18,980
	Domestic PAX B L D G		631	420	1,051	9,005	6,004	15,009	4,836	3,224	8,060	14,472	9,648	24,120
	Cargo Terminal B L D G		596	397	993	254	169	423	596	397	993	1,446	963	2,409
	Others		491	327	818	1,752	1,168	2,920	526	350	876	2,769	1,845	4,614
	SUB TOTAL		7,815	5,209	13,024	12,851	8,567	21,418	9,409	6,272	15,681	30,075	20,048	50,123
Navigational Aids System Work	Navigational Aids		972	108	1,080	1,314	146	1,460	447	50	497	2,733	304	3,037
	Field Lighting		552	61	613	26	3	29	263	29	292	841	93	934
	SUB TOTAL		1,524	169	1,693	1,340	149	1,489	710	79	789	3,574	397	3,971
Services Facility Works	Power Supply & Generating System		251	44	295	920	161	1,081	622	108	730	1,793	313	2,106
	Others		496	88	584	1,367	239	1,606	1,241	219	1,460	3,104	546	3,650
	SUB TOTAL		747	132	879	2,287	400	2,687	1,863	327	2,190	4,897	859	5,756
Special Services Facility Works	Boarding Bridge		625	32	657	359	20	379	1,104	123	1,227	2,088	175	2,263
TOTAL			16,195	9,335	25,530	22,389	12,856	35,245	16,558	9,113	25,671	55,142	31,304	86,446
Contingency			1,600	900	2,500	2,200	1,300	3,500	1,600	900	2,500	5,400	3,100	8,500
Consulting Fee			2,686	-	2,686	2,628	-	2,628	1,752	-	1,752	7,066	-	7,066
GRAND TOTAL			20,481	10,235	30,716	27,217	14,156	41,373	19,910	10,013	29,923	67,608	34,404	102,012

CHAPTER 12

ECONOMIC AND FINANCIAL ANALYSIS

CHAPTER 12 ECONOMIC AND FINANCIAL ANALYSIS

12.1 Outline of Economic Analysis

The purpose of the economic analysis is to evaluate the national benefits which the Bali Int'l Airport development plan will produce for Indonesian society. Cost-benefit analysis will be used to isolate the benefits arising from the project; i.e., by comparing with project and without project cases based on market prices. In order to calculate market price, all the costs and benefits are classified into 3 categories: namely, imported and exported goods, local products and manpower. For all categories, foreign and local currency portions are indicated in order to establish the market price base.

Since the Asian Development Bank indicates that shadow price rates are not necessary to apply for Indonesia, it was decided not to apply a shadow price rate for this project. Fixed market prices were adopted as those prevailing at the end of December, 1981. Economic inflation was not taken into consideration.

As to project life, since an airport project is a complex of elements consisting of a runway, passenger terminal buildings, air navigational facilities,etc., it is difficult to evaluate a definitive project life. Nevertheless, for Bali International project it was decided to adopt a project life of 30 years or until the year 2011. Foreign exchange rates at the end of December, 1981 were as follows:

US$ 1.00 = R.p 644
US$ 1.00 = ¥ 220.10
R.p 1.00 = ¥ 0.3428

For this study, physical contingency is included in the construction cost estimates and price contingency for inflation is considered in the sensitivity analysis. Economic cost excluded taxes on interest as well as depreciation. In this study, cost-benefit assessment,

internal rate of return (IRR), cost benefit ratio and net profit value (NPV) have been calculated.

12.2 Construction, Operation and Maintenance Costs

12.2.1 Construction Costs

Construction costs for the Bali International Airport Development Plan are composed of construction, operation and maintenance costs. Construction itself is divided into 3 stages as described in Chapter 11: namely, Short Term (up to 1990), Middle Term (up to 2000), and Long Term (up to 2010). Costs for each phase are summarized below.

Table 12.2.1 Construction Cost Summary

(Unit: Million Rp)

Item	Short Term	Middle Term	Long Term	Total	%
Civil Work	9,277	9,272	5,784	24,333	24.0
Architectural Work	13,024	21,418	15,681	50,123	49.1
NAVA'IDS System Work	1,693	1,489	789	3,971	3.9
Service Facilities Works	879	2,687	2,190	5,756	5.6
Special Service Facilities Works	657	379	1,227	2,263	2.2
Subtotal	25,530	35,245	25,671	86,446	84.7
Contingency	2,500	3,500	2,500	8,500	8.3
Consulting Fee	2,686	2,628	1,752	7,066	6.9
TOTAL	30,716	41,373	29,923	102,012	100.0
%	30.1	40.6	29.3	100.0	-

12.2.2 Operation and Maintenance Costs

Operation and maintenance costs are composed of three items: maintenance and repair work, personnel and administration and consumables including electricity and water. These costs are calculated based on the following rates:

(1) Maintenance and repair rates

O/M Items	Rate
Airside infrastructure	1% of the construction cost
Terminal buildings	Ditto
Equipment and Facilities	5% of the equipment and facilities construction cost

(2) Personnel and administration rates

Average personnel cost is based on current average salary rates at Bali International Airport. Annual personnel and administration cost is estimated by multiplying the current average salary rates by the number of employees in the airport staff organization plan stated in Section 10.5.

(3) Purchase Cost

Purchase cost for various materials such as electricity, water and consumables necessary for airport administration.

Based on past experience at Bali Int'l Airport, purchase costs have roughly equalled personnel and administration costs.

Hence, a cost value equal to personnel and administrative cost was adopted.

12.2.3 Total Project Costs

By allocating the construction and operation/ maintenance costs discussed in the previous section by year of expenditure, the following total project cost flow is obtained.

Year	CONSTRUCTION COST	O & M	TOTAL COST
1982	204.0	0.	204.0
1983	1168.0	0.	1168.0
1984	5967.0	0.	5967.0
1985	16583.0	0.	16583.0
1986	6796.0	921.0	7717.0
1987	292.0	921.0	1213.0
1988	292.0	921.0	1213.0
1989	10612.0	921.0	11533.0
1990	19078.0	921.0	19999.0
1991	11110.0	1345.0	12455.0
1992	0.	1345.0	1345.0
1993	0.	1345.0	1345.0
1994	0.	1345.0	1345.0
1995	0.	3345.0	3345.0
1996	0.	1441.0	1441.0
1997	292.0	1441.0	1733.0
1998	584.0	1441.0	2025.0
1999	6132.0	1441.0	7573.0
2000	15243.0	1441.0	16684.0
2001	7733.0	1666.0	9399.0
2002	0.	1666.0	1666.0
2003	0.	1666.0	1666.0
2004	0.	1666.0	1666.0
2005	0.	4066.0	4066.0
2006	0.	1714.0	1714.0
2007	0.	1714.0	1714.0
2008	0.	1714.0	1714.0
2009	0.	1714.0	1714.0
2010	0.	1714.0	1714.0

(Unit: Million Rp)

12.3 Estimation of Benefits

Without the Bali International Airport development plan, the capacity of the existing terminal buildings and aprons will reach a saturated condition in 1985. Consequently, passenger and aircraft growth will be curtailed at the 1985 saturation limit. Beyond this limit, passengers and aircraft will go elsewhere.

Therefore, benefit is calculated based on the increased numbers of passengers and aircraft starting from 1986 which can be handled as a result of the airport expansion. Direct benefits calculated in this study are derived from 3 sources: tourist foreign currency exchange, aircraft fees (landing and R.A.N.F. charges) and airport tax paid by international passengers.

12.3.1 Foreign Exchange Benefit from Foreign Passengers

It is assumed that 70% of the surplus number of foreign passengers above the BIA saturation limit will go to other Indonesian tourist resorts. The balance of 30% will go to countries other than Indonesia. Hence, the benefit to Indonesia is based on 30% of the increase in the number of tourists as a result of the airport expansion. The direct national benefit from tourists is income in the form of foreign exchange.
Forecast of DOM. and INT'L Pax. are shown in Tables 12.3.1 and 12.3.2.

(1) The tourism expenditure per passenger in Bali was estimated to be US$346 by the Bank Indonesia at Denpasar in 1980 as follows:

Total foreign currency exchanged	US$82,635,000
Annual No. of passengers	239,000
Average expenditure per passenger	346

(Note: Data from 1980 was selected since wide-body aircraft were introduced in that year and their continued use thereafter is expected.)
Based on the above data, US$350 was adopted as the forecast expenditure per passenger of BIA.

(2) The number of incoming foreign passengers was calculated to be 50% of the total forecast foreign arrivals and departures shown in Table 12.3.3.

(3) Although the average added value ratio of tourism in the world is considered to be 70%, the added value ratio of Japan is about 60% at present. Consequently, as a conservative estimate, the added value ratio for this project is adopted to be 60%.

(4) The foreign exchange benefit flow for the life of the project shown in Table 12.3.3 is based on the following formula:

Annual Benefit = Pax X Exp. X Valadd X Exch.

where : Pax = 30% of No. of surplus Int'l Arr. & Dep. above the 1985 level X 50%

Exp = Forecast foreign exchange expenditure per Pax (US$350)

Valadd = Added value ratio from tourism (60%)

Exch.= Exchange Rate (US$ 1=644 Rp)

Table 12.3.1 DEMAND FORECAST OF DOM. & INT'L PAX'S
(PEAK. DAY. PAX.)

(unit: person)

	DOM. PAX		INT'L PAX		Annual Pax
	Annual Pax	Peak Day Pax	Annual Pax	Peak Day Pax	
1980	340,000	1,130	478,000	1,700	818,000
1981	384,000	1,280	533,000	1,890	917,000
1982	434,000	1,440	595,000	2,110	1,029,000
1983	491,000	1,630	663,000	2,350	1,144,000
1984	554,000	1,840	739,000	2,620	1,293,000
1985	626,000	2,080	824,000	2,920	1,450,000
1986	710,000	2,360	900,000	3,200	1,610,000
1987	800,000	2,660	980,000	3,480	1,780,000
1988	900,000	2,990	1,070,000	3,800	1,970,000
1989	1,020,000	3,390	1,160,000	4,120	2,180,000
1990	1,150,000	3,710	1,270,000	4,300	2,420,000
1991	1,240,000	4,000	1,360,000	4,610	2,600,000
1992	1,330,000	4,290	1,460,000	4,950	2,790,000
1993	1,430,000	4,610	1,570,000	5,320	3,000,000
1994	1,540,000	4,970	1,680,000	5,690	3,220,000
1995	1,660,000	5,360	1,800,000	6,100	3,460,000
1996	1,780,000	5,740	1,910,000	6,470	3,690,000
1997	1,910,000	6,160	2,000,000	6,770	3,910,000
1998	2,060,000	6,650	2,200,000	7,450	4,260,000
1999	2,210,000	7,130	2,300,000	7,790	4,510,000
2000	2,380,000	7,290	2,440,000	7,870	4,820,000
2001	2,500,000	7,660	2,560,000	8,260	5,060,000
2002	2,620,000	8,030	2,700,000	8,710	5,320,000
2003	2,750,000	8,430	2,840,000	9,160	5,590,000
2004	2,880,000	8,830	2,990,000	9,650	5,870,000
2005	3,030,000	9,290	3,150,000	10,160	6,180,000
2006	3,180,000	9,750	3,300,000	10,650	6,480,000
2007	3,340,000	10,240	3,460,000	11,160	6,800,000
2008	3,510,000	10,760	3,620,000	11,680	7,130,000
2009	3,690,000	11,310	3,800,000	12,260	7,490,000
2010	3,870,000	11,860	4,000,000	12,900	7,870,000

Table 12.3.2 DEMAND FORECAST OF DOM. & INT'L PAX'S
(PEAK. DAY. PAX)

(unit: person)

	DOM. PAX		INT'L PAX		Annual Pax
	Annual Pax	Peak Day Pax	Annual Pax	Peak Day Pax	
1980	530,000	1,810	288,000	1,020	818,000
1981	597,000	2,040	320,000	1,130	917,000
1982	672,000	2,280	357,000	1,270	1,029,000
1983	756,000	2,560	388,000	1,410	1,144,000
1984	850,000	2,890	443,000	1,570	1,293,000
1985	956,000	3,250	494,000	1,750	1,450,000
1986	1,070,000	3,640	540,000	1,920	1,610,000
1987	1,190,000	4,050	590,000	2,090	1,780,000
1988	1,330,000	4,510	640,000	2,280	1,970,000
1989	1,480,000	5,040	700,000	2,470	2,180,000
1990	1,660,000	5,430	760,000	2,580	2,420,000
1991	1,780,000	5,840	820,000	2,770	2,600,000
1992	1,910,000	6,270	880,000	2,970	2,790,000
1993	2,060,000	6,740	940,000	3,190	3,000,000
1994	2,210,000	7,250	1,010,000	3,410	3,220,000
1995	2,380,000	7,800	1,080,000	3,660	3,460,000
1996	2,540,000	8,330	1,150,000	3,880	3,690,000
1997	2,710,000	8,870	1,200,000	4,060	3,910,000
1998	2,940,000	9,630	1,320,000	4,470	4,260,000
1999	3,130,000	10,250	1,380,000	4,670	4,510,000
2000	3,360,000	10,440	1,460,000	4,720	4,820,000
2001	3,520,000	10,960	1,540,000	4,960	5,060,000
2002	3,700,000	11,510	1,620,000	5,230	5,320,000
2003	3,890,000	12,090	1,700,000	5,500	5,590,000
2004	4,080,000	12,690	1,790,000	5,790	5,870,000
2005	4,290,000	13,350	1,890,000	6,100	6,180,000
2006	4,500,000	14,010	1,980,000	6,390	6,480,000
2007	4,720,000	14,700	2,080,000	6,700	6,800,000
2008	4,960,000	15,430	2,170,000	7,010	7,130,000
2009	5,210,000	16,210	2,280,000	7,360	7,490,000
2010	5,470,000	17,020	2,400,000	7,740	7,870,000

NOTE : Not include transit passengers

Table 12.3.3 TOURISM FOREIGN CURRENCY BENEFIT FLOW

Year	Forecast Total No. of Int'l Arr. & Dep.	Benefits (Million Rp)
1986	900,000	1,156
87	980,000	3,165
88	1,070,000	4,990
89	1,160,000	6,816
90	1,270,000	9,048
91	1,360,000	10,873
92	1,460,000	12,902
93	1,570,000	15,133
94	1,680,000	17,365
95	1,800,000	19,799
96	1,910,000	22,031
97	2,000,000	23,856
98	2,200,000	27,914
99	2,300,000	29,942
2000	2,440,000	32,782
01	2,560,000	35,216
02	2,700,000	38,057
03	2,840,000	40,897
04	2,990,000	43,939
05	3,150,000	47,185
06	3,300,000	50,228
07	3,460,000	53,474
08	3,620,000	56,720
09	3,800,000	60,371
10	4,000,000	64,428

12.3.2 Foreign Exchange Benefits from Aircraft Fees

Without the project, 30% of the aircraft greater than the 1985 level would be diverted to distinations outside Indonesia. With the project, the fees collected from them such as landing charges, route air navigation facility charges etc.

constitute a foreign exchange benefit of the project.

This benefit is calculated by multiplying the surplus number of foreign airline movements greater than the 1985 level as established in Chapter 3, times the landing charge, route air navigation facility charge, etc. as stated in Table 12.9.2, airport charge. The resulting flow of benefits is shown below.

Year	Benefits from Aircraft Fees (Million Rp)
1986	311.0
1987	456.0
1988	498.0
1989	539.0
1990	580.0
1991	631.0
1992	689.0
1993	749.0
1994	816.0
1995	890.0
1996	955.0
1997	1026.0
1998	1101.0
1999	1182.0
2000	1268.0
2001	1343.0
2002	1422.0
2003	1508.0
2004	1595.0
2005	1690.0
2006	1784.0
2007	1885.0
2008	1991.0
2009	2103.0
2010	2222.0

12.3.3 Foreign Exchange Benefit from Pax Airport Tax

Since foreign passengers pay airport tax when they leave Bali international airport, these charges are an additional foreign exchange benefit. Calculation of the foreign currency benefit is made by multiplying the airport tax (Rp 2,000 per passenger) by the number of surplus Int'l Pax as calculated in section 12.3.1 (4).
The resulting benefit flow is shown below:

Year	Benefits from Pax Airport Tax (Million Rp)
1986	17.0
1987	47.0
1988	74.0
1989	101.0
1990	134.0
1991	161.0
1992	191.0
1993	224.0
1994	257.0
1995	293.0
1996	326.0
1997	353.0
1998	413.0
1999	443.0
2000	485.0
2001	521.0
2002	563.0
2003	593.0
2004	650.0
2005	698.0
2006	743.0
2007	791.0
2008	839.0
2009	893.0
2010	953.0

12.3.4 Other Direct Benefits

In addition to the items mentioned above, the domestic passengers who use Bali International Airport on business will experience a time saving benefit due to the rationalization of the air-

port flows resulting from airport expansion. Since the data available for forecasting the number of such passengers is inadequate, the time saving benefit has not been estimated in this study.

12.3.5 Total Project Benefits

Total direct project benefits are a composite of the foreign exchange earnings generated over and above the "without project case." The benefits cover exchange of currency by tourists, aircraft fees (landing and R.A.N.F. charges) and international passenger airport tax. The sum of all the benefit flows for these items (i.e. the total flow of project benefits) is as follows:

Year	Total Benefit
1986	1484.0
1987	3668.0
1988	5562.0
1989	7456.0
1990	9762.0
1991	11665.0
1992	13782.0
1993	16106.0
1994	18438.0
1995	20982.0
1996	23312.0
1997	25235.0
1998	29428.0
1999	31567.0
2000	34535.0
2001	37080.0
2002	40042.0
2003	42998.0
2004	46184.0
2005	49573.0
2006	52755.0
2007	56150.0
2008	59550.0
2009	63367.0
2010	67603.0

12.4 Cost-Benefit Analysis

Based on the cost-benefit flows which were calculated in the previous sections, factors for economic evaluation such as internal rate of return, B/C ratio, etc. were calculated. The results are shown below.

Item \ Discount Rate	i=10%	i=15%	i=20%
Total Discounted Costs (Mil. Rp.)	57,410.5	42,012.1	32,523.4
Total Discounted Benefits (Mil. Rp.)	127,801.5	62,765.8	34,220.6
Net Present Value (Mil. Rp.)	70,391.0	20,753.7	1,697.2
Benefit/Cost Ratio	2.23	1.49	1.05
Internal Rate of Return = 20.8%			

Since the benefits are more than 1 1/2 times the costs using an interest rate of 15% and since the IRR is almost 21%, the project is economically viable and is recommended to be undertaken by the Government of Indonesia.

12.5 Sensitivity Analysis

As mentioned in Section 12.3, the forecast of benefit is extremely conservative. Nonetheless, price escalation within Indonesia is quite possible. For example, the domestic prices of petroleum products were raised by 60 percent from Jan. 1982. It is not yet known how this price rise will affect the construction cost of this development project. To evaluate the sensitivity of unforseen escalation in construction costs, the benefits of this development project, a sensitivity analysis was carried out for 10 and 20 percent increments in the total project cost.

The results shown below indicate that the project is not sensitive to cost changes since a 20% increase in total project costs only lowers the IRR by 2.5%. The Benefit-cost ratio also still remains at about 1.3 even with the

20% increase on the discount rate 15% in total project cost. Hence, economic viability of the project seems assured. Other non-qualifiable benefits which justify the construction works are discussed in the follwing section. Economic analysis data are shown in the APPENDIX 12.5.1-3.

Sensitivity Analysis Results

	IRR	B/C Ratio		
		i=10%	i=15%	i=20%
Base Case	20.8	2.2	1.5	1.1
+10% Cost	19.5	2.1	1.4	1.0
+20% Cost	18.3	1.9	1.3	0.9

12.6 Indirect Benefits

In addition to the direct economic benefits of this project, expansion of BIA facilities also will produce substantial indirect benefits which, although not contributing to the national economy, will contribute to the achievement of national goals. The major indirect benefits discussed in the sections below cover the role of BIA as the eastern gateway, eastern air route node, promoter of Lombok Island development and the improvement of safe aircraft operation at BIA.

(1) The Bali International Airport plays the very important role as the eastern air gateway of Indonesia and as the most advanced air node in domestic air routes to the isolated eastern islands (Nusa Tenggara Barat, Timur, Southern Sulawesi, Naluku, Irian, Jaya, etc.).
In the successive national development plans of Indonesia (REPELITA), the development of these eastern islands is scheduled. Bali International Airport will therefore function as the base and

transit airport for the manpower and commodities required for this development.

(2) At present, there is severe congestion in the Malaka Channel which is an important trunk sea route for the international trade located between Sumatra Island and Peninsular Malasia.
The Government of Indonesia and PERTAMINA have an oil terminal development plan for Lombok and air traffic between BIA and Lombok's Ampenan Airport is increasing rapidly. At this moment, it is considered that large scale develpment of Ampenan Airport is difficult. However, the Development Project of BIA will serve this traffic as a nearby route node. This will promote the development of Lombok Island and help preserve the integrity of the Lombok Channel.

(3) The development project of BIA, especially the runway extension and the works to achieve conformity to ICAO standards (such as widening of the runway strip and setting the apron back) will make a considerable improvement in the safe opertion of aircraft.

12.7 Outline of Financial Analysis

The purpose of the financial analysis is to verigy the financial viability of the airport as an investment. In addition, studies regarding revenue/expenditure flows are made in order to determine a policy for the sound financial execution of the project. The basic method of this study is financial cost-benefit analysis.

12.8 Present Financial Status of BIA

The operation and management of BIA is made by Perum Angkasa Pura a managing public corporation entrusted and supervised by the Government of Indonesia, Ministry of Transport and Telecommunication.

Perum Angkasa Pura is also in-charge of the operation and management of Halim International and Kemayoran Airports in Jakarta.

Table 12.8.1 below shows the financial returns of BIA from 1971 to 1980.

Table 12.8.1 FINANCIAL RETURNS OF BIA

Unit: Rp.

Year	Annual Revenue	Annual Expenditure	Annual Surplus
1971	136,484,278	15,552,273	120,932,005
1972	166,670,872	26,703,831	139,967,041
1973	262,621,521	95,112,993	167,508,528
1974	325,919,217	252,113,677	73,805,540
1975	352,844,676	338,239,262	14,605,414
1976	562,166,977	333,268,735	228,898,242
1977	844,383,312	336,616,000	507,767,312
1978	663,335,585	407,609,000	255,726,686
1979	951,879,669	518,467,000	433,412,669
1980	1,167,369,417	565,415,000	601,954,417

It can be seen from Table 12.8.1 that the BIA has a very sound financial basis.

12.9 Financial Forecast

12.9.1 Estimation of Financial Costs

The financial costs for this project consist of capital expenditures (ie, construction costs of the development works) and operational expenditures(ie, running costs of BIA).

The assumptions for estimating these financial costs are as follows:

(1) Construction costs for the development works
The same costs estimated in Chapter 11 of this Study are adopted. (Refer to Table 11.5.1)

(2) Operational costs
Operational costs consist of maintenance cost, personnel salaries and material cost (including fuel and lighting).

It is noted that financial operational costs use economic estimates with the price escalation for inflation.

(a) Maintenance costs of airport facilities are assumed to be the same as in Section 12.2.2.

(b) Personal expenses
Personnel expenses are assumed to increase in proportion to per capita GDP which indicates the personal income level.
Per capita GDP of Indonesia is forecast to grow at an average of 5.5 percent per annum as shown in Table 12.9.1. Thus the salaries for operational and managing staff of the BIA are also expected to increase at an average of 5.5 percent per annum.

The same base salaries as indicated in the previous Section 12.2.2 are adopted here.

Table 12.9.1 FORECAST GDP OF INDONESIA

	Actual		Forecast		
	1978	1980	1990	2000	2010
GDP (bill. 1978 Rp)	22,456	25,215	53,189	109,624	225,940
Population (1000)	137,801	147,331	179,431	214,439	256,277
Per Capita GDP (1000 Rp.)	162.9	171.1	296.4	511.2	881.6

(c) Purchase costs

As mentioned in Section 12.2.2 on economic cost, purchase costs are adopted as the same value as the personal expenses for the base year, 1981, however, the growth rate of material costs is forecast as an average 2.5 percent per annum.

(d) Total financial costs

Based on the abovementioned factors, total financial cost flow is estimated as follows:

	CAPITAL EXP.	CURRENT EXP.	TOTAL EXP.
1982	204.0	0.0	204.0
1983	1168.0	0.0	1168.0
1984	5967.0	0.0	5967.0
1985	16583.0	0.0	16583.0
1986	6796.0	1090.0	7886.0
1987	292.0	1129.0	1421.0
1988	292.0	1170.0	1462.0
1989	10612.0	1211.0	11823.0
1990	19078.0	1256.0	20334.0
1991	11110.0	1821.0	12931.0
1992	0.0	1882.0	1882.0
1993	0.0	1945.0	1945.0
1994	0.0	2012.0	2012.0
1995	0.0	4081.0	4081.0
1996	0.0	2330.0	2330.0
1997	292.0	2414.0	2706.0
1998	584.0	2504.0	3088.0
1999	6132.0	2596.0	8728.0
2000	15243.0	2692.0	17935.0
2001	7733.0	3081.0	10814.0
2002	0.0	3191.0	3191.0
2003	0.0	3309.0	3309.0
2004	0.0	3430.0	3430.0
2005	0.0	5960.0	5960.0
2006	0.0	3830.0	3830.0
2007	0.0	3977.0	3977.0
2008	0.0	4133.0	4133.0
2009	0.0	4295.0	4295.0
2010	0.0	4465.0	4465.0
TOTAL	102086.0	69804.0	171890.0

12.9.2 Forecast of Financial Benefits

The financial benefits (financial revenue) includes the following items:

* Landing charge
* Aircraft parking charge
* Overnight stay charge
* Route Air Navigation Facility charge
* Lighting charge
* Passenger service charge
* Rental Fee

The values for the above listed charges are forecast based on the present charge system of DGAC except for the concession charge.

The adopted unit values of these charges of base year 1980 are summarized in Table 12.9.2.

Table 12.9.2 AIRPORT CHARGES (1980)

	International	Domestic
1. Landing Charges		
i) For each 1,000 kg or its part of MTOW up to 40,000 kg	US$3.00	Rp 855
ii) For each 1,000 kg or its part of MTOW above 40,000 kg but below 100,000 kg	US$3.50	Rp1,140
iii) For each 1,000 kg or its part of MTOW above 100,000 kg	US$4.60	Rp1,330
2. Lighting Charge	n.a.	Rp13,800
3. Parking Charge (for each 1,000 kg of MTOW)	US$0.30	Rp 145
4. Overnight Stay Charge (for each 1,000 kg of MTOW)	US$0.60	Rp 290
5. Route Air Navigation Facility Charge (for each Route Unit)	US$0.30	Rp 185
6. Air Passenger Service Charge		
Halim, Kemayoran and Denpasar	Rp 2,000	Rp 1,000
Class I Airport	Rp 1,700	Rp 900
Class II Airport	Rp 1,500	Rp 700
Class III Airport	Rp 1,200	Rp 600

Note: i) Landing Charge: For domestic flight by foreign registered airplanes, the international rate shall be charged.

ii) Landing, Lighting and Parking Charges: The full charges shall be levied only at Halim, Kemayoran and Denpasar airports. 75% of them are applied to Class I airports.

iii) Parking Charge: Parking less than 2 hours shall be exempt from this charge.

iv) Route Air Navigation Facility Charge: Route Unit equals to Distance Factor multiplied by Weight Factor.

v) Distance and Weight Factors: For air routes and aircrafts studied in this report, distance factors and weight factors are shown in Table 10.2.2.

vi) MTOW: Maximum Take - Off Weight.

(1) Breakdown of landing charge

The landing charge by aircraft type is in proportion to the weight of each aircraft. The charges for the base year 1980 are summarized in Table 12.9.3.

Table 12.9.3 LANDING CHARGES (1980)

Aircraft	MTOW (1000 kg)	Landing Fee Domestic	Landing Fee International
		(Rp)	(US$)
B-747-200B	372	494,760	1,711
DC-10-30	252	335,160	1,159
A-300B4	165	219,450	
DC-9-32	49	55,860	
F-28	32.2	27,530	
F-27	20.41	17,450	
DHC-6	5.67	4,850	

Thus the landing charges in each year are forecast based on the above aircraft charges and number of landings for each air route (Ref. Chapter 3).

(2) Parking and overnight stay charge

The parking and overnight stay charge for each year are forecast based on the parking configuration, forecast number of flights and number of overnight stay aircraft (Ref. Chapter 3) and values of charges shown in Table 12.9.2.

The total charges of landing, parking and overnight stay are defined as "Landing Charge Revenue".

(3) Route air navigation facility charge

The route air navigation facility charges for each year are forecast based on the weight factor for aircraft type shown in Table 12.9.4, the distance factor for air route shown in

Table 12.9.5 and the number of aircraft movements forecast in Chapter 3.

Table 12.9.4 WEIGHT FACTOR

Aircraft	Weight Factor
B-747-200B	110
DC-10-30	84
A-300B4	60
DC-9-32	23
F-28	17
F-27	12
DHC-6	5

Table 12.9.5 DISTANCE FACTOR

[DPS]	Distance (km)	Factor
∿ [JKT]	686	7
∿ [JOG]	355	4
∿ [SUB]	299	3
∿ [UPG]	620	6
∿ [MOF]	765	8
∿ [SWQ]	313	3
∿ [AMI]	103	1
∿ [KOE]	928	9
∿ [WGP]	560	6
∿ [SYD]	494	5
∿ [PER]	367	4
∿ [DWR]	380	4
∿ [JKT]	1,040	10

(4) Lighting charge

The lighting charge for each year is forecast based on the number of aircraft movements after 18:00 forecast in Table 10.2.1 and unit

charge shown in Table 12.9.2.
The total of route air navigation facility charge and lighting charge is defined as the "Facility Charge Revenue".

(5) Passenger Service Charge
The passenger service charge in each year is forecast by multiplying the half of annual arrivals & departures forecast in Chapter 3 with unit charge value shown in Table 12.9.2.

(6) Rental Charge for Buildings Including Electricity Charge
Regarding rental charge for buildings, the actual charge of BIA as of 1981 was adopted;

1,000 R.p/m2/month for domestic terminal area
US$9.00/m2/month for international terminal area

Total amount of rental charge for buildings was estimated based on the above charges and floor space for rent in each stage of the development works.

Unit cost of cargo storage charge was calculated at 3,720 R.p/ton/year based on the construction cost and 30 years depreciation.

Total amount of cargo storage charge was estimated based on the above unit cost and annual cargo demand mentioned in Chapter 3.

Electricity charge was estimated at US$0.1/m2/month/ Rental charge for buildings, based on actual cost as of 1981,

was assumed to increase at an average of 5.5% per annum as shown in Fig. 12.9.1. This growth rate, which is assumed to be proportionate to the increase of passengers, was estimated conservatively.

(7) Total Financial Benefits

Based on the discussion in this seciton, the total financial Revenue flows are calculated as follows:

YEAR	LANDING CHARGE	FACILITY CHARGE	PASSENGER SERVICE	RENTAL FEE	TOTAL REV.
1982	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0
1986	1330.0	557.0	1075.0	201.0	3163.0
1987	1907.0	802.0	1185.0	217.0	4111.0
1988	2054.0	867.0	1305.0	231.0	4457.0
1989	2327.0	931.0	1440.0	249.0	4947.0
1990	2667.0	1014.0	1590.0	272.0	5543.0
1991	2815.0	1062.0	1710.0	1013.0	6600.0
1992	2972.0	1113.0	1835.0	1078.0	6998.0
1993	3130.0	1168.0	1970.0	1148.0	7416.0
1994	3296.0	1221.0	2115.0	1224.0	7856.0
1995	3467.0	1273.0	2270.0	1306.0	8316.0
1996	3799.0	1366.0	2420.0	1393.0	8978.0
1997	4137.0	1459.0	2555.0	1488.0	9639.0
1998	4481.0	1554.0	2790.0	1590.0	10415.0
1999	4829.0	1649.0	2945.0	1704.0	11127.0
2000	5182.0	1740.0	3140.0	1826.0	11888.0
2001	5595.0	1901.0	3320.0	2457.0	13273.0
2002	6014.0	2057.0	3470.0	2613.0	14154.0
2003	6439.0	2212.0	3645.0	2780.0	15076.0
2004	6866.0	2368.0	3830.0	2957.0	16021.0
2005	7299.0	2524.0	4035.0	3145.0	17003.0
2006	7643.0	2638.0	4230.0	3348.0	17859.0
2007	7994.0	2749.0	4440.0	3568.0	18751.0
2008	8350.0	2861.0	4650.0	3803.0	19664.0
2009	8712.0	2977.0	4885.0	4053.0	20627.0
2010	9081.0	3091.0	5135.0	4322.0	21629.0
TOTAL	122386.0	43154.0	71985.0	47986.0	285511.0

12.10 Financial Analysis

The financial cashflows presented in the previous section were discounted to determine the financial rate of return (FIRR). According to the results of calculation, at the previously assumed level of revenue income, FIRR is 7.95%. Since this figure is below the long-term interest rate of 13% which is justified in Indonesia, a test was run to determine at what level the revenues would produce a 13% FIRR. The results shown below indicate that the minimum level would be to increase revenues by 35%. In view of this, a slightly higher figure of 40% is recommended for the project. Financial analysis data are shown in the APPENDIX 12.10.1 - 12.10.4.

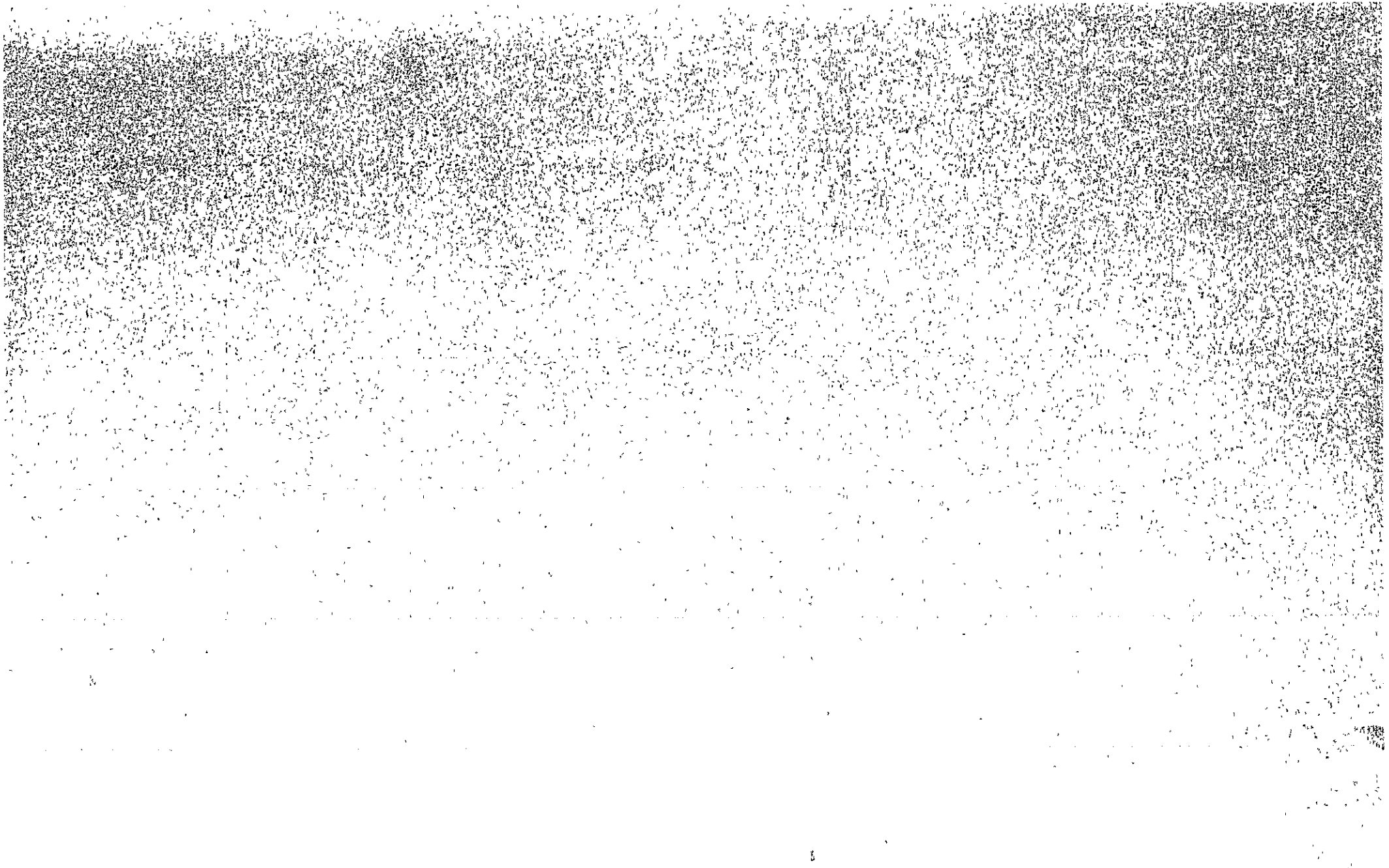
Total Revenue	FIRR	
Base Case	7.95	
+ 5%	8.74	
+10%	9.51	
+15%	10.25	
+20%	10.97	
+25%	11.67	
+30%	12.36	
+35%	13.04	(minimum level)
+40%	13.70	(recommended level)
+45%	14.36	
+50%	15.00	

12.11 Final Evaluation

According to the results of economic and financial analysis, it is judged that the Bali International Airport Development Project is economically justified and financially feasible if a 40% increment in the airport charge is allowed.

Therefore, it is concluded that this project is a suitable plan for promotion by the Indonesian Government.

CONCLSION



CONCLUSIONS

It is recommended as the conclusion of this comprehensive study that the existing Bali International Airport should be urgently developed to meet with ICAO Standards. The short-term Development Plan should be completed within the fiscal year 1985.

The major reasons leading to this conclusion are as follows:

- The airport facilities required to serve the air traffic demand for targeted year 2010 can be developed within the existing premises of the Bali International Airport.
- The construction of improvement and development works for the Bali International Airport for the target year 2010 is economically feasible based on the high project internal rate of return (IRR) of 20.8 percent.
- The improvement and development of Bali International Airport as the transfering node and base airport in the National airway system is indispensable to eastern regional development and the unity of Indonesia.

Based on the conclusions reached above, the following recommendations are made:

- The preparations including request for financial assistance, topographic survey, soil investigation, etc. should be initiated at the earliest possible date so that the engineering services including basic design, detailed design, preparation of tender documents, assistance in evaluation of the contractors, etc. can be completed by the end of [illegible] at the latest.
- The works included in the Short Term Plan [illegible] facility requirements for 1990. It is recommended, however, to initiate the construction of the works included in the Short Term Plan at the beginning of the financial year 1984 and compiete them by the end of fiscal year 1985 since the earlier completion will provide a great improvement in the safety of airport operations.

- The construction of the works included in the Middle Term Plan for the air traffic demands in the year 2000 should be completed by the end of 1991.
- The construction of the works included in the Long Term Plan for the air traffic demands forecast in the year 2010 will also be completed around 2001.

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