The Financial Feasibility on Developing Terminal Building of Sultan Mahmud Badaruddin II International Airport

M Oktari , M M Iqbal, M Agustien
Department of Civil Engineering, Sriwijaya University, Palembang, Indonesia

*E-mail : melisaokta21@gmail.com

Abstract. Passengers of Sultan Mahmud Badaruddin II (SMB II) International Airport has increased significantly. This can be seen by the increased flight in the Sultan Mahmud Badaruddin II International Airport, as much as 10.15% a year either domestic or international flights. The data shown in 2016, 5% revenue of Sultan Mahmud Badaruddin II International Airport comes from air side service (parking, take-off and landing), 6% from cargo, and 76% from terminal building service (Passenger Service Cost (PSC), and commercial area, 12% revenue from others (Angkasa Pura II, 2016). Objectives of the research are to forecast passenger growth at SMB II International Airport, to analyse revenue and costs of development of the terminal building and to analyse the financial feasibility of the development. To predict passenger growth employs trend projection, however, methods used for analysing the financial feasibility include Net Present Value (NPV), Benefit cost Ratio (BCR), Internal rate and Return (IRR), Payback Period (PP) and sensitivity analysis. After conducted analysis it can be concluded that the passenger will reach about 6.4 million in 2026. By considering revenue, expenses and investment costs of the terminal building development, it is obtained the value of NPV (Rp. 7,150,551,854.50), IRR (16.69%), BCR (1.003) and PP (7.13 Years). It can be concluded that the terminal building is feasible to be developed.

Keywords: SMB II Airport, development, terminal building, financial feasibility

1. Introduction
South Sumatera is the ninth populated province in Indonesia which has large of area 87,017.41 km2 and total is about 8,675,774 population. City of Palembang is the largest area in this province which has about 358,55 km2 in large and inhabited around 1.7 million people with population density of 4,800 per km2 (BPS, 2015). The population growth is 1.65% a year. The increasing rate of population has an impact on economic, social, culture and business in the city of Palembang. Considering as a metropolitan and capital city of South Sumatera, the increase of population has significantly effect on the need of transports which have high level on safety, fast, comfort. One of the required transportation is air transport.

Air transport mode user in Palembang has increased significantly every year that is proved by the increase of number of flights in Sultan Mahmud Badaruddin II (SMB II) International Airport. According to PT. Angkasa Pura II (Persero), operator of the airport, states that the increase of passenger is about 10.15% a year in average both domestic and international flights. In 2015, capacity of there is 3 million passengers per year. In order to improve services due to passenger growth, PT Angkasa Pura II (Persero) plans to develop the airport. One of the facilities to be developed is passenger terminal area. This development is needed in order to improve quality service of passengers and to increase revenue for PT. Angkasa Pura II (Persero). Since Air Traffic Control (ATC) becomes separate company, which called PT. Airnav Indonesia, corporate revenue of PT. Angkasa Pura II (Persero) decreased about 60%. According to PT. Angkasa Pura II (Persero), in 2016, the terminal area generated about 76% from total revenue of the company. It is quite reasonable that the company’s reason by developing the terminal include development of commercial areas so that income from business spaces can be maximized.
The research objectives are to forecast growth of passengers of the SMB II International Airport in the future, to analyse revenue generated from the terminal after the development and to analyse of the financial feasibility of terminal building development of SMB II International Airport. The result of this study is expected to know whether development the terminal is feasible or not for SMB II International Airport.

2. Literature Review
2.1. Passenger Terminal Building
According to Ashford and Wright (1992), terminal acts as a place to shifting passengers from landside and the airside and vice versa of a passenger journey. In accordance with regulation of Directorate General of Air Transport No. SKEP / 347 / XII / 1999 explains that the passenger terminal is a primary link between ground transport systems and air transport systems intended to accommodate transition activities between access from land to air or otherwise, processing of passenger’s arrival, departure, transit, or transfer including passengers and luggage to aircraft. In general, the terminal building of an airport is grouped into three parts, namely:

2.1.1. Public Area.
It is an area that can be used by general public. Generally, this area is located on the front of airport building, that includes exterior of the terminal building or warehouse. Facilities located in this area include parking lots, ticket sales counters, restaurants, worship place, public toilets and others.

2.1.2. Restricted Area.
It is an area of the airport that can be used in a limited community. This area is in the terminal building that is used to serve passengers who depart or arrive. People who is not going to depart or arrive is not allowed to enter this room, except airport personnel or airlines with special permission from the airport authorities. Services available within this area include check-in counters, immigration counter, banks, money changer, gift shops, restaurants, passenger lounges and others.

2.1.3. Non-Public Area.
It is an area of the airport that only authorized person who can access the area. Services available in this area are boarding lounges, transfer desk, immigration counter, health clinic, customs office, baggage claim, loss and found counter, and others.

2.2. Airport Revenue
One of revenue on the airport comes from Non-Aeronautical or commercial spaces. This type of revenue is derived from commercial activities that are not related to airplanes on terminal and airport land. The revenue comes from concession of office spaces and check-in desks, shopping areas, parking, billing to customers (tenants) for electricity and clean water services.

2.3. Forecasting Model
Multiple Forecasting Model (Multiple Regression), this method assumes that the predicted factor (as the dependent variable) shows a causal correlation with one or more independent variables. The purpose of this model is to find the correlation in the form of a mathematical equation that can be used to predict the future value of the dependent variable. Function of this method is shown below:
\[ Y = A + B_1x_1 + B_2x_2 + \ldots + B_nx_n \]  \hspace{1cm} (1)

\[ Y \] : dependent variable  
\[ X_n \] : independent variables \((n)\)  
\[ A \] : constants  
\[ B_n \] : coefficients of independent variables \((n)\)  
\[ n \] : number of independent variables

2.4. Financial Feasibility Analysis

2.4.1. Net Present Value (NPV). Net Present Value (NPV) is the difference between present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting to analyze the profitability of a projected investment or project.

\[ NPV = \sum (B(t))/(1+d)^t - \sum (C(t))/(1+d)^t = \sum [(B(t) - C(t))](1+d)^t \]  \hspace{1cm} (2)

\[ B(t) \] = total benefits of project in year \(-t\)  
\[ C(t) \] = total costs of the project in year \(-t\)  
\[ d \] = interest rate  
\[ t \] = number of years

to find out whether an investment plan is feasible or not, some criteria in the NPV method are required, such as:

- **NPV \(> 0\)**, investment is feasible/profitable;
- **NPV \(< 0\)**, investment is not profitable/not feasible;
- **NPV \(= 0\)**, value of the company remains even though the investment proposal is accepted/rejected.

2.4.2. Benefit Cost Ratio (BCR). Basic principle of this method is to find index of effectiveness of utilized costs toward maximum benefits in a project. This index is known as the Benefit Cost Ratio index, which is mathematically formulated as:

\[ BCR = \frac{PWB}{PWC} \]  \hspace{1cm} (3)

\[ BCR \] = Benefit Cost Ratio  
\[ PWB \] = present value of benefits  
\[ PWC \] = present value of costs

To find out whether an investment plan is feasible or not if:

- **BCR \(> 1\)**, investment is feasible
- **BCR \(< 1\)**, investment is not feasible

2.4.3. Internal Rate of Return (IRR). Internal Rate of Return (IRR) is a metric used in capital budgeting to estimate the profitability of potential investments. Internal rate of return is a discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero.

\[ IRR = i' + \frac{NPV}{NPV' - NPV'} (i' - i) \]  \hspace{1cm} (4)

To find out whether an investment plan is feasible or not if:

- **IRR \(\geq\) interest rate\(\)**, investment is feasible
- **IRR \(<\) interest rate\(\)**, investment is not feasible

2.4.4. Payback Period (PP).

The payback period is the length of time required to recover the cost of an investment. The payback period of a given investment or project is an important determinant of whether to undertake the position or project, as longer payback periods are typically not desirable for investment positions (Soeharto, 1997).

2.4.5. Sensitivity Analysis.

A sensitivity analysis is a technique used to determine how different values of an independent variable impact a particular dependent variable under a given set of assumptions. This technique is used within
specific boundaries that depend on one or more input variables, such as the effect that changes in interest rates have on bond prices.

3. Research Methods
The steps have been done on this research are:
   a. Data collection and passenger forecasting in the airport;
   b. Data collection methods:
      Data used in this research are both primary and secondary data. The secondary data obtained through airport management, in this case administration office of PT. Angkasa Pura II (Persero). The required data are:
      - Passenger movement (last 6 years);
      - Revenues from aeronautical and non-aeronautical;
      - Costs of initial construction of the terminal building;
      - Operational costs (electricity, water, and maintenance);
      - Data related to the development plan of terminal building.
   c. Forecasting of passenger.
      Method used in order to forecast the growth of passenger uses Trend Projection method.
   d. Investment feasibility is analyzed using:
      - Net Present Value (NPV);
      - Benefit Cost Ratio (BCR);
      - Internal Rate of Return (IRR);
      - Payback Period (PP);
      - Sensitivity Analysis.

4. Data Analysis
4.1. Projection of passenger growth
The growth of passengers at Sultan Mahmud Badaruddin II International Airport is shown in the Table 1 below.

| No. | Year | Total Passenger |
|-----|------|-----------------|
| 1   | 2017 | 4,030,647       |
| 2   | 2018 | 4,297,765       |
| 3   | 2019 | 4,564,883       |
| 4   | 2020 | 4,832,001       |
| 5   | 2021 | 5,099,119       |
| 6   | 2022 | 5,366,237       |
| 7   | 2023 | 5,633,355       |
| 8   | 2024 | 5,900,473       |
| 9   | 2025 | 6,167,591       |
| 10  | 2026 | 6,434,709       |
4.2. Revenues and Expenses

The table below represents the revenue and expenses of SMB II International Airport in 2016.

### Table 2. Revenues of SMB II International Airport.

| No | Non-Aeronautical | Total               |
|----|------------------|---------------------|
| 1  | Rent of spaces and warehouse | 10,933,189,410 |
| 2  | Rent of land      | 4,298,642,107      |
| 3  | Concession        | 12,547,039,653     |
| 4  | Parking           | 11,477,960,000     |
| 5  | The use of utilities | 4,063,221,180     |
| 6  | Advertisement installation | 2,971,761,189 |
| 7  | Waving galleries  | 1,603,191,944      |
| 8  | Rent of cable pair | 1,000,000          |
| 9  | Extend hour       | 74,698,239         |
| 10 | Antenna           | 412,688,000        |
| 11 | Other Non-Aeronautical revenues | 341,512,339 |

### Table 3. Expenditure of SMB II International Airport.

| No | Operational Expenses | Total               |
|----|----------------------|---------------------|
| 1  | Airport operational | 90,222,707,880      |
| 2  | Equipment and materials | 902,171,288        |
| 3  | Maintenance and repair | 16,629,035,832     |
| 4  | Building maintenance | 2,154,412,541       |
| 5  | Maintenance of transportation tools | 589,799,173 |
| 6  | Maintenance of office machines | 10,429,100        |
| 7  | Maintenance of AC    | 1,399,199,373       |
| 8  | Maintenance of mechanical equipment | 1,599,461,611 |
| 9  | Maintenance of electronic equipment | 210,204,370  |
| 10 | Maintenance of public information system | 585,139,506 |
| 11 | Maintenance of workshop equipment | 32,680,330    |
| 12 | Maintenance of electricity | 1,394,986,376    |
| 13 | Maintenance of water installation | 823,841,343  |
| 14 | Maintenance of telecommunication | 3,360,000       |
| 15 | Cleaning expenses   | 4,106,813,405       |
| 16 | Communication and utilities | 13,278,453,519  |
4.3. **Cost of Development Plan**

Cost of the terminal areas development of Sultan Mahmud Badaruddin II International Airport has been stated in the Airport Development Master Plan, with details as follows:

| No | Items                  | Total                    |
|----|------------------------|--------------------------|
| 1  | Construction cost      | 161,000,000,000          |
| 2  | Supervision consultant cost | 8,050,000,000          |
| 3  | Pre-operation cost     | 8,050,000,000           |
| 4  | Other costs            | 8,050,000,000           |
|    | Total                  | 185,150,000,000         |

5. **Discussion**

5.1. **Net Present Value (NPV)**

Net Present Value (NPV) is a method used to compare all the cost and benefit components of a project with the same reference in order to compare with each other. The development of Sultan Mahmud Badaruddin II requires an investment value of Rp. 185,150,000,000. From the calculation obtained NPV value is Rp. 7,150,551,854.50 The NPV > 0 means that the development is feasible and will bring benefit for the Company.

5.2. **Internal Rate of Return (IRR)**

Internal Rate of Return (IRR) is a method of assessing the feasibility of investing if the interest rate (i) at the time of NPV = 0. In IRR calculation, it is necessary to do trial and error for the interest that is to be interpolated. The interest rate is between $i_1 = 12\%$ and $i_2 = 18\%$, then it is interpolated with the following formula:

\[
\text{IRR} = i_1 + \frac{\text{NPV}_1}{\text{NPV}_2 - \text{NPV}_1} \times (i_2 - i_1)
\]

\[
\text{IRR} = 12 + \frac{24,808,145,870.10}{24,808,145,870.10 - (-6,922,937,398.50)} \times (12-18)
\]

\[
\text{IRR} = 16.69\%
\]

From the calculation obtained that the IRR value is 16.69\%. The value of IRR > interest rate (15\%). It is can be concluded that the investment of airport development is feasible.

5.3. **Benefit Cost Ratio (BCR)**

Benefit Cost Ratio (BCR) is a method used to find the index of cost effectiveness level against the benefits of a project. The calculation of BCR is performed by comparing the present benefit value (PWB) with the present cost value (PWC).

\[
\Sigma \text{PWB} = 1,184,939,998,352.77
\]
\[
\Sigma \text{PWC} = 1,177,789,446,498.27
\]

\[
\text{BCR} = \frac{\text{PWB}}{\text{PWC}} = \frac{1,184,939,998,352.77}{1,177,789,446,498.27}
\]

\[
\text{BCR} = 1.003
\]
From the calculation obtained that BCR value is 1.003 and then the BCR > 1. So, it can be concluded that the investment on Sultan Mahmud Badaruddin II International Airport is feasible.

5.4. Payback Period (PP)
The investment cost \((a)\) is Rp. 185,150,000,000. After conducting calculation obtained that the last period that total cash flow has not recovered the initial investment \((n)\) is year of 7. Total investment on year 7 \((b)\) is 179,153,640,611 and cumulative amount of the cash flow in year \(n+1\) \((c)\) is 226,891,939,902. Then, with the following equation obtained:

\[
PP = n + \frac{a - b}{c - b} \times 1\text{year}
\]

\[
PP = 7 + \frac{185,150,000,000 - 179,153,640,611}{226,891,939,902 - 179,153,640,611} \times 1\text{year}
\]

\[
PP = 7.13\text{ years}
\]

From the calculation of PP can be concluded that the invested capital will return after 7.13 years.

5.5. Sensitivity Analysis
Sensitivity analysis is an analysis conducted to determine the effect of changes in production parameters on changes in production system performance in generating profit. The parameters analysed in the development are cost overrun that is the increase of costs such as construction cost, expense cost and the decrease of building benefits. After conducting the analysis, it can be seen how far the impact of the changes toward the feasibility of the project.

| No | Description I (%) | NPV (Rpx1000) | IRR (%) | BCR | Conclusion |
|----|-------------------|----------------|---------|-----|------------|
| 1  | Construction +2%  | 15 4,001,951.85 | 16.101  | 1.003 | Feasible   |
| 2  | Construction +3%  | 15 2,427,651.85 | 15.804  | 1.002 | Feasible   |
| 3  | Construction +4%  | 15 853,351.85  | 15.505  | 1.001 | Feasible   |
| 4  | Construction +5%  | 15 (720,948.15) | 15.204  | 0.999 | Not Feasible |
| 5  | Revenue -2%       | 15 (16,548,248.11) | 11.687  | 0.986 | Not Feasible |
| 6  | Revenue +2%       | 15 (13,256,637.08) | 12.500  | 0.989 | Not Feasible |

6. Conclusions
From the research that has been done can be drawn some conclusions, there are:

1. By using multiple forecasting method, the number of passengers of Sultan Mahmud Badaruddin II International Airport will increase significantly and will reach about 6,434,709 passengers in 2026;
2. The development plan of terminal building is feasible to be executed because based on the analysis result shows that the value of NPV is Rp. 7,150,551,854.50, IRR of 16.69%, BCR of 1.003;
3. Cost of the investment on the terminal building is Rp. 185,150,000,000 and the payback period is 7.13 years.

References
[1]. Badan Pusat Statistik, 2015. Data Jumlah Penduduk di Palembang. Palembang: Berita Resmi Statistik.
[2]. Angkasa Pura II, 2016. Annual Report 2016 Bandara Internasional Sultan Mahmud Badaruddin II. Palembang: Angkasa Pura II.
[3]. Angkasa Pura II, 2016. Data Penumpang Bandara Internasional Sultan Mahmud Badaruddin II. Palembang: Angkasa Pura II.
[4]. Direktur Jenderal Perhubungan Udara, 1999. *Peraturan Direktur Jenderal Perhubungan Udara No. SKEP 347/XIII/99 Tentang Persyaratan Teknis Pengoperasian Fasilitas Teknik Bandar Udara*. Jakarta: Departemen Perhubungan, Direktorat Jenderal Perhubungan Udara.

[5]. Asford, N., & Wright, P., 1992. *Airport Engineering (Third Edition)*. USA: Wiley.

[6]. Soeharto, I., 1997. *Manajemen Proyek*. Jakarta: Airlangga.