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Analysis on the Performance of Passenger Terminal Services at I Gusti Ngurah Rai Airport, Bali

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A B S T R A C T

I Gusti Ngurah Rai International Airport is one of the busiest airports in Indonesia, due to the increasing number of air transportation service users. This research was conducted to determine the possibility of an increase in passengers every year for 20 years and provide alternative solutions that might be used at this airport if there are facilities that are no longer able to operate maximally. The method used in this research is an analysis of the average and linear trend using time series data from 2013 - 2022, then the method with the smallest standard deviation and the best correlation is chosen, namely the linear trend method. In conclusion, the increase in passengers based on the equation results reaches 3.249% and it causes some facilities to be no longer able to accommodate and operate optimally such as baggage claim devices, gate passport control, and arrival halls. Alternative applicable solutions must be found in these facilities, so that they can work optimally, such as expanding the number of tools and processing early on for gate passport control and generally providing solutions such as reconfiguring the terminal area, peak hour deployment, and technological innovation.

1. Introduction

According to Law of the Republic of Indonesia Number 1 of 2009 concerning Aviation, an airplane is an aircraft that is heavier than air, has constant collisions, and can fly under its own power. This plane flies by itself by fighting the force of gravity by using the lift force produced, this is caused by the buoyant force in the air. Nowadays, airplanes are one of the most popular modes of transportation for transportation service users, this is because the travel time required is shorter and the level of comfort is good. However, the level of aircraft service needs to be supported by good maintenance infrastructure, such as airports, hereinafter referred to as airports [7].

According to PM 39 of 2019 concerning the National Airport Arrangement [13], an airport is an area on land and/or water with certain boundaries which is used as a place for planes to land or take off, and also a place for passengers to get on and off, loading and unloading of goods and a place of

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movement. intra and intermodal transportation. This airport is also equipped with aviation safety and security facilities, as well as basic facilities and other supporting facilities. One of the airports in Indonesia is I Gusti Ngurah Rai International Airport. This airport, which is located in South Bali, is the main entry point for tourists who are going on holiday or working in Bali.

I Gusti Ngurah Rai International Airport is one of the busiest airports in Indonesia. This is due to the continued increase in the number of users of this air transportation service, where according to the International Airports Council in 2008 the number of users of aviation services at this airport was 8.5 million, and in 2019 it increased to 23.8 million users. From the data above, of course, there has been a quite drastic increase in 11 years, reaching 3 times that of 2008 [12]. From the data above, every year the number of arrivals of air transportation users my continue to increase. The number of transportation users also influences the capacity of this airport, in terms of parking capacity, waiting room, passenger terminal, etc, especially in the arrival and departure section of international passengers. I Gusti Ngurah Rai Airport has carried out Phase III development and is the last development managed by PT. Angkasa Pura 1 (2011 – 2013). Phase III development includes the development of the terminal building, parking building, and apron [12].

From similar research, it is predicted that the number of tourists coming to Bali in 2023 at peak hours will be 3,023 people per year with an average increase in passengers of 5.51%/year, where in this research the need for arrival terminal facilities in the form of baggage claim is taken into account. Arrival hall area, curb/courtyard area, and public facilities (toilets). The results of the increase in passengers mentioned above can no longer be by the 20-year planning basis because the terminal capacity saturation point occurs 15 years after development stage III (2013). One of the solutions offered is that the airport needs to adjust the layout and technical arrangements of the field [17], while predictions for the international departure terminal in 2023 will reach 4,390 people with an average increase in passengers of 6.55% [12].

Likewise, the growth that occurred at Sultan Mahmud Baharuddin II Airport - Palembang predicts passenger growth in 2020, namely 3,811,909 people or a monthly average of 317,659 people, with a growth of 5%, where here the need for terminal facilities in the form of the arrival hall area is taken into account, waiting room area, check-in area, number of seats, baggage claim area, and arrival hall area. In this research, it is explained that the calculation results will be adjusted to the Phase 1 development carried out at Sultan Mahmud Baharuddin II Airport - Palembang and that several facilities are no longer able to meet the necessary needs, such as the area of the departure hall and seating which has exceeded the existing one. [26].

In the next few years I Gusti Ngurah Rai Airport may need to expand its capacity further, especially the terminal part of this airport. This is because the terminal is the main link between land and air access, so comfort is needed for passengers when traveling, whether they have just arrived or are about to depart. Even though PT. Angkasa Pura 1 itself has carried out developments in the terminal building.

Based on existing research, this research is expected to analyze the current capacity of the international arrival terminal at I Gusti Ngurah Rai Airport and predict the capacity of the international arrival terminal with the estimated number of foreign passengers in the next 20 years. This aims to create comfort for users of air transportation services, especially I Gusti Ngurah Rai International Airport - Bali.

2. Research Method

Based on the problems that exist at the I Gusti Ngurah Rai Bali international arrival terminal which can result in an assessment of the performance of the facilities studied, it is necessary to carry out feasibility study research into development planning which can be reviewed using several existing references.

The method used in this research is secondary data collection from PT. Angkasa Pura 1 (PERSERO) and then takes into account the service performance of the facilities at the international arrival terminal, namely: baggage claim area, baggage claim device, passport inspection area, gate passport control, arrival hall and toilet. After taking into account the service performance of each facility, we proceed with providing alternative solutions for facilities that can no longer serve optimally.

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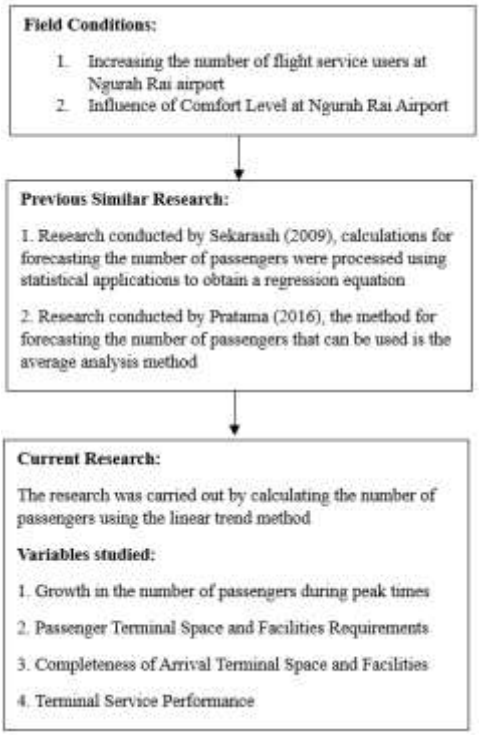

Source: Research, 2023.
Figure 2. Research concept

Description and Technical

1. Research Location
   The research location is at the International Passenger Arrivals Terminal at I Gusti Ngurah Rai Airport, Bali.
2. Data Collection Methods
   In collecting data, the correct method is needed, because this method influences the results obtained. This data collection method uses secondary data, data obtained from PT Angkasa Pura 1 (PERSERO) I Gusti Ngurah Rai Airport - Bali.
3. 3. Data Analysis
   The data obtained is then processed using methods based on SNI 03-7046-2004 and according to the Regulation of the Director General of Civil Aviation SKEP/77/VI/2005 [21].
   a. Analysis of Growth in Number of Passengers at Busy Times
      Data were taken on rush hour passenger arrivals from 2013 to 2022. Then the data obtained was processed using the average analysis method linear trend method.
   b. Analysis of Space Requirements and Passenger Terminal Facilities
      The results of this analysis relate to space requirements and also facilities at the passenger arrival terminal at I Gusti Ngurah Rai Airport - Bali. With the data that has been processed, the processed results can predict the number of passenger arrivals in 2039 during busy times. This analysis already has standards based on the regulations of the Director General of Civil Aviation SKEP/77/VI/2005 and SNI 03-7046-2004.
   c. Analysis of Arrival Terminal Space Completeness and Facilities
      This analysis aims to evaluate the completeness of terminal space and facilities regarding the area or dimensions of the terminal at I Gusti Ngurah Rai International Airport - Bali.
   d. Terminal Service Performance Analysis: Baggage Area, Number of Conveyor Device Belts, Passport Check Area, Number of Passport Control Gates, Arrival Hall Area, Toilet Area.

3. Results and Discussions

4.1 Analysis of International Passenger Terminal Arrival Facility Needs

This needs analysis aims to find out and determine the number of requests for international passengers arriving at I Gusti Ngurah Rai International Airport, Bali.

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4.1.1 Selection of Forecasting Methods

In selecting this method, 2 methods were used, namely average analysis and least squares linear trend analysis. Which is based on the number of international passenger arrivals during peak hours from 2013 - 2022. The method selection is based on the smallest standard deviation and the best level of correlation.

Table 1. Historical Data on Busy Time International Passenger Arrivals 2013 - 2022

Years to	Years	Total
0	2013	1688
1	2014	2094
2	2015	2074
3	2016	2519
4	2017	2333
5	2018	2360
6	2019	2408
7	2020	2990
8	2021	2958
9	2022	2998

Source: Research Data, 2023

From Table 1 it is known that the number of passengers arriving in 2022 will be 2,998 people. So, we can calculate the estimated amount of demand for 2022 – 2042 which can be seen in Table 2.

4.1.2 Estimated Total Needs for 2022 – 2042

Analysis of estimates of arriving passengers at the international arrival terminal of I Gusti Ngurah Rai International Airport using the least squares linear trend method. Based on the calculation results obtained, using the linear trend method equation.

Table 2. Estimated Passengers During Rush Hours for the 2022 - 2042 Period

Years	Estimated Passengers Arrival at Rush Hours (people)	Percentage Increase per Year (%)
2022	2998	-
2023	3132	4.47
2024	3226	3
2025	3400	5.39
2026	3534	3.95
2027	3668	3.79
2028	3802	3.65
2029	3936	3.52
2030	4070	3.4
2031	4204	3.29
2032	4339	3.21
2033	4473	3.09
2034	4607	3
2035	4741	2.91
2036	4875	2.83
2037	5009	2.75
2038	5143	2.68
2039	5277	2.61
2040	5411	2.54
2041	5545	2.48
2042	5679	2.42
Rata - Rata		3.249

Source: Research Data, 2023.

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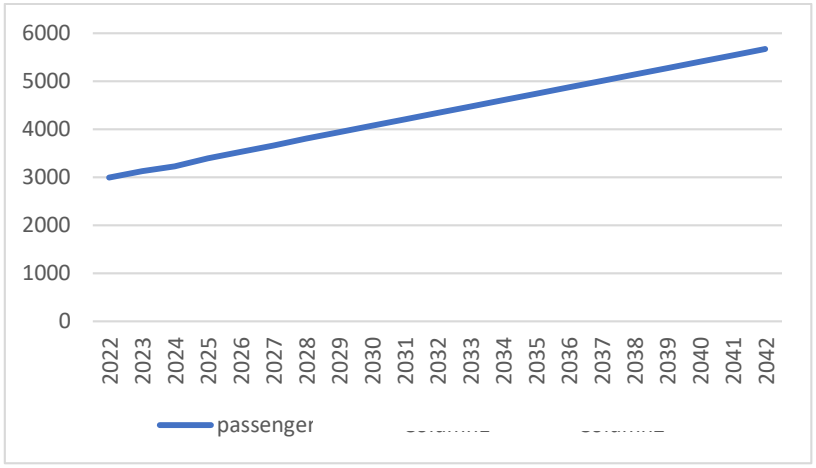

Source: Research Data, 2023.

Figure 2. Passenger Projection Graph for 2022 – 2042

From the data above, passenger growth was obtained at 3,249% with an annual increase of 134 passengers. The results of this calculation become a benchmark in providing international arrival terminal facilities at I Gusti Ngurah Rai Airport, Bali.

4.3 Evaluation of the Space and Facilities of the International Passenger Arrival Terminal

Evaluation of the completeness of the space and facilities of the passenger arrival terminal at I Gusti Ngurah Rai International Airport based on SNI 03-7046-2004 concerning Airport Passenger Terminals. The number of spaces and the completeness of this space are adjusted to the area of the building and also adjusted to the number of passengers served at I Gusti Ngurah Rai Airport, Bali. The completeness of space and facilities at I Gusti Ngurah Rai Airport will be explained in Table 3 below.

Table 3. Evaluation of Standard Passenger Arrival Terminal Space and Facilities for International Flights

No	Facility	Completeness of Space and Facilities in 2022
1	Arrival terrace (curb side)	There is
2	Check in area	There is
3	Arrival waiting room (departure lounge)	There is
4	Men's and women's toilets, arrival waiting area	There is
5	(toilet)	There is
6	Commercial area (concession area/room)	There is
7	Airline office (airline administration)	There is
8	Men's and women's public toilets (public toilets)	There is
9	Lost and found room	There is
10	Fiscal facilities (fiscal counter)	There is
11	Immigration and customs facilities (immigration and custom)	There is
12	Quarantine facilities	There is
13	Public telephone facilities	There is
14	Light fire extinguishing facilities	There is
15	Waiting chair	There is
16	Men's and women's public toilets (public toilets)	There isn't any
17	Lost and found room	There is
18	Fiscal facilities (fiscal counter)	There is

Source: PT. Angkasa Pura 1 (2022).

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Table 4. Evaluation of Equipment and Other Facilities

Other Facilities		Completeness of Space and Other Facilities in 2022
Disabled Facilities	Provision of ramps for each difference in floor height in the passenger terminal building (for wheelchair users)	There is
Facilities for Passengers (Concession Room)	Restaurants, kiosks, salons, post and giro offices, banks, money changers, nurseries, and others	There is
Terminal/Airport Support Facilities	Management office, mechanical and electrical room, communications room, health room, meeting room, conference room, kitchen, catering, aircraft maintenance facilities	There is

Source: PT. Angkasa Pura 1 (2022).

Based on Table 2. regarding the Evaluation of the Completeness of Space and Facilities in Standard Passenger Arrival Terminals for International Flights, it can be seen that of the 14 facilities that are the standard for completeness of space and facilities, most of them are available, but there is 1 facility that is no longer available, namely public telephone facilities (public telephone). This facility is no longer available because one of the main factors is the advancement of technology, so each visitor already has a personal cell phone, so public telephones are starting to be abandoned.

4.4 Evaluation of Terminal Space Provision

Evaluate the number and size of each area and facility of the International Arrival Terminal at I Gusti Ngurah Rai Airport based on SNI 03-7046-2004 concerning Airport Passenger Terminals. The results of the evaluation of the provision of this space can be seen in Table 5.

Table 5. Evaluation of Space Provision for the I Gusti Ngurah Rai International Passenger Arrival Terminal

No			1	2	3	4	5	6
Evaluated Facilities			Baggage Claim Area	Baggage Claim Device	Passport Collection Area	Gate Passport Control	Arrival Hall	Toilet
Existing Facilities			7725	7	3219	26	4108	2324
Units			m^2	Unit	m^2	unit	m^2	m^2
Years	2022	Passengers	2998	2690	6	786,97	30	5846,1	599,6
	2023		3132	2819	6	739,93	31	6107,4	626,4
	2024		3226	2903	7	762,14	32	6290,7	645,2
	2025		3400	3060	7	803,25	34	6630	680
	2026		3534	3181	7	834,9	35	6891,3	706,8
	2027		3668	3301	7	866,56	37	7152,6	733,6
	2028		3802	3422	8	898,22	38	7413,9	760,4
	2029		3936	3542	8	929,88	39	7675,2	787,2
	2030		4070	3663	8	961,53	41	7936,5	814
	2031		4204	3784	11	993,19	42	8197,8	840,8
	2032		4339	3905	12	1025,088	43	8461,05	867,8
	2033		4473	4026	12	1056,75	45	8722,35	894,6
	2034		4607	4146	12	1088,41	46	8983,65	921,4
	2035		4741	4267	13	1120,06	47	9244,95	948,2
	2036		4875	4388	13	1151,72	49	9506,25	975

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2037	5009	4508	13	1183,38	50	9767,55	1001,8
2038	5143	4629	14	1215,04	51	10028,85	1028,6
2039	5227	4749	14	1246,69	53	10290,15	1055,4
2040	5411	4870	14	1278,35	54	10551,45	1082,2
2041	5545	4991	15	1310,01	55	10812,75	1109
2042	5679	5111	15	1341,67	57	11074,05	1135,8

Source: Research Data, 2023

4.5 Evaluation of the Capacity of the International Arrival Terminal at I Gusti Ngurah Rai Airport, Bali Based on IP4

Capacity evaluation for all parts of the I Gusti Ngurah Rai International Arrival Terminal is calculated based on Initial Indications of Construction, Utilization, Development, and Operation (IP4). IP4 is used to determine initial passenger development indications so that terminal development needs can be identified. The results of the calculation of the International Arrival Terminal Capacity at I Gusti Ngurah Rai Airport, Bali can be seen in Table 6 below.

Table 6. Evaluations of International Arrival Terminal Capacity at I Gusti Ngurah Rai Airport, Bali Based on IP4

No	Years	Passangers	IP4	Information
1	2019	2998	0,012296624	
2	2020	3132	0,011770523	
3	2021	3226	0,01142755	
4	2022	3400	0,010842729	
5	2023	3534	0,010431601	
6	2024	3668	0,010050512	
7	2025	3802	0,009696286	
8	2026	3936	0,009366178	
9	2027	4070	0,009057808	Existing Area
10	2028	4204	0,008769096	= 22119.2 m2
11	2029	4339	0,008496261	
12	2030	4473	0,008241734	Terminal Area Standards
13	2031	4607	0,008002014	= 600 m2
14	2032	4741	0,007775844	
15	2033	4875	0,007562108	
16	2034	5009	0,007359808	
17	2035	5143	0,007168049	
18	2036	5277	0,00698603	
19	2037	5411	0,006813025	
20	2038	5545	0,006648382	
21	2039	5679	0,006491509	

Source: Research Data, 2023.

From Table 6, the area of the international passenger arrival terminal at I Gusti Ngurah Rai Airport, Bali is still sufficient in terms of Initial Indications of Construction, Utilization, Development, and Operation (IP4). With an index value of 0.006491509, this result is smaller than 0.6, so the available capacity is still sufficient.

4.6 Alternative Terminal Facility Solutions

The results of the evaluation of determining the need for facilities at the passenger arrival terminal then provide alternative solutions for facilities that can no longer operate optimally until the end of the forecast year (2042).

1. Baggage Claim Device
   This facility is in the baggage claim area, where the baggage claim area still has enough space to add alt from the baggage claim device.

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2. Gate Passport Control
   This part can be overcome by remote processing or early processing, where it can be checked from inside the plane because it is not impossible as technology advances. So, there is no buildup at the passport control gate.
3. Arrival Hall
   The arrivals hall usually rarely sees a buildup of passengers, because there are very few passengers waiting to be picked up here. This is because passengers who come to Bali usually have ordered transportation from their place of stay or relatives as well as online transportation.
   In general, several alternative solutions can be provided, such as:
   a. Reconfigure the airport terminal area
      This reconfiguration aims to maximize the capacity of the passenger arrival terminal at I Gusti Ngurah Rai Airport, Bali so that it can accommodate maximum passengers arriving without reducing service quality.
   b. Spread of peak hours: Slot auctions during peak hours. Airlines that dare to pay high fees have the right to use the airport during peak hours. Limit the number of airlines that will land or the number of passengers that will land at busy times so that you can control the level of delays that might occur.
   c. Technological innovation
      This innovation aims primarily at crowding at one facility so that it can cause delays that affect the quality of airport services. Like the passport checking area, as technology advances, the checks that must be passed can be done while still on the plane, so that there is no buildup on the ground during the check.

4. Conclusion and Suggestion

5.1 Conclusion

The results of this research can be concluded as follows: The estimated number of passengers in 2020 will reach 2998 people and will continue to increase until the end of the forecast year for passengers in 2039 which will reach 5679 people with an average annual increase of 3.249%. Several facilities at the international passenger arrival terminal at I Gusti Ngurah Rai Airport, Bali are no longer able to accommodate passengers in that area, including the Baggage Claim Device Section, Gate Passport Control, and the arrival hall section, but the rest can still accommodate passengers until the end of the specified time. expected to be in 2039. Alternative solutions that can be provided are: increasing the number of tools on baggage claim devices, early booking at the passport control gate area, and early booking of pick-up transportation so that there is no spread in the arrivals hall. In general, alternative solutions that can be provided are, reconfiguring the airport terminal area, spreading peak hours, and technological innovation.

5.1 Suggestion

Based on the results of this research which predicts an increase in arriving passengers in the future, it is hoped that PT. Angkasa Pura 1 is starting to consider reconfiguring the airport terminal so that it can receive maximum incoming passengers and does not reduce the quality of passenger service. Based on the Regulation of the Governor of Bali Number 28 of 2020 concerning Bali Tourism Management, the local government and tourism actors are tightening enforcement regarding quality tourists and adding policies regarding the prohibition of building City Hotels in tourist areas in Bali and Mass Tourism. This certainly has an influence and needs further research.

The suggestion is an analysis of advanced solutions that are still needed to improve research results to be better research.

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