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Multi-Airport System Development Model: Case Study of Airports in Indonesia

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Abstract

Indonesia's air transportation business has grown substantially to suit the community's transportation needs. An increasing number of people travel by airline each year. By way of secondary and tertiary multiplier effects, the intensifying competition between airport services provided in neighboring regions is likely to have a multiplier influence on a territory. Simultaneously, airport services that are more competitive are focused on areas with rising economic growth in sectors like tourism. MAS is an airport system consisting of at least two airports within a metropolitan area that support civil aviation. MAS includes both big and small airports. MAS is the development of an air transportation system to suit the growing demand for air transportation services. As an example of an integrated multi-model airport design in Indonesia, this research will examine Juanda International Airport, Surabaya, as the major airport and Abdul Rachman Saleh Airport as the secondary airport. In order to establish an integrated multi-modal airport in Indonesia, it is necessary to adopt a multi-airport system. This study's airport location is in East Java Province and includes two airports: Juanda International Airport and Abdul Rachman Saleh Airport. The Juanda International Airport is situated in Sedati, Sidoarjo, whilst the Abdul Rachman Saleh Airport is in Pakis, Malang Regency. Using modelling findings and final passenger statistics, airport capacity in 2045 is determined. The results demonstrated the necessity for more comprehensive points in the MADAM simulation used in this research study, which can estimate a number of crucial parameters.

Keywords: Multi-Airport System (MAS); Capacity; Airport Operator; East Java Province.

1. Introduction

The air transportation industry in Indonesia has expanded significantly to meet the community's transportation demands. Every year, a rising number of individuals travel by airplane [1]. The rising number of individuals who prefer to travel by airplane is not without cause, as aircraft are the most convenient and quickest method of transportation to reach their destinations. Taking into account that the Republic of Indonesia is about 1,905,000,000 km^2 and has 17,504 islands spread across its territory, it is very important to make sure that air travel runs smoothly and efficiently. This requires planning, building, developing, and managing transportation infrastructure, especially for air travel in the East Java Province.

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In recent years, several studies have shown that airport business operations are not restricted to infrastructural features or economic activities but may play a key role in enhancing territorial competitiveness. As a result, airports may provide economic and social value from two distinct perspectives: as a business activity and as infrastructure for the economic growth of the area.

In addition, other studies have demonstrated a link between territorial competitiveness and specific airport system models. Increasing rivalry between airport services supplied in surrounding geographic locations may certainly impose a multiplier impact on a territory through secondary and tertiary multiplier effects. At the same time, airport services that are more competitive are concentrated in locations where economic development in industries such as tourism is expanding. From the aforementioned factors, it is feasible to comprehend the influence of the transportation sector on its relative geographical growth. Taking into account sectorial regulatory changes, airports have transitioned from public utilities to private businesses that provide airside and various ancillary services during the last several years.

Previously, North America, Europe, and Asia-Pacific, as well as the Middle East, have all had major passenger traffic increases over the last two decades, although the Middle East has just lately experienced growth. Future and sustainable traffic development in these locations presupposes that airport infrastructure capabilities can expand to satisfy future demand. However, in certain places of the globe (mostly the United States and Europe), the gap between airport demand and airport capacity manifests itself as delays. This condition of persistent delays negatively affects the travel experience of passengers and the economy as a whole. Because the air transportation system is a critical component of an economy's underlying infrastructure, it is necessary to discover solutions to maintain its dependability, safety, and efficiency while meeting future demand.

MAS is an airport system consisting of at least two airports supporting civil aviation within a metropolitan region. There are major and minor airports within MAS. MAS is the creation of an air transportation system to accommodate the rapidly growing number of air transportation service consumers [2]. MAS operate in 25 (twenty-five) countries, including 25 (twenty-five) in Europe, 18 (eighteen) in North America, 9 (nine) in Asia-Pacific, 5 (five) in Latin America, and 3 in the Middle East [3].

PT Angkasa Pura 1 managed 13 airports in Indonesia, with a capacity of 80,000,000 people and passenger movement of 89,700,000 people in 2017 and 96,500,000 people in 2018, causing capacity issues, while PT Angkasa Pura 2 managed 16 airports, with passenger mobility of 105,000,000 people in 2017 and increased to 115,000,000 people in 2018, causing an increase in the number of passengers. Between 2009 and 2014, the passenger growth rate is expected to be 10%, and between 2015 and 2020, it will be 8%, with a growth rate of 5% between 2021 and 2030. This demonstrates Indonesia's rather strong passenger growth rate. Airports in Indonesia will encounter capacity restrictions, accessibility issues, airspace congestion, and ground traffic congestion in the future [4].

Excess capacity (over capacity) results in significant issues on the airside (aircraft queues on the runway and taxiway), aircraft parking runways (apron), and landside (terminal and parking), among other issues. To enhance air transportation services, it is necessary to examine the existing and future capacity limits within the MAS in East Java Province in order to predict the rise of demand. In the Decree of Minister of Transportation Rules for the Air Transport Strategic Plan for 2010-2014, the growth of MAS is outlined.

Currently, the growth of MAS is required to alleviate congestion at the primary airport [5]. Effective and efficient planning, development, construction, and operation of MAS in the province of East Java. Therefore, a full, in-depth, and integrated examination is required.

This study will focus on Juanda International Airport, Surabaya as the primary airport and Abdul Rachman Saleh Airport as the secondary airport as an example of an integrated multi-model airport plan in Indonesia. An integrated multi-modal airport development in Indonesia requires the implementation of a Multi-Airport System (MAS). This research aims to (1) examine the development of a multi-airport systems model that can overcome air traffic congestion at the main airport by optimizing the function of a secondary airport; (2) analyze the creation of a passenger movement model in managing the network and flight routes; and (3) analyze the limited capacity of the primary airport in the metropolitan area by optimizing the secondary airport as a support for the primary airport.

2. Literature Review

2.1. Multi-Airport System (MAS)

MAS is influenced by the following variables [6]: (1) technical considerations (airport infrastructure capacity and passenger demand); (2) political factors and government policies; (3) social factors (population distribution around airports and their effect on the community near airports); and (4) economic factors. (5) maintaining service quality (particularly at primary airports) by breaking down and reducing the effects of disruptions to flight operations; (6) providing alternative travel options for passengers in metropolitan areas, which can reduce the distance and travel time to airports [7]; and (7) stimulating economic activity [8].

2.2. Metropolitan City

Two sorts of causes have been highlighted as major contributors to the expansion of the MAS [9]: demand and airport capacity constraints [10]. This evidence may be used as a benchmark for the viability of constructing a new airport to support an existing airport in a metropolitan region [11]. There are no specific numbers for the minimum number of passengers in a metropolitan region that would justify the development of a multi-airport system [12]. As long as an airport can continue to meet passenger demand in the metropolitan region, there is no need to create a secondary airport [13]. The distance from the airport to the heart of the metropolitan region is calculated as shown in Figure 1 [14].

Figure 1 illustrates the correlation between the proportion of airport passenger traffic and the distance to the city center in the United States' multi-airport system. Based on these facts, secondary airports should preferably be constructed no more than 80 kilometers from the city centers of metropolitan regions [15, 16]. This must be taken into account so that travelers do not have difficulty gaining access to airports, particularly in terms of distance and journey time [17]. The development of secondary airports will also be more promising since passengers will be more likely to pick a secondary airport if it is more accessible and less expensive [18]. In addition to distance, travel time is a barrier in the creation of multi-airport systems. Passengers will readily choose a secondary airport if the trip time is relatively short, even if the distance is considerable [19].

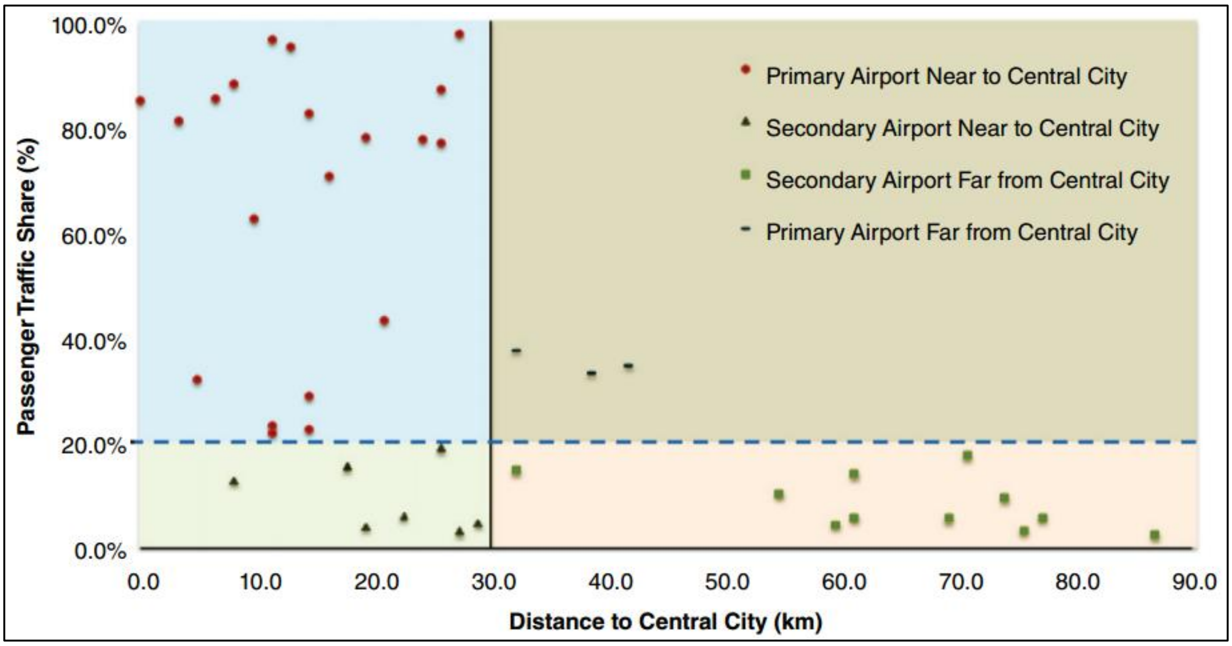

Figure 1. Relationship between the passenger traffic share of the United States MAS airports in 2014 and the distance to the central city (Shen et al. (2016) [14])

The maximum travel time is 90 minutes [15], this travel time is an ideal time for passengers to go to the airport [19]. To ensure a short travel time, the airport manager must prepare transportation from several modes that provide convenience for passengers [1]. The distance and travel time requirements for airports in Indonesia shown in Table 1.

Table 1. Service Radius and Travel Time

Region	Service Radius	Travel Time for other Modes of Transport
Java Island	50 km (straight distance of 2 airports 100 km)	4 hours minimum
Bali	75 km (straight distance of 2 airports 150 km)	4 hours minimum
Sumatera Island	75 km (straight distance of 2 airports 150 km)	4 hours minimum
Kalimantan Island	60 km (straight distance of 2 airports 120 km)	4 hours minimum
Sulawesi Island	60 km (straight distance of 2 airports 150 km)	4 hours minimum
Nusa Tenggara, Maluku Islands and Papua Island	30 km (straight distance of 2 airports 60 km)	4 hours minimum

Airport council International stipulates that all airports within a multi-airport system must be operated or governed by the same entity [20]. According to previous research Cattaneo et al. (2022) [21], out of a total of fifty (fifty) MAS, 55 percent are owned by the same agency [22]. The growth of MAS will be facilitated if the two (or more) airports are owned/managed by the same entity. If under one ownership/management, airport roles and specializations (e.g., full service versus low-cost carrier or domestic versus international) will be separated [23]. In classifying primary and secondary airports, passenger distribution-based criteria are utilized [24] developing secondary airport, servicing fewer than 500,000 passengers or less than 1 percent of total passengers in the metropolitan region [25]. Figure 2 (two) illustrates 59 (fifty-nine) sets of MAS coming from the identifying procedure. In all parts of the globe, the number of MAS is typically proportional to the maturity of this air transportation system [26].

Europe and North America are home to the greatest number of MAS [27], with 25 and 18, respectively [28]. Asia-Pacific has eight (eight) systems, while Latin America and the Middle East each have five (five) systems [29]. Congestion issues at New York's three primary airports may potentially spur the development of additional airports. The most frequent varieties of MAS consist of 2 (two) airports [30], 1 (one) primary airport and 1 (one) secondary airport (e.g., Chicago, Frankfurt, and Melbourne) [31], or in certain instances 2 (two) primary airports (i.e. Miami, Belfast and Shanghai). As the number of primary and secondary airports rises, this system becomes more complicated. Los Angeles "has 1 (one) primary airport and 4 (four) subsidiary airports", London "has 2 (two) primary airports and 3 (three) minor airports", and New York "has 3 (three) primary airports and 1 (one) secondary airport" have the most complicated MAS (Figure 2) [32, 33].

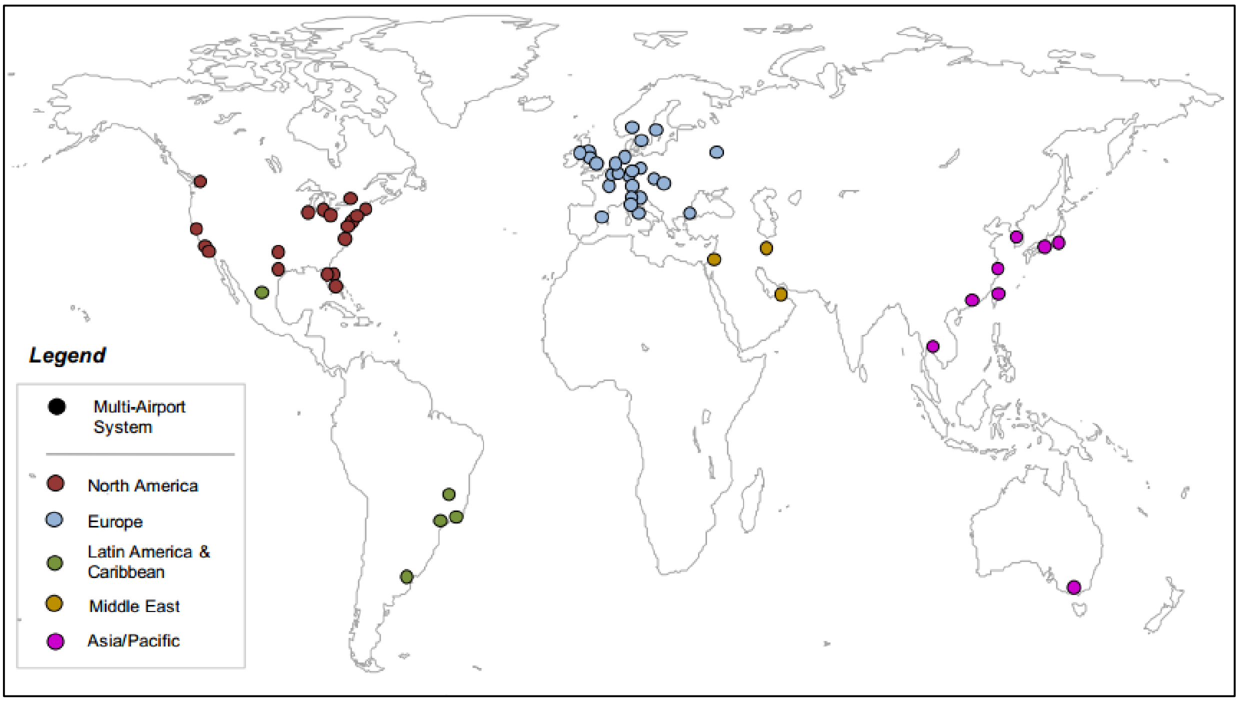

Figure 2 . Geographical distribution of Multi-Airport Systems (MAS) in the Worldwide

3. Methodology

The airport location in this study is in East Java Province and consists of 2 (two) airports, Juanda International Airport and Abdul Rachman Saleh Airport. The airport location, distance, travel time and number of passengers between airports are shown in Figures 3 and 4, and Table 2.

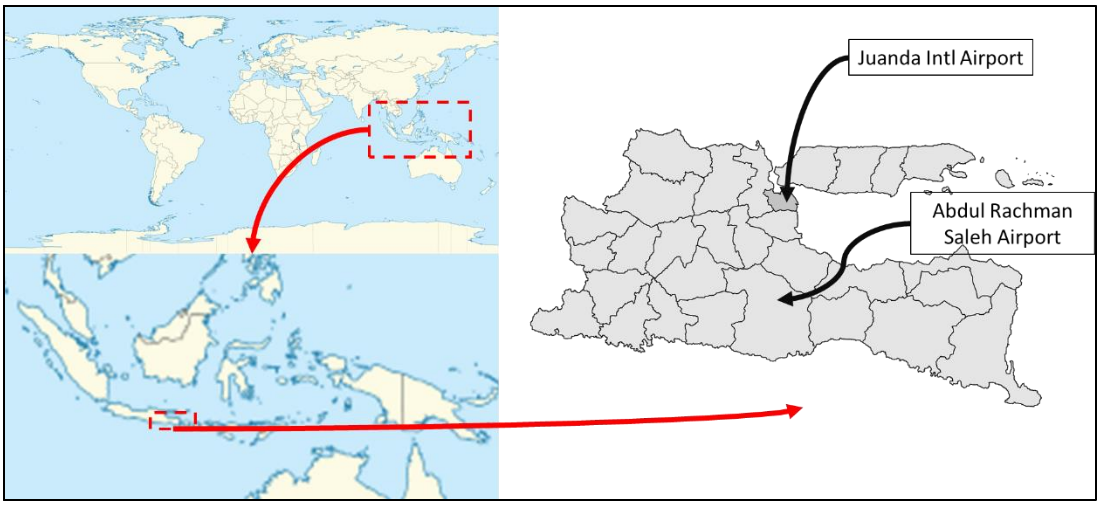

Figure 3. Airport Location in East Java Province

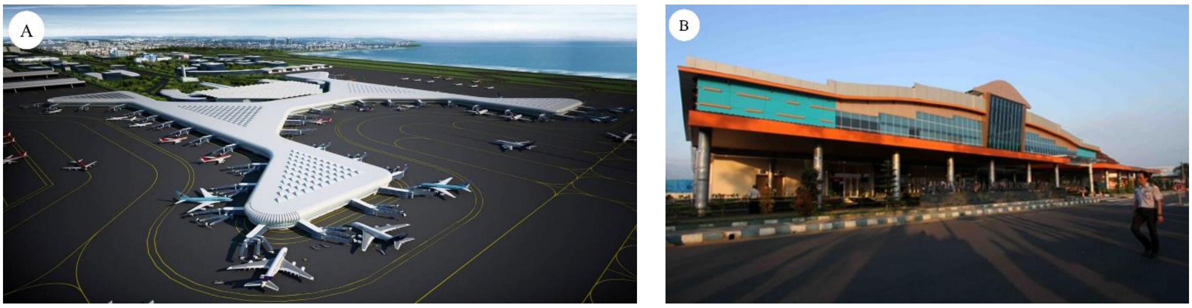

Figure 4. Juanda International Airport (A) and Abdul Rachman Saleh Airport (B)

Table 2. Distance, Travel Time and Number of Passengers between Airports

Metropolitan Area	Airport	Distance to Metropolitan Centre Area	Travel Time to Metropolitan Centre Area	No. of Domestic Pass (2018)	No. of International Pass (2018)	Runway (m)
East Java (Grebangkartosusilo)	Juanda	15 km	30 minutes	17,555,698	2,237,456	3,000m 2,300m
	Abdul Rechman Saleh	74km	99 minutes	1,333,870	-	1,500m

3.1. Potential, Resources and Local Wisdom of the Partner Area

This model is used to distribute passenger volume projections between principal and secondary airports in accordance with market, aircraft type, and desired schedule time. This model's primary objective is to depict the actual equilibrium between passenger preferences and current flight schedules, which is constrained by supporting factors for MAS issue occurrences. The findings of this model are anticipated to be considered in relation to the creation of a MAS [30].

3.2. Potential, Resources and Local Wisdom of the Partner Area

The modelling stages consist of the allocation of traffic movement to the airport (divide the metropolitan area into several zones; predict/calculate the traffic of each zone towards the airport based on the minimum total travel time and integrated accessibility and location-allocation); flight schedule passenger demand at each airport into aircraft movements and scheduling; added to the travel time used for the initial passenger assignment; each combination of local z-scores; and each combination of local z-scores multiplied by the travel time used for the initial passenger assignment airport capacity. Figure 5 depicts the phases of modelling.

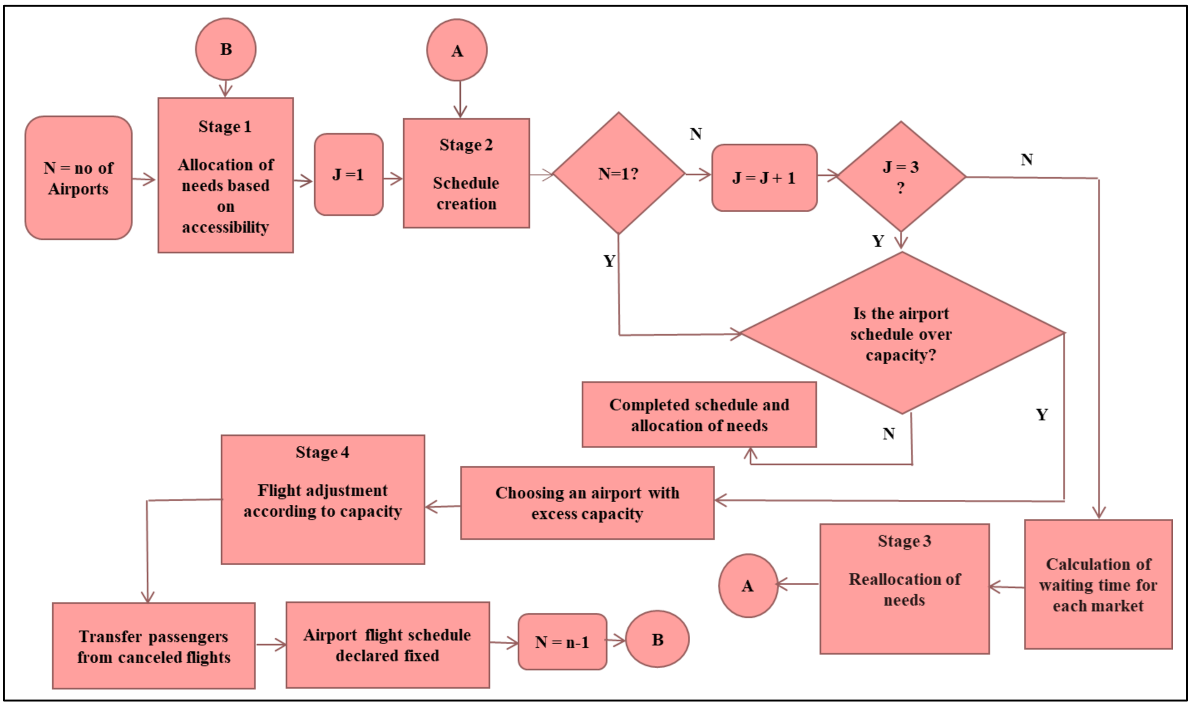

Figure 5. The Stages of Multiple Airport Demand Allocation Model

4. Results and Discussions

As many as 38 (thirty-eight) areas are adapted to the number of regencies/cities in East Java Province (Figure 6 and Table 3). Table 4 displays the travel time from each area of East Java Province to the airport.

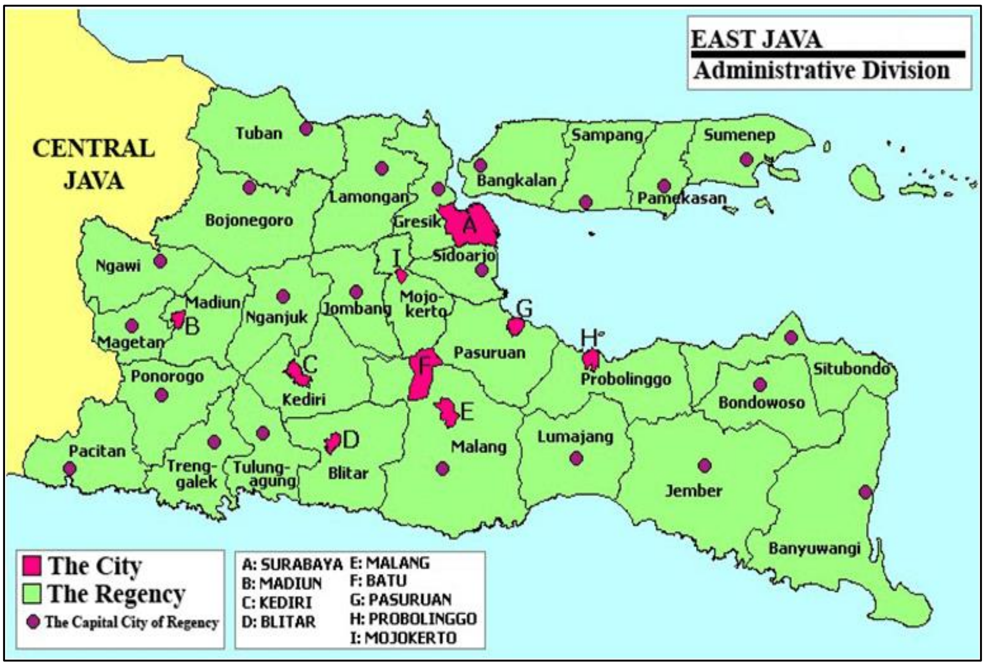

Figure 6. Map of East Java Province

Table 3. Region of East Java Province

No.	Region	Code	No.	Region	Code
1	Bangkalan	201	20	Pasuruan	220
2	Banyuwangi	202	21	Ponorogo	221
3	Blitar	203	22	Probolinggo	222
4	Bojonegoro	204	23	Sampang	223
5	Bondowoso	205	24	Sidoarjo	224
6	Gresik	206	25	Situbondo	225
7	Jember	207	26	Sumenep	226
8	Jombang	208	27	Trenggalek	227
9	Kediri	209	28	Tuban	228
10	Lamongan	210	29	Tulungagung	229
11	Lumajang	211	30	Madiun	230
12	Madiun	212	31	Blitar	231
13	Magetan	213	32	Mojokerto	232
14	Malang	214	33	Kediri	233
15	Mojokerto	215	34	Malang	234
16	Nganjuk	216	35	Batu	235
17	Ngawi	217	36	Pasuruan	236
18	Pacitan	218	37	Probolinggo	237
19	Pamekasan	219	38	Surabaya	238

East Java Province is bounded to the north by the Java Sea, to the east by the Bali Strait (Bali Province), to the south by the Indian Ocean, and to the west by Central Java Province. The west-east section is around 400 kilometers long, while the north-south stretch is about 200 kilometers wide in the west but only about 60 kilometers wide in the east. Madura is East Java's biggest island, separated from the rest of the island by the Madura Strait. Bawean Island is located around 150 kilometers north of Java. To the east of Madura are a set of islands, the Kangean Islands to the east and the Masalembu Islands to the north. Nusa Barung and Sempu Island are two tiny islands in the southern section.

Table 4. Calculation of Passenger Travel Time to the Airport from each region

No.	Regency/City	Juanda Airport	Abdul Rachman Saleh Airport	No.	Regencies/ Cities	Juanda Airport	Abdul Rachman Saleh Airport
		Travel Time (minute)	Travel Time (minute)			Travel Time (minute)	Travel Time (minute)
1	Bangkalan	93	179	20	Pasuruan	97	82
2	Banyuwangi	407	414	21	Ponorogo	172	234
3	Blitar	206	142	22	Probolinggo	170	167
4	Bojonegoro	190	240	23	Sampang	199	279
5	Bondowoso	271	281	24	Sidoarjo	48	76
6	Gresik	67	122	25	Situbondo	302	316
7	Jember	228	238	26	Sumenep	288	370
8	Jombang	86	144	27	Trenggalek	238	284
9	Kediri	131	190	28	Tuban	179	243
10	Lamongan	103	160	29	Tulungagung	175	210
11	Lumajang	172	177	30	Madiun	124	183
12	Madiun	131	188	31	Blitar	188	161
13	Magetan	152	210	32	Mojokerto	55	113
14	Malang	164	85	33	Kediri	131	190
15	Mojokerto	73	103	34	Malang	99	34
16	Nganjuk	87	143	35	Batu	115	55
17	Ngawi	152	212	36	Pasuruan	71	68
18	Pacitan	273	340	37	Probolinggo	98	95
19	Pamekasan	224	308	38	Surabaya	48	108

East Java has the second highest population in Indonesia, behind West Java, and the greatest geographical area among the six provinces on the island of Java. Administratively, East Java consists of 29 regencies and 9 cities, making it the province in Indonesia with the most number of regencies/cities. East Java is recognized as the industrial and financial hub of Central and Eastern Indonesia, generating around 15 percent of the country's Gross Domestic Product. This region has a significant economic impact, since it accounts for a large proportion of the country's GDP. In 2020, the population of East Java will reach 40,665,696, with a density of 851 inhabitants per square kilometer. Malang Regency, where Abdul Rachman Saleh Airport is located, will be the most populous district in East Java Province in 2020, with a population of 2,654,448. Surabaya City, where Juanda International Airport is located, will be the most populous city in East Java Province, with a population of 2,874,000.

4.1. Multiple Airport Demand Allocation Model

The flight routes and frequencies at Juanda International Airport and Abdul Rahman Saleh Airport can be seen in Tables 5 and 6.

Table 5. Flight Routes and Frequency in Juanda International Airport, Surabaya

No.	Flight Routes	Code	Frequency (in a day)	No.	Flight Routes	Code	Frequency (in a day)
1	Balikpapan	1	9	17	Samarinda	21	4
2	Bandung	2	6	18	Palangkaraya	22	3
3	Banjarmasin	3	9	19	Ambon	23	1
4	Batam	4	3	20	Banyuwangi	24	2
5	Denpasar	5	13	21	Sorong	36	1
6	Jakarta (HLP)	6	8	22	Ternate	37	1
7	Jakarta (CGK)	7	40	23	Kertajati	40	2
8	Palembang	9	2	24	Meulaboh	46	1
9	Pangkalan Bun	10	2	25	Yogyakarta	47	6
10	Pontianak	11	2	26	Kendari	48	1
11	Sampit	12	2	27	Kupang	49	5
12	Ujung Pandang	14	13	28	Labuan	50	1
13	Lombok	16	7	29	Manado	51	2
14	Medan	17	1	30	Semarang	52	6
15	Padang	18	1	31	Tarakan	53	1
16	Pekanbaru	20	1				

Table 6. Flight Routes and Frequency in Abdul Rachman Saleh Airport, Malang

No.	Flight Routes	Code	Frequency (in a day)
1	Bandung	2	1
2	Denpasar	5	1
3	Jakarta (HLP)	6	4
4	Jakarta (CGK)	7	8

Flights at Juanda Airport are dominated by flights with the Jakarta route with a frequency of 40 flights a day, followed by the Denpasar (Bali) and Ujung Pandang (Makassar) routes with a frequency of 13 flights a day. The route to Balikpapan and Banjarmasin, both located on the island of Borneo, only has 9 flights per day. Other routes have far less frequent flights than these routes.

4.2. Multiple Airport Demand Allocation Model

Total runway capacity per hour is 34 (thirty four) movements, with an average composition of 28 (twenty eight) movements for regular, 1 (one) movement for irregular, and 5 for TNI AL military exercises; and departure terminal capacity is 4,758 passengers per hour. While Abdul Rachman Saleh Airport operates for fourteen (14) hours per day, the runway capacity per hour for routine take-off is six (6) operations, and the departure terminal capacity is 531 (five hundred and thirty one) passengers per hour. By using data from number of flight routes and frequency of existing flights, the simulation results are shown in Tables 7 and 8 for Juanda International Airport and Abdul Rachman Saleh Airport respectively.

Table 7. Simulation Results in Juanda International Airport, Surabaya

Flight Routes	Code	Frequency (days)	
		Data	Simulation
Balikpapan	1	9	9
Bandung	2	6	7
Banjarmasin	3	9	9
Batam	4	3	3
Denpasar	5	13	13
Jakarta (HLP)	6	8	8
Jakarta (CGK)	7	40	42
Palembang	9	2	1
Pangkalan Bun	10	2	2
Pontianak	11	2	1
Sampit	12	2	2
Ujung Pandang	14	13	11
Lombok	16	7	7
Medan	17	1	1
Padang	18	1	1
Pekanbaru	20	1	1
Samarinda	21	4	4
Palangkaraya	22	3	3
Ambon	23	1	1
Banyuwangi	24	2	2
Sorong	36	1	2
Ternate	37	1	1
Kertajati	40	2	1
Meulaboh	46	1	3
Yogyakarta (JOG)	47	6	6
Kendari	48	1	1
Kupang	49	5	5
Labuan	50	1	3
Manado	51	2	1
Semarang	52	6	6
Tarakan	53	1	1

Model Test Result $Sy = \sqrt{\frac{\Sigma(Y-Y')^2}{n-2}}$, $Sy = 0.87$ (The model standard error is close to 0, then the model is eligible).

Table 8. Simulation Results in Abdul Rachman Saleh Airport

No.	Flight Routes	Code	Frequency (days)	
			Data	Simulation
1	Bandung	2	1	1
2	Denpasar	5	1	1
3	Jakarta (HLP)	6	4	4
4	Jakarta (CGK)	7	8	8

Model Test Result $Sy = \sqrt{\frac{\sum(Y-Y')^2}{n-2}}$, Sy = 0 (The model standard error is 0, then the model is eligible).

By using the ultimate passenger data, the results of frequencies at Juanda International Airport, and Abdul Rachman Saleh Airport are shown in Tables 9 and 10.

Table 9. Simulation Results in Juanda International Airport, Surabaya

No.	Flight Routes	Frequency (days)
1	Balikpapan	23
2	Bandung	17
3	Banjarmasin	23
4	Batam	6
5	Denpasar	30
6	Jakarta (HLP)	31
7	Jakarta (CGK)	105
8	Palembang	3
9	Pangkalan Bun	4
10	Pontianak	3
11	Sampit	4
12	Ujung Pandang	27
13	Lombok	16
14	Medan	3
15	Padang	3
16	Pekanbaru	3
17	Samarinda	10
18	Palangkaraya	6
19	Ambon	3
20	Banyuwangi	4
21	Sorong	3
22	Ternate	3
23	Kertajati	3
24	Meulaboh	8
25	Yogyakarta (JOG)	9
26	Kendari	3
27	Kupang	13
28	Labuan	8
29	Manado	3
30	Semarang	14
31	Tarakan	3

Table 10. Simulation Results in Abdul Rachman Saleh Airport, Malang

No.	Flight Routes	Frequency (days)
1	Bandung	2
2	Denpasar	2
3	Jakarta (HLP)	9
4	Jakarta (CGK)	18

The simulation results with ultimate passenger data are used to determine airport capacity in 2045, where (1) passengers departing from the area in 2045 are estimated to be 24,175,899 people/year; (2) the number of passengers departing from Juanda International Airport is 60,580 people/day (60,125 Juanda passengers and 455 passengers moving from Abdulrahcman Saleh Airport); (3) the number of passengers departing from Abdul Rahcman Saleh Airport is 5,203 people/day (4,592 Abdul Rachman Saleh Airport passengers and 611 passengers moving from Juanda International Airport); and (4) the average travel time at Juanda International Airport is 122 minutes (see Table 11).

Table 11. The Ultimate of Simulation Results Passenger at Juanda International Airport and Abdul Rachman Saleh Airport

<table>
<tr><th>No.</th><th>Airport</th><th>Passenger</th><th>Ultimate capacity</th><th>% Movement</th><th>Travel Time from Area Centre (Min)</th><th>Distance from Airport Area Centre (km)</th><th>Distance between Airports (km)</th><th>Operator</th><th>Multi-Airport System</th></tr>
<tr><td>1</td><td>Juanda</td><td>65,652,476</td><td>64,834,000</td><td>92.94</td><td>30</td><td>15</td><td rowspan="2">62</td><td rowspan="2">2</td><td rowspan="2">Not Eligible for MAS, cause the airport operator are 2</td></tr>
<tr><td>2</td><td>Abdul Rachman Saleh</td><td>1,918,133</td><td>1,841,000</td><td>7.06</td><td>99</td><td>74</td></tr>
</table>

The high demand and mismatch between direct and indirect flights in Indonesia caused a passenger backlog at numerous major airports, which led to a series of aircraft delays. Due to the fact that airports constitute the backbone of air transportation, airport development is an imperative need that must be planned in advance. Other methods, like regression modelling, may be used to account for additional elements, as noted by the 2017 National Transportation Level Study in the National Transportation Master Plan (RITN) 2017. Multiple regression testing is used, taking into account the influence of 14 independent variables, while planning for a multi-airport system is conducted using a passenger-sharing approach to airport accessibility. In order to execute a multi-airport system in Indonesia, the government must adapt airport development goals and management strategies to a mature level.

5. Conclusion

In all areas, multimodal transportation systems are required to support accessibility from primary and secondary airports; specifically, (i) there is a need for more detailed points in the regulation of the Indonesian airport structure, which regulates the MAS to anticipate the future growth of metropolitan areas and air transportation demand; and (ii) there are additional criteria that must be considered when developing multimodal transportation systems. This research study's MADAM simulation can predict (a) the number of flight frequencies for each route in the future, (b) the number of passengers who still choose the previous airport and passengers who move to another airport in the MAS, (c) at airports that are far from the center of the area, the proportion of passengers who transfer to other airports is lower, and (d) for certain reasons at one of the final airports, passengers choose to depart from a different terminal. Analyses with more variable characteristics may be conducted using modelling based on other methodologies.

6. Declarations

6.1. Author Contributions

Conceptualization, S.A.A. and L.C.; methodology, S.A.A.; software, L.C.; validation, S.A.A.; formal analysis, S.A.A.; investigation, S.A.A. and L.C.; resources, L.C.; data curation, S.A.A.; writing—original draft preparation, L.C.; writing—review and editing, L.C.; visualization, S.A.A.; supervision, S.A.A.; project administration, L.C.; funding acquisition, L.C. All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available in article.

6.3. Funding

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6.5. Conflicts of Interest

The authors declare no conflict of interest.

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