World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:7, No:10, 2013

Determination of Second Airport for Soekarno-Hatta International Airport in a Multi Airports System Greater Jakarta: Karawang Airport or Majalengka Airport

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***Abstract*—**Soekarno-Hatta International Airport (Soetta IA) is a primary airport of Greater Jakarta, the busiest airport in Indonesia and the 12th rank of busiest airport in the world. In 2010, the number of air passengers significantly grows and being the second highest one in the world. To anticipate the demand, Greater Jakarta needs a multi airports system (MAS). Ministry of Communication and Government of West Java Province choose different airport for being positioned as the second airport, whether Karawang Airport or Majalengka Airport. The present study predicts that, in 2019, the number of air passengers origin from Greater Jakarta and departure from Karawang IA is going to be considered, namely between 5-20 million passengers, meanwhile that of Majalengka Airport is going to be less than two million passengers. The present study concludes that Karawang Airport is more suitable for being positioned as the second airport in MAS Greater Jakarta than such plan for Majalengka Airport.

***Keywords*—**Greater Jakarta, multi airports system, second airport.

I. Introduction

SOEKARNO-HATTA International Airport (Soetta IA) is the busiest airport in Indonesia and the 12th rank of the busiest airport in the world. In year 2010, the number of air passengers grew 19.4% per annum. This growth rate was the second highest one in the world after Shanghai Airport at China that grew 26.4% per annum. The airport's airside capacity is almost exceeded. Number of aircraft movement at peak hour has been equal to runway capacity, namely 52 movements per hour. PT Angkasa Pura II, a national state company managing Soetta IA, mentioned that in year 2010, Soetta IA serves 61 197 international aviation and 244 344 domestic aviation. Total number of aircraft movement reaches 305 541 movements. In year 2014, aircraft movement is going to exceed runway capacity, that is 370 000 movements.

Soetta IA is located at Greater Jakarta, which an agglomeration area consisted of Jakarta metropolitan city and five medium cities nearest Jakarta. Rapid increasing air demand at Soetta IA should be immediately anticipated, in order to avoid Soetta IA experiencing the problem of over capacity. In regard with that, Indonesia Government considers two options. The first option is by revitalizing existing Soetta IA. The revitalizing program includes some works, namely constructing new runway, expansion of passenger terminal and development of the airport using aerotropolis approach. Through the revitalizing program, existing capacity of passenger terminal is going to be expanded, thus the passenger terminal is able to serve 62 million annual passengers. The second one and going to be evaluated in the present study is, by preparing a multi airports system (MAS) Greater Jakarta. MAS is a number of airports serving metropolitan area. MAS consists a major airport and one or more minor airport(s). However, two authoritative institutions, namely Ministry of Communication and Government of West Java Province, have different plan concerning the choice of second airport. Ministry of Communication proposes Karawang airport as the second airport, after the existing Karawang airport is expanded. On the other hand, Government of West Java Province prefers a plan to develop a new international airport at Majalengka Region, for being projected as the second airport for Soetta IA. Indeed, the construction project of Majalengka International Airport (Majalengka IA) is going to be begun in year 2013. Karawang International Airport (Karawang IA) is going to be operated in year 2018, while operation of Majalengka IA is being earlier, namely in year 2015.

The present study is mainly addressed to evaluate which airport is appropriate as a second airport at MAS Greater Jakarta. In order to carry out a comprehensive evaluation from the air travel demand side, the present study considers an official document *Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia* (MP3EI) [Masterplan for the Acceleration and Expansion of Indonesia Economic Development] year 2011-2025, and ASEAN Single Aviation Market (ASAM) policy. MP3EI is a current and most priority economic policy referred by Indonesia Government. ASAM is an open skies agreement among ASEAN countries and is going to be effectively implemented since 2015.

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II. Objective of Study

The followings are the main goals of the present study.

1. To estimate air passengers traffic demand in MAS Greater Jakarta by considering MP3EI document and ASAM policy.
2. To decide which airport appropriate as the second airport in MAS Greater Jakarta, whether Karawang IA or Majalengka IA.

III. Area of Study

Fig. 1 presents a map of airport locations at Greater Jakarta and West Java Province, and (assumed) hinterland of three airports evaluated here, namely Soetta IA, Karawang IA and Majalengka IA. The airport hinterland is assumed being a circle area with a radius of 100 kms.

IV. Literature Study

A MAS served air passengers, who generated in a metropolitan city and fly to other cities. In a MAS, air passengers choose their departure airport. Air passengers mainly choose the major or primary airport as their departure airport. The remaining ones choose the second airport as their origin airport. In general, a primary airport serves total departure and arrival air passengers more than 30 millions passengers or amount of air cargo traffic 100 000 per year. A suggested empirical criterion for a second airport is the airport serving amount of departure passengers over 14 million per year [1].

Model of airport demand allocation [2] could be used to calculate passengers sharing (*PS*) between two competing airport. *PS* is a probability of air passengers choosing an airport as their origin airport based on accessibility consideration. The following steps are required in *PS* calculation.

1. Define two possible origin airports, namely two airports are going to be compared each other and both the airports offer direct flight to the same destination airport. There are two kinds of origin airport, namely close airport and distant airport. Close airport is a closer airport from a place where air passengers depart. Distant airport is another airport where its distance from origin place of air passenger is farther than that between origin place of air passenger and closer airport.
2. Calculate access time difference (*ATD*), namely difference of time travel to reach origin airports from an origin place of air passenger.
3. Calculate frequency ratio (*FR*) using (1).

$$FR = 1{,}1025e^{0{,}7392 \times ATD} \tag{1}$$

4. Determine FF_C and FF_D. FF_C is frequency of direct flight offered by a closer airport to destination airport. FF_D is frequency of direct flight offered by a distant airport to destination airport.
5. Calculate a corrected frequency of direct flight from a distant airport (FF_K). FF_K is calculated using (2).

$$FF_K = FR \times FF_C \tag{2}$$

6. Calculate local relative frequency of a distant airport (LRF_D) using (3).

$$LRF_D = \frac{FF_D}{FF_K} \tag{3}$$

7. Calculate relative frequency of a distant airport (RF_D) dan that of a closer airport (RF_C) using (4) and (5), respectively.

$$RF_D = \frac{LRF_D}{LRF_D + LRF_C} \tag{4}$$

$$RF_C = 1 - RF_D \tag{5}$$

in which LRFC = 1.

8. Calculate *PS* of a distant airport (PS_D) and that of a closer airport (PS_C) using (6) and (7), respectively.

$$PS_D = \frac{RF_D}{RF_D^a + (1 - RF_D)^a} \tag{6}$$

$$PS_C = 1 - PS_D \tag{7}$$

with value of a being 1 – 2.

V. Methodology

To achieve the goals of study, the steps are following:

1. Arrange an econometric model of domestic air passenger traffic.
2. Predict national air passenger traffic.
3. Predict demand of air passenger traffic at Soetta IA. This estimation is assumed representing a demand of air travel generated at Greater Jakarta.
4. Analyze PS among Soetta IA, Karawang IA and Majalengka IA.

Fig. 1 Location and (assumed) hinterland of Soetta IA, Karawang IA and Majalengka IA [3]

VI. An Econometric Model of Domestic Air Passenger Traffic in Indonesia

An economic model is arranged by using income per capita as an independent variable and number of domestic air passenger traffic as dependent variable. Table I presents historical data of number of domestic air passenger traffic, population size and Gross Domestic Product (*GDP*) between years 1993–2010. Those are used to obtain an appropriate domestic air travel model in Indonesia.

The results of regression analysis conducted using Microsoft Excel is presented in Table II.

A regression equation obtained is the following.

$$Pax = -7376110 + 4644587 \times \left(\frac{PDB}{Pop}\right) \quad (8)$$

The regression equation is sufficient, because it has R^2=0.892 (which is > 0.8) and F significance=3.67×10^{-9} (which is < 0.05). A dependent variable $\left(\frac{PDB}{Pop}\right)$ has p-value=3.67×10^{-9} (which is also < 0.05), so variable $\left(\frac{PDB}{Pop}\right)$ is significantly affecting the dependent variable of *Pax*.

TABLE I
HISTORICAL DATA OF NUMBER OF DOMESTIC AIR PASSENGER TRAFFIC, POPULATION SIZE AND *GDP*

Year	*Pax* (person)	*Pop* (inhabitant)	*GDP* (million IDR)	*GDP* per capita (million IDR/ inhabitant)
1993	9 319 472	188 461 127	329 775 000	1.7498
1994	10 581 817	191 589 582	382 219 000	1.9950
1995	12 220 809	194 753 808	454 514 000	2.3338
1996	13 494 810	196 720 821	532 568 000	2.7072
1997	12 813 548	198 707 702	627 695 000	3.1589
1998	7 585 853	200 714 650	955 753 000	4.7618
1999	6 350 481	202 741 868	1 099 731 000	5.4243
2000	7 622 570	206 264 595	1 264 918 000	6.1325
2001	9 168 059	209 337 937	1 467 654 000	7.0109
2002	12 253 173	212 457 073	1 610 564 000	7.5807
2003	19 095 170	215 622 683	1 786 690 000	8.2862
2004	57 003 265	218 835 461	2 210 818 476	10.1027
2005	54 629 402	222 096 109	2 669 975 427	12.0217
2006	67 727 749	225 405 341	3 118 308 049	13.8342
2007	70 406 350	228 763 881	3 535 736 449	15.4558
2008	72 332 667	232 172 463	4 274 764 504	18.4120
2009	83 245 871	235 631 833	4 653 067 434	19.7472
2010	98 230 469	237 641 326	5 284 854 287	22.2388

Note: *Pax* = no of domestic air passengers traffic, *Pop* = population size

TABLE II
THE RESULTS OF REGRESSION ANALYSIS

Regression Statistics	
Multiple R	0.944742
R^2	0.892538
Adjusted R^2	0.885822
Stand. Error	10810575
Observations	18

ANOVA

	Df	SS	MS	F	Sig. F
Regression	1	1.553E+16	1.55E+16	132.8902	3.67E-09
Residual	16	1.87E+15	1.17E+14		
Total	17	1.74E+16			

	Coefficients	Stand. Error	t Stat	p-value
Intercept	-7376110	4449352.3	-1.65779	0.116833
X Variable 1	4644587	402903.16	11.5278	3.67E-09

VII. PREDICTION OF AIR PASSENGER TRAFFIC IN INDONESIA

A. Prediction of Domestic Air Passenger Traffic in Indonesia

Prediction of domestic air passenger traffic is carried out by considering expected addition of Indonesia *GDP* endorsed in MP3EI. MP3EI plans some national economic achievement, including target of *GDP* per capita in year 2010, 2025 and 2045. The target of *GDP* per capita in year 2010, 2025 and 2045 are USD 3000, USD 14 250–15 500 and USD 44 500–49 000, respectively [4]. Using exchange rate 1 USD=IDR 9500, and thus based on (8), the prediction of domestic air passenger traffic in year 2015, 2019, 2025 and 2030 can be obtained. The result of air travel demand prediction is presented in Table III.

TABLE III
PREDICTION OF DOMESTIC AIR PASSENGER TRAFFIC IN INDONESIA

Year	Expected *GDP* per capita		Prediction of domestic air passenger traffic
	In USD	In million IDR	
2015	6280*	66.1	299 631 087
2019	9138*	96.2	439 433 154
2025	14 875**	141.3	648 904 026
2030	20 617***	217.0	1 000 499 258

Note: *) Estimated based on expected *GDP* per capita year 2010–2025, **) estimated as a mid value of expected *GDP* per capita year 2025, ***) estimated based on expected *GDP* per capita year 2025–2045.

B. Prediction of International Air Passenger Traffic in Indonesia

Historical data of national air transportation between year 2005-2009 showed that average of market sharing between the domestic and international air passenger in Indonesia were 84% and 16%, respectively. The comparison is used to predict international air passenger traffic in Indonesia, before we consider an effect of ASEAN open sky implementation in year 2015. The result is presented in Table IV as the following.

TABLE IV
PREDICTION OF INTERNATIONAL AIR PASSENGER TRAFFIC IN INDONESIA

Year	Prediction of Domestic Air Passenger Traffic	Prediction of International Air Passenger Traffic
2015	299 631 087	57 072 588
2019	439 433 154	83 701 553
2025	648 904 026	123 600 767
2030	1 000 499 258	190 571 287

Source: authors

C. Prediction of International Air Passenger Traffic Due to Implementation of ASEAN Open Sky Policy

ASEAN open sky is a policy conducted by a central government to give some rights for airlines from other country in ASEAN region. The policy particularly will increase competition between the airlines. For Indonesia, the policy will also affect the demand of international air passenger traffic, especially at Soetta IA (Greater Jakarta) and Ngurah Rai International Airport (Bali Island).

Demand of air transportation in Indonesia grows higher than that of *GDP* per capita [5]. Air transportation statistics shows that air passenger traffic in Indonesia (both domestic and international) annually grows 6-0%. Implementation of ASEAN open sky will create additional growth on the international air passenger traffic being 6-10 % per year. Considering the same experience in implementation of open sky at US and Europe region (in the mid of years 1990), effect of ASEAN open sky policy is estimated taking in two phases, namely (a) in five years since the policy being implemented, the additional growth of international air passenger traffic happens gradually, and then (b) after five years, the additional growth of international air passenger traffic is continuously stable. Based on the mechanism, additional demand of international air passengers is going to arise as follow: (a) In year 2015, ASEAN open sky policy has no effect on additional international air passengers yet; (b) Between year 2016-2020, demand of international air passengers gradually grows until reaching 8 % (from the estimated number of

international air passenger due MP3EI only). The growth value of 8% is an average of additional growth rate of air transportation demand in Indonesia, namely about 6-10% per year. Therefore, additional of international air passenger demand due ASEAN open sky policy in year 2016, 2017, 2018, 2019, 2020 being of 1.6%, 3.2%, 4.8%, 6.4%, and 8% per year, respectively; (c) then, from year 2020 to year 2030, an additional growth of international air passengers is stable on a rate 8% per year from the estimated number of international air passenger due MP3EI only. The result of calculation is presented in following Table V.

TABLE V
PREDICTION OF INTERNATIONAL AIR PASSENGERS DUE TO IMPLEMENTATION OF ASEAN OPEN SKY

Year	Prediction of International Air Passenger Traffic (Int. Air Pax Traffic)		Prediction of Additional Int. Air Pax Traffic
	due to *MP3EI*	due to *MP3EI* & ASEAN open sky	
2015	57 072 588	57 072 588	0
2019	83 701 553	89 058 452	5 356 899
2025	123 600 767	141 324 571	17 723 804
2030	190 571 287	207 652 161	17 080 874

Source: authors

VIII. PREDICTION OF AIR PASSENGER DEMAND IN SOETTA IA

Air passenger demand in Soetta IA is assumed representing air passenger demand generated at MAS Greater Jakarta in the future. Historical air traffic data between year 2005-2009 showed that average contribution of domestic and international air passenger traffic at Soetta IA to those of national demand were 34% dan 47%, respectively. Based on the historical data and considering the results of analysis shown in Table IV and Table V. Table VI presents prediction of air passenger demand at Soetta IA.

TABLE VI
PREDICTION OF AIR PASSENGER DEMAND AT SOETTA IA

Year	National		At Soetta IA	
	Domestic	International	Domestic	International
2015	299 631 087	57 072 588	101 874 570	26 824 116
2019	439 433 154	89 058 452	149 407 272	41 857 472
2025	648 904 026	141 324 571	220 627 369	66 422 548
2030	1 000 499 258	207 652 161	340 169 748	97 596 516

Source: authors

In a PS analysis, what should be considered is the number of departure air passengers. Statistics of air transportation at Soetta IA shows that number of departure air passengers being 51.4–52.4% from the total air passengers at the airport. Table VII presents prediction of air passenger number departured from Soetta IA. Table VI shows that in year 2015 the estimated number of air passengers at Soetta IA has exceeded 100 million passengers per year. The estimated number of air passengers is larger than the ultimate capacity of passenger terminal of Soetta IA after the terminal being expanded, namely 62 million per year. It means that Soetta IA must be over saturated. Thus a MAS for Greater Jakarta is absolutely necessary and development of the second airport is very urgent.

TABLE VII
PREDICTION OF DEPARTURE AIR PASSENGER AT SOETTA IA

Year	Air passenger traffic			
	Domestic	International	Total	Departure
2015	101 874 570	26 824 116	128 698 686	66 923 317
2019	149 407 272	41 857 472	191 264 744	99 457 667
2025	220 627 369	66 422 548	287 049 917	149 265 957
2030	340 169 748	97 596 516	437 766 264	227 638 457

Source: authors

IX. CALCULATION OF PASSENGER SHARING AMONG SOETTA IA, KARAWANG IA, AND MAJALENGKA IA

Calculation of ATD is presented in Table VIII. Table VIII shows that distance from Greater Jakarta to Soetta IA is shorter than that to Karawang or Majalengka. Therefore, in the PS analysis carried out herein, Soetta IA is the closer airport, while Karawang IA or Majalengka IA is the distant airport.

TABLE VIII
ATD BETWEEN SOETTA IA-KARAWANG IA AND SOETTA IA-MAJALENGKA IA

Karakteristik	GJ–Soetta	GJ–Krw	GJ–Mjk	*ATD* (minute)	
				GJ–Soetta and GJ–Krw	GJ–Soetta and GJ–Mjk
Distance (km)	20	70	270	=108.33–41.67	=385.67–41.6
Speed* (km/h)	45	45	45	=66.67	=344
Δ time (min)	15	15	15		
Travel time (min)	41.67	108.33	385.67		

Source: authors. *Speed here means the expected minimum speed of road vehicle on an arterial road with good structural condition, while GJ=Greater Jakarta, Soetta=Soetta IA, Krw=Karawang IA, Mjk=Majalengka IA.

Calculation of *PS* among Soetta IA, Karawang IA and Majalengka IA is carried out according the procedure above described. Currently, the plan of flight routes and flight frequencies at both Karawang IA and Majalengka IA are not being available. Thus, in the present study, the Authors evaluate a hypothetical case to obtain *PS* between Soetta IA-Karawang IA and Soetta IA-Majalengka IA. As above mentioned, Soetta IA is the closer airport for air passenger generated in Greater Jakarta, whereas Karawang IA or Majalengka IA is a distant airport. Because Soetta IA is the primary airport of Greater Jakarta, the number of flight frequency for a direct flight at Soetta IA is supposed same or more than that available at Karawang IA or Majalengka IA. Calculation of PS dan estimated number of air passenger shared between Soetta IA and Karawang IA are presented in Tables IX and X. Calculation of *PS* dan estimated number of air passenger shared between Soetta IA and Majalengka IA are presented in Tables XI and XII.

Table IX shows *PS* Karawang IA is between 10–40%. The sharing is depended on number of flight frequency with a similar direct flight route offered both at Soetta IA and Karawang IA. The more flight frequency with a similar direct flight route offered at Soetta IA being available at Karawang IA, the more air passengers depart from Karawang IA. Table X shows that, in year 2019, the number of air passenger origin from MAS Greater Jakarta and departure from Karawang IA is 5-20 million passengers per year. In 2025, the number of air passengers from Greater Jakarta and flying from Karawang IA significantly increase being 8–30 million passengers.

Table XI shows *PS* Majalengka IA is less 2%. The sharing is very small and almost not influenced by the options of flight frequency with a similar direct flight route offered both at Soetta IA and Majalengka IA. Table XII shows that, in year 2015, the number of air passenger origin from MAS Greater Jakarta and departure from Majalengka IA is less than 1 million passengers. In year 2025, this situation is almost unchanged. At the time, number of air passenger origin from Greater Jakarta and flying from Majalengka IA just little increase being two million passengers. The main problem therein probably is accessibility, because the time travel between Greater Jakarta-Majalengka IA is quite long.

As above described, in year 2019 (one year after Karawang IA opened), the number of air passengers origin from Greater Jakarta and choose Karawang IA as departure airport is considerable. The number of air passengers is sufficient to meet a criterion for a second airport mentioned in [2], namely 14 million passengers per year. Therefore, it can be concluded that Karawang IA is more appropriate positioned as the second airport for Soetta IA than such plan for Majalengka IA.

Tables X and XII show that the estimated number of air passengers choose Soetta IA as their departure airport being high, namely more than 100 million passengers. It means that the current policies, both the airport revitalizing and MAS Greater Jakarta, are insufficient to overcome the problem of over capacity at Soetta IA. In addition, there is also another possible transportation problem there. Increase of air passengers is going to create the traffic congestion on the road network around Soetta IA. Therefore, the program of airport revitalizing and implementation of MAS Greater Jakarta should be simultaneously accompanied with other programs. For instance, the first, by provide a reliable express or rapid train system connecting Greater Jakarta and the airports. That is necessary to reduce traffic congestion and to improve accessibility between the cities and the airports. The second, by moving the service of some profitable air routes at Soetta IA to Karawang IA. It is positive to reduce high demand loading at Soetta IA and to strengthen the role of Karawang IA. Another program is by revitalizing some small airports within Greater Jakarta area. By revitalizing small airports, thus they are suitable to serve a part of air passenger traffic generated at Greater Jakarta and may also reduce air traffic pressure at Soetta IA.

TABLE IX
PS BETWEEN SOETTA IA-KARAWANG IA

ATD	*FR*	FF_C	FF_K	FF_D	LRF_D	RF_D	RF_C	PS_D (%)						PS_C
					(%)	(%)	(%)	*a*=1	*a*=1.25	*a*=1.5	*a*=1.75	*a*=2	Average	(%)
66.7	2.51	1	2.51	1	39.9	28.5	71.5	28.5	32.9	37.7	42.7	48.2	38.0	62
		2	5.01	1	19.9	16.6	83.4	16.6	18.4	20.1	21.6	23	19.9	80.1
		3	7.52	1	13.3	11.7	88.3	11.7	12.7	13.5	14.2	14.8	13.4	86.6
				2	26.6	21.0	79	21	23.7	26.3	28.9	31.5	26.3	73.7
		4	10.03	1	9.9	9.1	90.9	9.1	9.7	10.1	10.5	10.9	10.1	89.9
				2	19.9	16.6	83.4	16.6	18.4	20.1	21.6	23	19.9	80.1
				3	29.9	23	77	23	26.2	29.3	32.5	35.7	29.3	70.7

Source: authors

TABLE X
PREDICTION OF DEPARTURE AIR PASSENGER SHARED BETWEEN SOETTA IA-KARAWANG IA

FF_C	FF_D	PS_D	PS_C	Estimated Departure Air Passengers at Year 2019			Krw/Soetta
		(%)	(%)	MAS GJ	Soetta	Krw	(%)
1	1	38.0	62		79 797 738	19 659 929	25
2	1	19.9	80.1		89 144 326	10 313 341	12
3	1	13.4	86.6		92 533 968	6 923 699	7
	2	26.3	73.7	99 457 667	85 869 706	13 587 961	16
4	1	10.1	89.9		94 257 910	5 199 757	6
	2	19.9	80.1		89 144 326	10 313 341	12
	3	29.3	70.7		84 287 027	15 170 640	18
FF_C	FF_D	PS_D	PS_C	Estimated Departure Air Passengers at Year 2025			Krw/Soetta
		(%)	(%)	MAS GJ	Soetta	Krw	(%)
1	1	38.0	62		119 760 357	29 505 600	25
2	1	19.9	80.1		133 787 707	15 478 250	12
3	1	13.4	86.6		138 874 876	10 391 081	7
	2	26.3	73.7	149 265 957	128 873 160	20 392 797	16
4	1	10 .1	89 .9		141 462 168	7 803 789	6
	2	19 .9	80 .1		133 787 707	15 478 250	12
	3	29 .3	70 .7		126 497 878	22 768 079	18

Source: authors

TABLE XI
PS BETWEEN SOETTA IA-MAJALENGKA IA

ATD	*FR*	FF_C	FF_K	FF_D	LRF_D (%)	RF_D (%)	RF_C (%)	PS_D (%)						PS_C (%)
								a=1	*a*=1.25	*a*=1.5	*a*=1.75	*a*=2	Average	
344	76.3	1	76.3	1	1.3	1.3	98.7	1.3	1.3	1.3	1.3	1.3	1.3	98.7
		2	152.7	1	0.7	0.7	99.3	0.7	0.7	0.7	0.7	0.7	0.7	99.3
		3	229	1	0.4	0.4	99.6	0.4	0.4	0.4	0.4	0.4	0.4	99.6
				2	0.9	0.9	99.1	0.9	0.9	0.9	0.9	0.9	0.9	99.1
		4	305.4	1	0.3	0.3	99.7	0.3	0.3	0.3	0.3	0.3	0.3	99.7
				2	0.7	0.7	99.3	0.7	0.7	0.7	0.7	0.7	0.7	99.3
				3	1.0	1.0	99.0	1.0	1.0	1.0	1.0	1.0	1.0	99.0

Source: authors

TABLE XII
PREDICTION OF DEPARTURE AIR PASSENGER SHARED BETWEEN SOETTA IA-MAJALENGKA IA

FF_C	FF_D	PS_D (%)	PS_C (%)	Estimated Departure Air Passengers at Year 2015			Mjk/Soetta (%)
				MAS GJ	Soetta	Mjk	
1	1	1.3	98.7	66 923 317	66 044 385	878 932	1 .33
2	1	0.7	99.3		66 484 367	438 950	0 .66
3	1	0.4	99.6		66 630 812	292 505	0 .44
	2	0.9	99.1		66 337 808	585 509	0 .88
4	1	0.3	99.7		66 703 990	219 327	0 .33
	2	0.7	99.3		66 484 367	438 950	0 .66
	3	1.0	99.0		66 264 489	658 828	0 .99
FF_C	FF_D	PS_D (%)	PS_C (%)	Estimated Departure Air Passengers at Year 2025			Mjk/Soetta (%)
				MAS GJ	Soetta	Mjk	
1	1	1.3	98.7	149 265 957	147 305 585	1 960 372	1 .33
2	1	0.7	99.3		148 286 921	979 036	0 .66
3	1	0.4	99.6		148 613 554	652 403	0 .44
	2	0.9	99.1		147 960 035	1 305 922	0 .88
4	1	0.3	99.7		148 776 768	489 189	0 .33
	2	0.7	99.3		148 286 921	979 036	0 .66
	3	1.0	99.0		147 796 504	1 469 453	0 .99

Source: authors

X. CONCLUSION

Conclusions of the present study are the following:

1. Demand of domestic air passengers in Indonesia may be fairly modeled using an empirical equation:

$$Pax = -7376110 + 4644587 \times \left(\frac{PDB}{Pop} \right)$$

The model has $R^2 > 0.8$, significance of $F < 0.05$ and p-Value < 0.05.

2. Successfulness of MP3EI year 2011-2025 is going to generate a large number of air passenger demand in Indonesia. In year 2025, the number of air passengers is estimated more than 700 million passengers. Implementation of ASAM policy in year 2025 will also create additional demand of international air passengers in Indonesia, namely as much as 17.7 million passengers.
3. Since year 2015, the number of air passengers generated at Greater Jakarta is predicted exceeding 66 million passengers. Because the estimated number of air passengers in the year has exceeded 30 million passengers and the ultimate capacity of expanded passenger terminal at Soetta IA just 62 million passengers, thus implementing a MAS for Greater Jakarta is absolutely necessary in short time.
4. In year 2019, one year after Karawang IA opened, the number of air passengers origin from Greater Jakarta and departure from Karawang IA is considerable, namely between 5-20 million passengers per year. Those are sufficient to meet a criterion for a second airport. Therefore, Karawang IA is more appropriate positioned as the second airport for Soetta IA than such plan for Majalengka IA.

ACKNOWLEDGMENT

The work presented in this paper is carried out with support from Directorate General of Higher Education (DGHE), Ministry of Education and Culture, Republic of Indonesia. The authors express their sincere thanks to DGHE for their support providing the research grant under a scheme of National Priority Research of *Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia* (MP3EI) for fiscal year 2012 [Masterplan for the Acceleration and Expansion of Indonesia Economic Development].

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