

3917-ArticleText-6788-1-10- 20210901.pdf

by

Submission date: 02-Apr-2023 12:22PM (UTC+0700)

Submission ID: 2053243337

File name: 3917-ArticleText-6788-1-10-20210901.pdf (617.48K)

Word count: 3913

Character count: 21425

2

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/354338781>

Multi Airports Optimization Model in Supporting Integrated Air Transportation Networks in East Kalimantan Province

Article in *Design Engineering (Toronto)* · September 2021

CITATIONS

0

READS

352

4 authors:



Tukimun Tukimun

Universitas 17 Agustus 1945 Samarinda

24 PUBLICATIONS 0 CITATIONS

[SEE PROFILE](#)



Sakti Adji Adisasmita

Universitas Hasanuddin

57 PUBLICATIONS 134 CITATIONS

[SEE PROFILE](#)



Muhammad Isran Ramli

Universitas Hasanuddin

101 PUBLICATIONS 197 CITATIONS

[SEE PROFILE](#)



Rusdi Usman Latief

Universitas Hasanuddin

4 PUBLICATIONS 0 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Shopping Travel Behavior in Developing Countries [View project](#)



Civil Engineering Research [View project](#)

All content following this page was uploaded by Tukimun Tukimun on 03 September 2021.

The user has requested enhancement of the downloaded file.

Multi Airports Optimization Model in Supporting Integrated Air Transportation Networks in East Kalimantan Province

Tukimun¹, S. A. Adisasmita², Muhammad Isran Ramli³ and Rusdi Usman Latief³

¹Doctoral Course Student, Civil Engineering Department, Hasanuddin University

²Professor, Civil Engineering Department, Hasanuddin University

³Associate Professor, Civil Engineering Department, Hasanuddin University

moonix.mgt@gmail.com, adjiadisasmita@yahoo.com, isranramli@unhas.ac.id, rusdiul@gmail.com

Abstract:

14
Aji Pangeran Tumenggung (APT) Pranoto airport in Samarinda and Sultan Aji Muhammad Sulaiman (SAMS) airport in Sepinggán Balikpapan have a straight distance of ±107 km, less than the minimum requirement of 120 km (Kalimantan Island), have an overlapping hinterland area and have the same flight route for domestic routes, which have an impact on the emergence of airports competition. The establishment of the New Indonesian Capital in East Kalimantan Province impacts increasing the number of passengers in the future, which will affect the existing airport capacity. For this reason, a multi-airport optimization model development has an opportunity to support an integrated air transportation network from 2 hub airports. APT Pranoto airport in Samarinda and SAMS airport in Sepinggán Balikpapan, to synergize with each other, has to be competitive in serving air transportation users in East Kalimantan Province in the future. The model used was the Multiple Airport Demand Allocation Model (MADAM). The result of the modeling of the flight frequency review obtained the APT Pranoto airport flight frequency. The flight frequency of APT Pranoto airport in Samarinda did not change (fixed), while SAMS airport in Sepinggán Balikpapan did. SAMS airport in Sepinggán Balikpapan experienced a change in frequency from 82 times/day to 86 times/day. The modeling of the existing airport capacity of all transported passengers means that the capacity is sufficient in the current condition. However, for the short-term (2026) projections, there will be 540 passengers not transported; in the middle term (2031), there will be 3,087 passengers not transported, and in the long term (2036), as many as 5,801 passengers will not transported. This condition illustrates that the airport's capacity will be unable to serve the number of future passengers. Then it is simulated for optimization of airport capacity development from the airside (runway) and the landside (terminal) at the two airports, and the simulation result from the model is that all passengers can be transported (sufficient capacity).

Keywords: Optimization, Capacity, Multi airports, MADAM, East Kalimantan

I. INTRODUCTION

East Kalimantan Province is the fourth largest province in Indonesia with an area of 127,346.92 km² and has abundant natural resources from the plantation, mining, tourism, and forestry sectors. In utilizing the potential of these natural resources, it is necessary to have effective and efficient transportation facilities and infrastructure following the objectives of the National Transportation System. In addition, the development of the air transportation system is very much needed to meet the integration of land and water transportation modes that have not been fully able to reach remote and border areas in East Kalimantan province related to terrain conditions (geography) and protected forest concessions [1].

As the primary infrastructure of air transportation mode, the airport is an option to drive travel both within and outside the province of East Kalimantan. East Kalimantan Province has 13 airports, of which three airports serve as hubs and ten feeder airports (spoke), each of which interacts with each other in local, national and international flight networks. Therefore, it is necessary to regulate the flight network based on the national airport order to create a reliable, integrated, efficient, competitive flight operation and support national development with an archipelago perspective [2].

There are many obstacles to network growth in the air transportation network, including several conditions such as airport capacity, government policies, geographical location, and financial interests [3]. For example, many airports in Indonesia are experiencing capacity constraints that impact flight delays due to the increasing number of passengers. In addition, the emergence of adjacent airports in one metropolitan area will affect unfair competition, aviation safety, air space capacity, and flight network regulation systems.

In East Kalimantan Province, two adjacent hubs serve the same potential flight routes and have hinterland areas that intersect, which will impact the emergence of competition. The airport is APT Pranoto airport in Samarinda and SAMS airport in Sepinggan Balikpapan with a straight distance of ±107 km, where the requirements in the national airport arrangement for the Kalimantan Island region, the minimum straight distance between 2 airports is 120 km [2].

With the stipulation of the New Indonesian Capital in East Kalimantan Province, it will have an impact on increasing the number of passengers in the future, thus affecting the capacity of the existing airport, namely APT Pranoto airport in Samarinda and SAMS airport in Sepinggan Balikpapan as support for air transportation in East Kalimantan Province will be developed with the concept of multi airports [4].

16
In order to overcome the problem, this study aims to develop a multi-airport optimization model to support an integrated air transportation network from 2 hub airports, APT Pranoto airport in Samarinda and SAMS airport in Sepinggan Balikpapan, so that the two airports synergize with

each other, being competitive in serving air transportation users in East Kalimantan Province in the future.

II. LITERATURE REVIEW

A. Definition of Airport

According to Law Number 1 of 2009 concerning Aviation, Airport is an area on land and waters with specific boundaries that are used as a place for aircraft to do landing and taking off, boarding and dropping passengers, loading and unloading goods, and a place for movement among modes of transportation, which is equipped with aviation safety and security facilities, and basic facilities and other supporting facilities [5].

B. Air Transport Network System

The air transportation network system consists of airport arrangements and air space for flights. The airport structure consists of general airports and particular airports. Meanwhile, the air space consists of the air space above the airport used directly for airport activities, the air space around the airport used for flight operations, and the air space designated as the flight path/route. There is a provision for the distance of 2 adjacent airports in the national airport arrangement, where the minimum straight distance for the island of Kalimantan is 120 km with a radius of 60 km. For service areas, it is a 4 hour trip for other modes of transportation. This arrangement means that each airport authority has the authority to regulate flights in their respective airport areas. However, with the emergence of adjacent airports not following the national airport order, the concept of multiple airports needs to be developed in Indonesia [2].

C. Flight Route Network Patterns

The current domestic flight route network is still a combination of hub and spoke patterns, grip patterns, line patterns, and combined patterns. The pattern of flight network routes in Indonesia uses many hubs and spoke patterns where the smaller airports as a feeder airport (spoke), support the local hub airports in districts or provinces. From the local feeder airports, there are direct flights to carried out to airports for flight destinations outside the province of East Kalimantan.

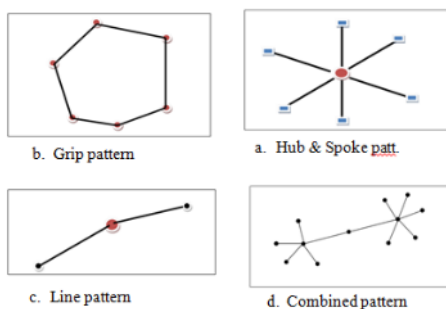


Fig 1: Flight Route Network Patterns [6]

D. Multi Airport System

Multi Airport System collects airports that serve air traffic in a metropolitan area, where two or more airports can service an urban area [7]. The growth of passengers and airports in the Multi-Airport System unit focuses on developing secondary airports and constructing new airports [8].

The application of the multi-airport system has several advantages, including; (1) reducing congestion at primary airports while increasing the capacity of the regional air transportation system, (2) maintaining service quality (especially at primary airports) by breaking down and reducing the effects of disturbances that may occur in airport operations; (3) providing alternative travel options for people in the metropolitan area that can reduce the distance and travel time to the airport; (4) generating economic activities in the surrounding area such as increasing employment opportunities, tax revenues, attracting new companies and others; (5) reducing the impact of the monopoly service that can arise at any time in a single airport system.

E. Metropolitan City

Based on the size of population, cities in Indonesia can be classified as small cities (less than 250,000 people), medium cities (250,000 - 750,000 people), big cities (750,000 - 1,250,000 people) and metropolitan cities (above 1,250,000 people) [9]. There are 13 Metropolitan Areas designated by the Indonesian government, one of which is the Balikpapan–Tenggarong–Samarinda–Bontang Metropolitan Area in East Kalimantan Province [10].

F. Multiple Airport Demand Allocation Model (MADAM)

Multiple Airport Demand Allocation Model (MADAM) is a model developed by the FAA to analyze the relationship between passenger preferences and flight schedules with several factors. The output of this model can be in the form of a review of flight frequency, passenger sharing, and the analysis process. We carried out repeatedly (iteration) in the form of a paired matrix diagram [11].

III. DATA AND RESEARCH METHODOLOGY

The research data consists of 3 components for modeling, which include passengers data, airports data, and airlines data. Passengers data include departure location (W), travel time (T), destination airport (D), transportation to the airport (C), and departure airport (B). Airport data include route (R), landside capacity (K1), and airside (K2). Meanwhile, airline data include load factor (Lf), aircraft type (P), and flight frequency (S).

The research method used the Multiple Airport Demand Allocation Model (MADAM). The modeling steps were as follows:

1. First step: Initiation of traffic allocation to the airport

The analysis process simulated knowing the departure location of passengers at an airport. The modeling divided East Kalimantan region into twelve zones. Then, the equation (1) formulated the zone as a matrix form.

$$\text{Data} = [W \quad T \quad D \quad C \quad B] = \begin{bmatrix} \text{Data}_{11} & \text{Data}_{12} & \dots & \dots & \text{Data}_{1m} \\ \text{Data}_{21} & \text{Data}_{22} & \dots & \dots & \text{Data}_{1m} \\ \vdots & \vdots & \dots & \dots & \vdots \\ \text{Data}_{n1} & \text{Data}_{n2} & \dots & \dots & \text{Data}_{nm} \end{bmatrix} \quad (1)$$

Where : W = area; T = travel time; D = destination airport; C = transportation to the airport and B = departure airport.

2. Second step: Derivation of flight schedule initiation

Creating an airplane departure model involves several factors such as flight route, aircraft type, airport airside capacity, and load factor.

$$R = [r_1 \quad r_2 \quad \dots \quad r_k] \quad (2)$$

Where: R = flight route; and the value of k = 1... k (according to the number of flight routes at the airport).

The flight routes at the airport were modeled in the form of a matrix and produce a schedule of flight frequencies and airport capacities as follows:

$$S = \begin{bmatrix} S_{11} & S_{12} & \dots & \dots & S_{1y} \\ S_{21} & S_{22} & \dots & \dots & S_{1y} \\ \vdots & \vdots & \dots & \dots & \vdots \\ S_{x1} & S_{x2} & \dots & \dots & S_{xy} \end{bmatrix} \quad (3)$$

Where S = flight frequency schedule, x-axis = number of flight operating hours, and y-axis = the number of aircraft movements according to airport capacity.

$$K = \begin{bmatrix} K_{11} & K_{12} & \dots & \dots & K_{1y} \\ K_{21} & K_{22} & \dots & \dots & K_{1y} \\ \vdots & \vdots & \dots & \dots & \vdots \\ K_{x1} & K_{x2} & \dots & \dots & K_{xy} \end{bmatrix} \quad (4)$$

Where: K = airport capacity, x-axis = number of flight operating hours, and y-axis = number of aircraft movements according to airport capacity.

3. Third step: Application of limits for landside airport capacity

IV. RESEARCH RESULTS

A. Flight Route and Frequency Overview

Simulation result on routes and flight frequencies from 2 airports, namely APT Pranoto airport in Samarinda and SAMS airport in Sepinggan Balikpapan, produced the following output:

TABLE I Flight Route and Frequency of APT Pranoto airport in Samarinda

No.	Flight Route	Frequency/Day		Remarks of
		Existing	Simulation	Result
1	Jakarta (CGK)	7	7	Fixed
2	Jakarta (HLP)			Fixed
3	Surabaya (SUB)	4	4	Fixed
4	Makasar (UPG)	1	1	Fixed
5	Denpasar (DPS)	1	1	Fixed
6	Yogyakarta (YIA)	3	3	Fixed
12	Kalimaran Berau (BEJ)	2	2	Fixed
17	Tanjung Selor (TJS)	1	1	Fixed
19	Melak/Melahan (GHS)	1	1	Fixed
	Result	20	20	Fixed

The simulation result produced routes and flight frequencies at APT Pranoto airport in Samarinda, which did not change. In this regard, the existing conditions and the simulation result were the same (fixed).

TABLE II Flight Route and Frequency of SAMS airport in Sepinggan Balikpapan

No.	Flight Route	Flight Frequency/Day		Remarks of
		Existing	Simulation	Result
1	Jakarta (CGK)	19	17	Fixed
2	Jakarta (HLP)		2	Fixed
3	Surabaya (SUB)	11	10	Changed
4	Makasar (UPG)	8	8	Fixed
5	Denpasar (DPS)	1	1	Fixed
6	Yogyakarta (YIA)	5	5	Fixed
7	Manado (MDC)	1	1	Fixed
8	Semarang (SRG)	1	1	Fixed
9	Banjarmasin (BDJ)	7	7	Fixed
10	Tarakan (TRK)	6	6	Fixed
11	Palangkaraya (PKY)	2	2	Fixed
12	Kalimaran Berau (BEJ)	9	9	Fixed

No.	Flight Route	Flight Frequency/Day		Remarks of
		Existing	Simulation	Result
13	Pontianak (PNK)	1	1	Fixed
14	Palu (PLW)	3	4	Changed
15	Banyuwangi (BWX)	1	1	Fixed
16	Kertajati (KJT)	1	1	Fixed
17	Tanjung Selor (TJS)	1	2	Changed
18	Mamuju (MJU)	1	2	Changed
19	Melak/Melahan (GHS)	3	4	Changed
20	Malinau (LNU)	1	2	Changed
Result		82	86	Changed

The simulation result showed a change in the route and frequency of flights at SAMS airport in Sepinggan Balikpapan from 82 times/day to 86 times/day. Table 2 shows the changed route.

B. Model Validation

The model validation used the Standard Error (Sy) as the following formula:

$$S_y = \sqrt{\frac{\sum(Y-Y')}{n-2}} \quad (7)$$

Where: Sy was the Standard Error, y was the value of the observations, y' was the value of the simulation, and n is the amount of data.

The model validation for routes and flight frequencies at APT Pranoto airport in Samarinda, Sy = 0 (existing data was the same as modeling data). As for the SAMS airport in Sepinggan Balikpapan, Sy = 0.47, close to 0 (described the actual condition).

C. Overview of Existing Airport Passenger Capacity and Movement (Sharing)

This model illustrates the capacity requirements of existing airports to accommodate the number of existing passengers who will use the airport with the consideration that passengers will choose the destination airport for flights based on distance, travel time, and travel costs incurred by passengers so that they will get a passenger sharing model. The result of the modeling are as follows:

TABLE III The result of the simulation of the capacity and movement (sharing) of existing passengers

No.	Simulation Data	Passengers	SAMS Airport in Sepinggan Balikpapan			APT Pranoto Airport in Samarinda			Not Transported
		Total (person/day)	Fixed (person/day)	Transported (person/day)	Travel Time (minute)	Fixed (person/day)	Transported (person/day)	Travel Time (minute)	Person /day
1	Data of Existing Capacity and existing passengers	7500	5598	802	36.38	660	440	32.88	0

The simulation result above showed that the two airports' capacity was sufficient to accommodate the number of existing passengers, namely all passengers transported by sharing passengers between the two airports, namely APT Pranoto airport in Samarinda and SAMS airport Sepinggan in Balikpapan with a multi-airport concept.

D. Future Passangers Forecast

To find out future passenger forecast using the multiple linear regression method from variable Y (number of passengers) in the last ten years and variable X (data for social class) in the last ten years, where X1 is total population, X2 is GDP at current prices, X3 is constant price GDP, X4 is labor force, X5 is hotel beds, and X6 is tourists. The prediction results of the future total passengers that calculated from generated regression model (Equation 8 and Equation 9) are presented in Table 4 and Table 5.

a. Passangers regression model of SAMS airport in Sepinggan Balikpapan:

$$Y' = 2799290,683 + 9,093.X3 \quad (8)$$

TABLE IV Future Total Passangers of SAMS airport in Sepinggan Balikpapan

Year	Passangers of SAMS airport in Sepinggan Balikpapan			Remarks
	Arrive (person/year)	Departure (person/year)	Total (person/year)	
2021	4.443.707	4.137776	8.581.484	Existing Condition
2026	6.239.408	5.727.482	11.966.890	Short Term
2031	8.035.109	7.317.188	15.352.297	Middle Term
2036	9.830.810	8.906.894	18.737.704	Long Term

b. Passangers regression model APT Pranoto airport in Samarinda:

$$Y' = -1379638,536 + 1,021.X4 \quad (9)$$

TABLE V. Future Total Passangers APT Pranoto in Samarinda

Year	Passangers of APT Pranoto airport in Samarinda			Remarks
	Arrive (person/year)	Departure (person/year)	Total (person/year)	
2021	309.170	318.797	627.967	Existing Condition
2026	501.759	512.502	1.014.260	Short Term
2031	694.348	706.206	1.400.554	Middle Term
2036	886.936	899.911	1.786.848	Long Term

E. Overview of Future Airport Passenger Capacity/Sharing

From the result of forecasting future passengers (short term, middle term, and long term) to the existing airport capacity, Table 6 presents the modeling capacity and movement (sharing) of passengers.

TABLE VI Simulation result of future passenger capacity and movement (sharing)

No.	Simulation Data	Passangers	SAMS Airport in Sepinggan Balikpapan			APT Pranoto Airport in Samarinda			Not Transported
		Total (person/day)	Fixed (person/day)	Transported (person/day)	Travel Time (minute)	Fixed (person/day)	Transported (person/day)	Travel Time (minute)	Person /day
1	Short Term (2026)	16250	12019	1541	35,20	1290	860	36,50	540
2	Middle Term (2031)	19150	11943	1470	35,40	1590	1060	38	3087
3	Long Term (2036)	21900	11757	1242	35,70	1854	1246	39,50	5801

The model simulation data above illustrates that the capacity of the two airports cannot accommodate the number of passengers in the future. The number of passengers not being transported in the short term (2026) of 540 persons/day, the middle term (2031) of 3087 persons/day, and the long term (2036) of 5801 persons/day indicated this condition. Therefore, to overcome these capacity constraints, it is necessary to develop the capacity of the two airports from the airside and the landside in maximum conditions.

F. Overview of Future Airport Capacity Development

To overcome the problem of the capacity of the SAMS airport in Sepinggan Balikpapan and APT Pranoto airport in Samarinda with the concept of multiple airports is to optimize the development of the airside and landside to the maximum limit at both airports. SAMS airport in Sepinggan Balikpapan expanded from a single runway of 2,500 x 45 meters to a parallel runway of 2 x 3, 250 x 45 meters and a passenger terminal from 119,000 m² to 200,000 m². On the other side, APT Pranoto airport in Samarinda developed the runway length from 2,250 x 45 meters to 3,000 x 45 meters, and the passenger terminal 12,700 m² to 72,000 m². Tabel 7 provides MADAM simulation result.

TABLE VII Simulation result of future airport capacity development

No.	Simulation Data	Passangers Total (person/ day)	SAMS Airport in Sepinggan Balikpapan			APT Pranoto Airport in Samarinda			Not Trans- ported Transported (person/ day)
			Fixed (person/ day)	Trans- ported (person /day)	Travel Time (minute)	Fixed (person/ day)	Total (person /day)	Fixed (person/ day)	
1	Short Term (2026)	16250	13651	449	35	1290	860	38,80	0
2	Middle Term (2031)	19150	16187	313	34,90	1590	1060	41,21	0
3	Long Term (2036)	21900	18602	184	34,87	1854	1246	42,91	14

By optimizing the development of the two airports, the planned airport capacity will be able to overcome the problem of airport capacity to serve passengers in the future. However, the overload around 14 passengers in 2035 indicated that it will be necessary to add new airports to support existing airports based on the simulation result in 2036.

V. CONCLUSIONS

Noticing the SAMS airport in Sepinggan Balikpapan and APT Pranoto airport in Samarinda, which included in the metropolitan area of Balikpapan, Samarinda, Tenggarong, and Bontang, with proximity to airports, with overlapping coverage areas and serving the same domestic flight routes, it is necessary to make arrangements with a multi-airport system.

The existing flight route and frequency model review showed that the route and flight frequency at the APT Pranoto airport in Samarinda has not changed. Meanwhile, the route and frequency of flights at SAMS airport in Sepinggan Balikpapan have changed from the existing condition of 82 to 86 flights/day.

The simulation result on airport capacity in existing conditions can serve the number of existing passengers. However, the airport will exceed it's capacity to serve the number of future passengers in the short term (2026), the middle term (2031), and long term (2036). Therefore, the optimizing between the airside and landside are opportunity in producing sufficient capacity of the airport.

Furthermore, it is necessary to manage a centralized multi-airport system, considering that different managers can manage between SAMS airport in Sepinggan Balikpapan and APT Pranoto airport in Samarinda. Hence, there is a synchronization of the two airports' management to be better, even though operationally, the two airports have their respective management authorities. In addition, the multi-airport optimizing model needs to consider non-regular and international flight data, and the potential for developing new airports as a form of system-integrated multi-airport system, in the further research.

REFERENCES

- [1] **Sitorus. B., Sitorus. T.I., Subandi.** (2016). Improved Transportation Networks in East Kalimantan Province in Supporting Regional Accessibility, *Journal of Transportation & Logistics Management (JMTranslog)* - Vol. 03 No. 1.
- [2] **Minister of Transportation Regulation No. 39 of 2019.** concerning the National Airport Order. (in Indonesian).
- [3] **Latora. V., Marchiori. M.** (2008) *Efficient Behavior of Small-World Network*. University of Venice, Italy.
- [4] **Minister of Transportation Regulation Number PM 80 of 2020** concerning the Strategic Plan of the Ministry of Transportation for 2020-2024. (in Indonesian).
- [5] **Law of the Republic of Indonesian No. 1 of 2009** concerning Aviation. (in Indonesian).
- [6] **Adisasmita. S.A.** (2011). *Transport Network Theory and Analysis*, First Edition. Yogyakarta: Graha Ilmu.
- [7] **De Neufville,** (1995). Management of Multiple-Airport system. A development strategy, *Journal of Air Transport Management*, Vol. 2, No. 2, pp. 99-110.
- [8] **Bonnefoy, P.A.** (2008). Scalability of the air transportation system and development of multi-airport systems: A worldwide perspective (Doctoral dissertation, Massachusetts Institute of Technology).
- [9] **Adisasmita. S.A., Rahardjo.** (2005). *Regional Economic Fundamentals*. Graha Ilmu Publisher.
- [10] **Government Regulation of the Republic of Indonesia Number 13 of 2017 concerning Amendments to Government Regulation Number 26 of 2008** concerning National Spatial Planning. (in Indonesian).
- [11] **FAA.** (1977). Description of The Multiple Airport Demand Allocation Model, United States Department of Transportation Federal Aviation Administration, Washington DC. Federal Aviation Administration (FAA), Advisory Circular AC No: 150/5070-7, The Airport System Planning Process, November 10, 2004.

ORIGINALITY REPORT

9%

SIMILARITY INDEX

%

INTERNET SOURCES

9%

PUBLICATIONS

%

STUDENT PAPERS

PRIMARY SOURCES

- | | | |
|---|--|----|
| 1 | Sahithya Namani, Lalita Snigdha Akkapeddi, Saritha Bantu. "Performance Analysis of VGG-19 Deep Learning Model for COVID-19 Detection", 2022 9th International Conference on Computing for Sustainable Global Development (INDIACom), 2022
Publication | 3% |
| 2 | "DD212 Intro to Block 2 SUP108836", Open University
Publication | 1% |
| 3 | D L Trenggonowati, M Ulfah, R Ekawati, V A Yusuf. "Organization clustering airports using K-Means clustering algorithm", IOP Conference Series: Materials Science and Engineering, 2019
Publication | 1% |
| 4 | Kurt Fuellhart, Kevin O'Connor. "A supply-side categorization of airports across global multiple-airport cities and regions", GeoJournal, 2018
Publication | 1% |
-

5

Mark Hansen. "Positive Feedback Model of Multiple-Airport Systems", Journal of Transportation Engineering, 1995

Publication

1 %

6

T D Anggalini, N D Retnandari, K Yuliani, Y T Keban, J H Mulyo. "Sustainable food agriculture land protection policy for Gunungkidul, Yogyakarta, Indonesia: solution or dilemma?", IOP Conference Series: Earth and Environmental Science, 2020

Publication

1 %

7

Nini H Aswad, Herman Parung, Rita Irmawaty, A Arwin Amiruddin. "The Effects of Reduced Beam Section on Castellated Beam", MATEC Web of Conferences, 2017

Publication

<1 %

8

Wang Liao, Xiaoshu Cao, Yongwei Liu, Yingmin Huang. "Investigating differential effects of airport service quality on behavioral intention in the multi-airport regions", Research in Transportation Business & Management, 2022

Publication

<1 %

9

Daniel Sitohang, Yusuf Latief, Leni Sagita Riantini. "Development of Risk-Based Work Breakdown Structure (WBS) Standard to Improve Scheduling Planning of Airport

<1 %

Construction Work", IOP Conference Series:
Earth and Environmental Science, 2019

Publication

10

Philippe A. Bonnefoy, Richard de Neufville, R. John Hansman. "Evolution and Development of Multiairport Systems: Worldwide Perspective", Journal of Transportation Engineering, 2010

Publication

11

Journal of Modelling in Management, Volume 1, Issue 1 (2006-09-19)

Publication

12

Willem J. Homan. "Design of Multimedia Situational Awareness Training for Pilots", Educational Media International, 1998

Publication

13

F Fadlin, M A Thaha, F Maricar, M P Hatta. "Spatial Modelling for the Calculation of River Capacity: Case Study Downstream Area of Wanggu River Kendari", IOP Conference Series: Earth and Environmental Science, 2022

Publication

14

Yanti, Sri Sunarjono, Agus Riyanto, Nurul Hidayati, Alfia Magfirona. "Visual assessment deterioration analysis of runways at Sultan Aji Muhammad Sulaiman Sepinggan Airport Balikpapan", AIP Publishing, 2019

Publication

<1 %

<1 %

<1 %

<1 %

<1 %

15 Yuan Wang, Yu Zhang. "Prediction of runway configurations and airport acceptance rates for multi-airport system using gridded weather forecast", Transportation Research Part C: Emerging Technologies, 2021
Publication <1 %

16 "Proceedings of the Second International Conference of Construction, Infrastructure, and Materials", Springer Science and Business Media LLC, 2022
Publication <1 %

17 Herman Fithra, Sirojuzilam, Sofyan M. Saleh, Erlina. "Readiness of freight transportation system at special economic zone of Lhokseumawe", AIP Publishing, 2017
Publication <1 %

18 Katarzyna Angelika Gil, Igor Jerković, Zvonimir Marijanović, Maria Letizia Manca et al. "Evaluation of an innovative sheep cheese with antioxidant activity enriched with different thyme essential oil lecithin liposomes", LWT, 2022
Publication <1 %
