

Public Service Agency Policy and Efficiency of Regional Airports in Indonesia

Rofi'i^{1*}, Widyono Soetjipto¹

¹ Magister of Economic Planning and Development Policy (MPKP) Faculty of Economics and Business, Universitas Indonesia, Indonesia

*Corresponding email: rofii88@gmail.com

Abstract

The Public Service Agency policy began to be implemented in Indonesia across hospitals, educational institutions, and airports following the enactment of Law No. 17/2003 on State Finance and Law No. 1/2004 on State Treasury. However, research examining BLU policy within the airport sector remains limited, with existing studies predominantly focusing on hospitals and educational institutions. This study aims to analyze the implementation process of the Public Service Agency policy at ten regional airports in Indonesia over the period 2016–2024 by examining the policy formulation, its application in airport operations, and airport performance using the Data Envelopment Analysis (DEA) and Tobit regression approaches. Based on the efficiency analysis using the Data Envelopment Analysis (DEA) approach, the Public Service Agency policy tends to be implemented at regional airports that are already efficient, although there is a tendency for airport performance to decline after the policy's is implemented. According to the results of the Tobit Regression analysis, variables that significantly influence the efficiency scores of airports include the distance of the airport from the city center and regional GDP per capita. These findings provide an evaluative tool for assessing the performance of regional airports in Indonesia in implementing the BLU policy.

Keywords: Airport, Data Envelopment Analysis, Efficiency, Public Service Agency

Abstrak

Kebijakan Badan Layanan Umum (BLU) mulai diterapkan di Indonesia di rumah sakit, lembaga pendidikan, dan Bandar Udara sejak diberlakukannya Undang-Undang No. 17 Tahun 2003 tentang Keuangan Negara dan Undang-Undang No. 1 Tahun 2004 tentang Perbendaharaan Negara. Penelitian terkait kebijakan BLU di bandar udara masih terbatas dan cenderung dilakukan di rumah sakit dan lembaga pendidikan di Indonesia. Penelitian ini bertujuan untuk menganalisis proses penerapan kebijakan Badan Layanan Umum (BLU) pada sepuluh bandara regional di Indonesia dalam rentang waktu 2016-2024 dengan melihat proses penetapan, penerapan pada operasional bandara, dan kinerja bandara dengan pendekatan Data Envelopment dan regresi tobit. Berdasarkan hasil perhitungan efisiensi dengan pendekatan Data Envelopment Analysis, kebijakan BLU cenderung diterapkan pada bandara regional yang sudah efisien walaupun ada kecenderungan kinerja bandara menurun setelah diterapkan kebijakan BLU. Berdasarkan analisis regresi tobit, penerapan kebijakan BLU dan kebijakan tarif serta jumlah wisatawan tidak signifikan mempengaruhi nilai efisiensi bandara BLU. Variabel-variabel yang signifikan mempengaruhi nilai efisiensi bandara BLU adalah jarak bandara dari pusat kota dan PDRB per kapita. Hasil temuan ini dapat menjadi salah satu alat evaluasi yang dapat digunakan dalam melihat kinerja bandar udara regional di Indonesia dalam menerapkan kebijakan Badan BLU.

Kata Kunci: Bandara, *Data Envelopment Analysis*, Efisiensi, Badan Layanan Umum

INTRODUCTION

Airports serve as catalysts for regional development (Tveter, 2017; Pot & Koster, 2022; Zhang & Xie, 2023; Liang & Zou, 2024) and face multiple challenges. High operating costs and environmental impacts (Budd & Ison, 2021), as well as demand uncertainty for air transportation services (Quintero, 2022), are persistent issues for regional airports. These challenges are exacerbated by limited supporting infrastructure, leading to suboptimal efficiency levels (Thomas & Jha, 2022). Air transport plays a central role in regional development in Indonesia, particularly in Papua (Warpani, 2017). As an archipelagic country, Indonesia has 692 airports, 63% of which are located in Eastern Indonesia (Ministry of Transportation, 2024). According to the International Air Transport Association (IATA, 2018), Indonesia's air passenger traffic is projected to grow to 390 million passengers by 2037. Given these challenges and opportunities, the Government of Indonesia adopted the Public Service Agency policy for the management of regional airports across Kalimantan, Sulawesi, Maluku, and Papua.

Under Law No. 1 of 2004 on State Treasury, Public Service Agency are government institutions that provide non-profit goods or services while adhering to principles of efficiency and productivity. The implementation of the Public Service Agency policy represents a major reform in Indonesia's public service management system. For regional airports, Public Service Agency status requires sound financial indicators, making efficiency one of the key performance metrics in assessing policy implementation. The Public Service Agency policy emerged during a period when Indonesia lacked a legal framework governing integrated transport management, and PT Angkasa Pura, a state-owned enterprise (SOE) in the airports operator sector, had limited capacity to manage a large number of regional airports, particularly in Eastern Indonesia. The Public Service Agency, as a semi-fiscal decentralization mechanism, was expected to ensure the quality of public services through more professional airport management aligned with economic principles while maintaining public service obligations.

Airport management decentralization has been implemented in several countries, such as China, where it has led to increased airport efficiency, particularly in regions with uneven economic development (Liang & Zou, 2024). Improved efficiency and productivity in airport management tend to attract private investment (Iyer & Jain, 2019). However, not all forms of airport governance reform—whether decentralization or privatization—necessarily yield significant improvements in efficiency. Pavlyuk (2016) in the European context and Muslim et al. (2024) in the Pakistani context both found that management reforms do not automatically translate into higher operational efficiency.

The implementation of the Public Service Agency policy in Indonesia generally began with the enactment of Law No. 17 of 2003 on State Finance and Law No. 1 of 2004 on State Treasury. These laws were later elaborated through Government Regulation (PP) No. 23 of 2005 concerning Financial Management of Public Service Agencies. However, the implementation of the Public Service Agency policy is considered to be still imperfect. Choi (2016) argues that the implementation of the the Public Service Agency policy needs further improvement in several dimensions, including the Public Service Agency governance, the application of financial flexibility and autonomy, and the performance of stakeholders in managing the Public Service Agencies. Efficiency and systematic performance evaluation remain key issues in the implementation of the the Public Service Agency policy in several institutions, as efficiency and performance assessments tend to serve as the primary indicators for measuring the Public Service Agencies performance. Therefore, this study aims to provide an evaluation of the

implementation of the the Public Service Agency policy in regional airports in Indonesia.

Studies of airports efficiency and productivity has been extensively conducted in various countries, including Indonesia. At least 61 studies have examined airport efficiency and productivity using a wide range of methodologies (Iyer & Jain, 2019). These studies are often focused on major airports in each country, with relatively limited attention given to the efficiency and productivity of regional airports. Several studies have been conducted internationally focusing on regional airports (Thomas & Jha, 2022) or comparing regional and major airports (Pavlyuk, 2016; Ozsoy & Orkcu, 2021; Chifuentes-Faura & Faura-Martinez, 2023; Choi et al., 2024). Furthermore, variables used in airport efficiency studies tend to be segregated into two main categories: physical variables and financial variables. The limited availability of airport operational data is one of the reasons why research on airport efficiency tends to be distinctly separated between these two variable groups. The combination of these variables is closely related to the status of the airports being studied, airports operating under the Public Service Agency scheme in the service sector, an institutional model developed by the government to promote flexibility in financial management and support equitable regional development. Moreover, existing Public Service Agency-related research has largely concentrated on hospitals (Damhuri, 2011; Ebyude et al., 2025) and educational institutions (Payumo et al., 2014). Studies examining the implementation of Public Service Agency policies in airports remain scarce, thereby providing further motivation to analyze Public Service Agency policy implementation in regional airports in Indonesia.

Reform of Airport Management as Public Goods

Airports can be classified as a form of impure public goods. The benefits of airports are shared by all economic agents involved in air transportation; however, their use requires the payment of certain fees. Public goods are defined as goods or services that are non-rival and non-excludable (Gruber, 2019). In economic theory, there are four categories of goods and services based on their characteristics: private goods (rival and excludable), impure public goods (either rival but non-excludable, or non-rival but excludable), and pure public goods (non-rival and non-excludable). At least three of these categories can be considered public in nature. David Gillen (2011) argues that airports, once viewed purely as public facilities, have increasingly evolved into modern business enterprises. This transformation has largely been driven by privatization trends across many countries. In addition to privatization, airport management reform has also taken the form of decentralization, particularly for regional airports. Liang and Zou (2024) found that decentralizing airport management promotes greater flexibility in financial and operational policy decisions. The Public Service Agency concept is not entirely new, it has been adopted in various forms worldwide. Indonesia's Public Service Agency system, as a semi-autonomous agency, shares similar characteristics with the Next Step Agencies in the United Kingdom, Crown Entities in New Zealand, and Special Operating Agencies in Canada (Choi, 2016). The Public Service Agency framework represents a form of management reform and a shift in how airports are governed in Indonesia. Within the Indonesian context, Public Service Agency implementation is considered the most logical approach to improving the quality of regional airport services while maintaining their role as public service providers.

Airport Efficiency

The theory of the firm provides the fundamental framework for understanding efficiency and

productivity through production functions. Efficiency reflects how an organization makes sequential decisions based on production technology, cost constraints, and the choice of input variables (Pindyck & Rubinfeld, 2013). Efficiency measurement typically relies on a production function that incorporates capital and labor as inputs, which can be adjusted according to the organization's production scale. The main assumptions in production function analysis include: non-negativity of input variables, non-decreasing output with increased input, and concavity in inputs (Sickles & Zelenyuk, 2019). Efficiency is generally classified into three categories: technical efficiency, allocative efficiency, and economic efficiency. Technical efficiency measures performance changes across time periods; allocative efficiency requires information on input and output prices or values; while economic efficiency combines both technical and allocative perspectives (Sickles & Zelenyuk, 2019). Iyer and Jain (2019) conducted a meta-analysis of airport efficiency and productivity studies across various countries, identifying three key variable groups: input variables, output variables, and exogenous variables.

Public Service Agency Policy in Airport Management

The Public Service Agency policy is a government initiative designed to reform bureaucracy and financial management within public institutions that provide goods and services. The Public Service Agency framework has been in effect since the enactment of Law No. 17 of 2003 on State Finance and Law No. 1 of 2004 on State Treasury. Its technical implementation is regulated under Government Regulation No. 23 of 2005 on Public Service Agency Financial Management, later amended by Government Regulation No. 74 of 2012. These regulations define the Public Service Agency's objectives and principles, eligibility requirements, service standards and tariffs, financial management, and governance structure. Further implementation details were codified in the Ministry of Finance Regulation (PMK) No. 129/PMK.05/2020 on Public Service Agency Financial Management Guidelines, as amended by the Ministry of Finance Regulation (PMK) No. 202/PMK.05/2022.

Institutions seeking Public Service Agency designation must fulfill three categories of requirements: substantive, technical, and administrative.

1. Substantive requirements define the functions and activities eligible for Public Service Agency status, entities providing non-profit public services that generate revenue from goods or services, manage economic zones to improve local welfare, or manage special funds for public benefit.
2. Technical requirements emphasize financial soundness and the capacity for sustainable financial management.
3. Administrative requirements include documentation demonstrating operational potential and good governance practices, such as:
 - a. A statement of commitment to service performance improvement and willingness to undergo independent audits;
 - b. Governance framework documentation;
 - c. A five-year Business Strategic Plan;
 - d. Core financial statements; and
 - e. Minimum service standards documentation.

Given this regulatory context, this study aims to evaluate the efficiency of the Public Service Agency implementation process in regional airport management as an indicator of institutional

and financial reform performance. It contributes to the broader academic discourse on airport efficiency and productivity, particularly in archipelagic countries, by integrating both physical and financial variables into the analysis.

METHODOLOGY

This study analyzes the implementation of Public Service Agency policy with respect to financial flexibility and operational efficiency in regional airports, focusing on three dimensions: policy formulation, application, and evaluation. The research covers ten regional airports in Indonesia that have adopted the Public Service Agency model, spanning the period 2016–2024.

Table 1.
Regional Airports in Indonesia Included in the Study

No	Airport Name	City	Airport Class	Type of Use	Year of Implementation
1	Juwata	Tarakan	Class I Main	Domestic	2017
2	Kalimarau	Berau	Class I	Domestic	2017
3	Mutiara	Palu	Class I	Domestic	2017
4	Djalaluddin	Gorontalo	Class I	Domestic	2017
5	Haluoleo	Kendari	Class I	Domestic	2023
6	APT Pranoto	Samarinda	Class I	Domestic	2023
7	Domine E. Osok	Sorong	Class I	Domestic	2023
8	Sultan Babullah	Ternate	Class II	Domestic	2023
9	Rendani	Manokwari	Class II	Domestic	2023
10	Mozes Kilangin	Timika	Class II	Domestic	2023

Source: Ministry of Transportation (2024)

The analytical approach is deterministic, employing the Data Envelopment Analysis – Slack-Based Measurement (DEA-SBM) model with an output-oriented and static configuration. The DEA-SBM calculations were performed using R-Statistics and conducted annually for the ten airports included in the study, resulting in yearly DEA-SBM efficiency scores. The second stage involves Tobit regression analysis to identify external factors associated with airport efficiency. Right-censoring is applied to the efficiency scores, given that their maximum possible value is one. Furthermore, continuous independent variables in the Tobit regression model are transformed using the natural logarithm to reduce the influence of outliers and address differences in measurement units. Qualitative insights were also obtained through in-depth interviews with stakeholders from the Ministry of Transportation and Public Service Agency airport management units. The DEA-SBM model used follows Cooper et al. (2007):

$$\rho_o^* = \min_{\lambda, s^+} \frac{1}{1 + \frac{1}{s} \sum_{r=1}^s s_r^+ / y_{ro}} \dots\dots\dots(1)$$

Subject to:

$$\begin{aligned} x_o &\geq X\lambda \\ y_o &= Y\lambda - s^+ \\ \lambda &\geq 0, s^+ \geq 0 \end{aligned}$$

where λ represents the intensity variable that indicates the combination of Decision-Making Units (DMUs) being analyzed, and s_r^+ denotes the output slack variable. A DMU is considered efficient when ρ_o^* efficiency score equals 1.

The selected input and output variables satisfy the general assumptions of efficiency analysis and the non-negativity requirement typical of DEA models. Both physical and financial dimensions are incorporated into the input–output structure.

Table 2.
Descriptive Statistics of Input and Output Variables of Public Service Agency Airports, 2016–2024

Variable	Unit	Obs	Mean	Std. dev.	Min	Max
Input						
Passenger Terminal Area	Sqm	90	11.634	5.071	754	21.000
No. of Employee	Person	90	138	73	50	366
Capital Expenditure	IDR Million	90	47.219,600	45.680,120	349,900	202.381,700
Operating Expenditure	IDR Million	90	37.050,690	24.921,190	9.027,840	151.071,200
Output						
No. of Passenger	Thousand Persons	90	663,386	399,724	7,491	1.604,952
No. of Cargo	Thousand Kg	90	6.357,105	4.959,864	63,011	21.685,520
No. of Aircraft Movement	Thousand Units	90	9,438	5,418	2,427	27,643
Airport Revenue	IDR Million	90	18.777,900	10.002,620	338,049	43.428,520

Source: Ministry of Transportation Processed, 2016-2024

The second stage of this study aims to identify the factors that influence the level of airport efficiency obtained from the first-stage analysis by employing a Tobit regression model. The Tobit regression model, introduced by Tobin in 1958, applies a censoring mechanism to the dependent variable (Greene, 2012). The model used is as follows:

$$E_{it}^* = \alpha_0 + W_{it}\alpha + z_{it}\gamma + \varepsilon_{it} \quad , \quad i = 1, 2, \dots, N ; t = 1, 2, \dots, T \quad \dots\dots\dots(2)$$

where

$$E_{it} = \begin{cases} E_{it}^* & \text{if } E_{it}^* < 1 \\ 1 & \text{if } E_{it}^* = 1 \end{cases}$$

E_{it} represents the efficiency score obtained from the first-stage analysis for airport i in year t , where E_{it}^* is a latent variable that is observed and subject to censoring. Values of E_{it}^* equal to 1 are censored in the Tobit regression analysis. W_{it} denotes a vector of variables that influence airport efficiency, such as the implementation of the Public Service Agency policy (PSA) and the tariff policies set at each airport, while Z_{it} represents control variables such as the distance from the airport to the city center, Gross Regional Domestic Product (GRDP), and the number of tourists. α and γ are the estimated coefficients of the respective vectors, and ε_{it} is the error term.

Based on the explanation above, the empirical model used in the second-stage analysis employing the Tobit regression can be expressed as follows:

$$Efficiency_{it}^* = \alpha_0 + Status_PSA_Dummy_{it}\alpha + Ln_Tariff_Pax_{it}\alpha + Ln_Tariff_Cargo_{it}\alpha + Ln_Dist_City_Center_{it}\gamma + Ln_GDRPperCapita_{it}\gamma + Ln_Tourist_{it}\gamma + \varepsilon_{it} \quad \dots\dots\dots(3)$$

The dependent variable Y is represented by the efficiency scores obtained from the DEA-SBM calculation. The variable W_{it} , represented by airport status (PSA or Non-PSA), is treated as a dummy variable, while tariff variables are divided into passenger service charges and cargo service charges. Furthermore, the control variables Z_{it} including the distance from the airport to the city center, the provincial GRDP where the airport is located, and the number of tourist arrivals are transformed into natural logarithms to minimize the presence of outliers due to differences in measurement units. The variables used in this study are derived from data published by the Ministry of Transportation and the Central Bureau of Statistics (BPS), which are publicly accessible online.

Table 3.
Descriptive Statistics of Variables Correlated with Airport Efficiency, 2016–2024

Variable	Obs	Mean	Std. dev.	Min	Max
Status_PSA_Dummy	90	1,48	0,502	1,00	2,00
Tariff_Pax	90	36500,00	14193,090	25000,00	65000,00
Tariff_Cargo	90	46,27	17,017	0,00	85,00
Distance_City_Center	90	10,66	9,997	2,30	31,50
GRDPperCapita	90	64758,03	38448,630	18177,00	141088,00
Tourist	90	2360,04	2997,683	281,67	12946,37

Source: Ministry of Transportation & Central Bureau of Statistics (BPS) Processed, 2016-2024

DISCUSSION AND FINDINGS

The implementation of the Public Service Agency policy at airports have been aligned with Minister of Finance Regulation (PMK) No. 129/PMK.05/2020 on Guidelines for the Management of Public Service Agencies, as amended by Minister of Finance Regulation (PMK) No. 202/PMK.05/2022. The policy requires the fulfillment of substantive, technical, and administrative criteria by the management of regional airports. In general, airports as public service institutions are required to meet minimum service standards and maintain sound financial management based on the administrative documents provided. The ten regional airports implementing the Public Service Agency policy have met all three requirements. Moreover, these regional airports possess the characteristics of a Public Service Agency institution, including a non-profit orientation, proper management and governance, effective management of revenues and profits, asset and business unit development and optimization, as well as employee career development based on performance evaluation. Nevertheless, the implementation of the Public Service Agency policy at regional airports in Indonesia still faces limitations, particularly in aspects related to human resource management. The autonomy in staffing and remuneration, which should ideally be fully exercised under the Public Service Agency scheme, has not yet been implemented to its full extent.

The DEA-SBM efficiency scores presented in Table 4 tend to be equal to 1.000 for all airports across all years. To ensure that these results are not driven by analytical or computational errors given that the DEA-SBM calculations were performed sequentially on an annual basis, the study also compares the findings with Stochastic Frontier Analysis (SFA) approach, using Principal Component Analysis (PCA) for the same set of output variables employed in the DEA model. Based on this comparison, airports operating under the Public Service Agency policy framework generally exhibit efficiency levels that are close to fully efficient. The distribution of efficiency scores for each airport is illustrated in Figure 1.

Based on the efficiency analysis using the Data Envelopment Analysis (DEA) approach with the Slack-Based Measurement (SBM) model presented in Table 4, the implementation of the Public Service Agency policy tends to occur in regional airports that are already efficient. This finding is consistent with Pavlyuk (2016), who stated that airport management reforms are generally undertaken at airports that are already operating efficiently. The Public Service Agency policy, as a form of semi-decentralization implemented in Indonesia and applied to regional airports, exhibits a different pattern from airport efficiency reforms in China, as analyzed by Liang and Zou (2024).

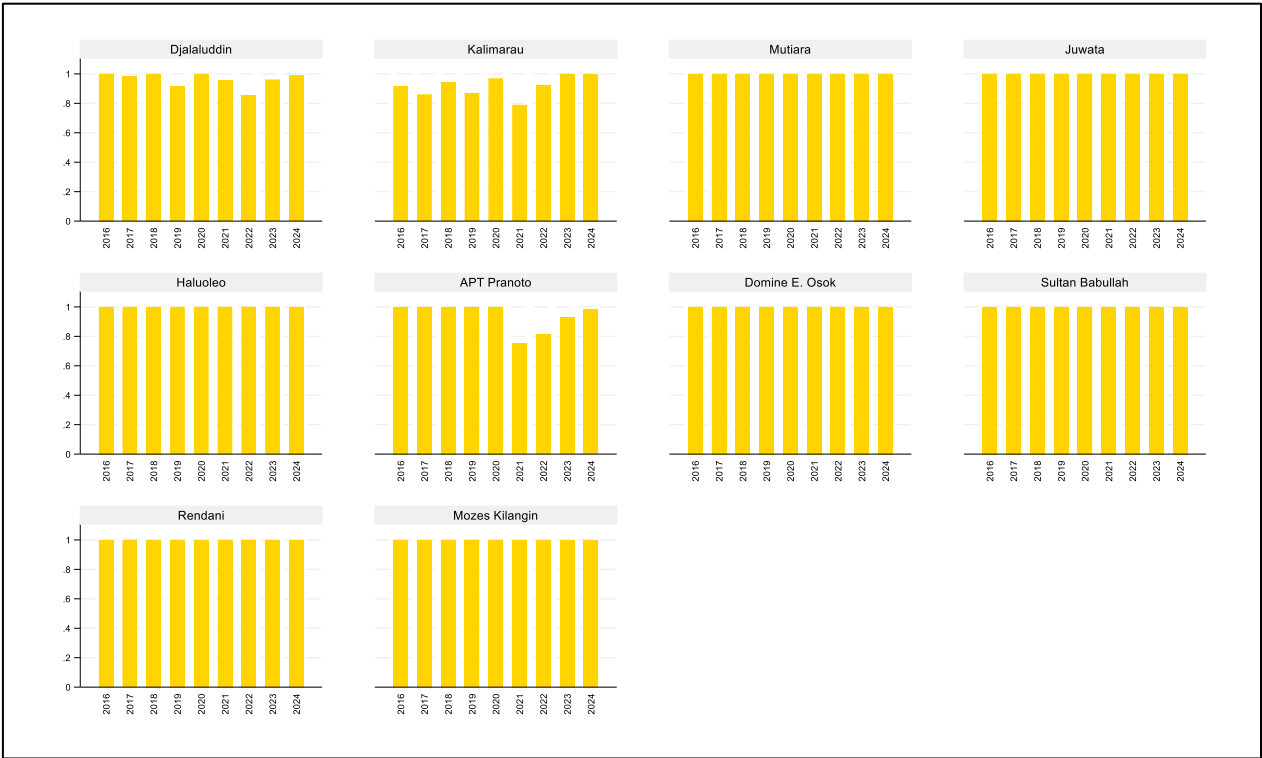


Figure 1.
Distribution of Airport Efficiency Scores by Year
 Source: Author's Calculation, 2025

This difference arises because the implementation of the Public Service Agency policy in Indonesia is not necessarily accompanied by the development of industries surrounding airport areas, unlike the situation observed in China according to Liang and Zou (2024). Kalimantan Airport in Berau (2017) and APT Pranoto Airport in Samarinda (2023) are examples of airports that adopted the Public Service Agency policy even though they had not yet achieved efficiency at the time of designation. Based on in-depth interviews with representatives from the Ministry of Transportation, the designation of these two airports as regional airports implementing Public Service Agency policy was largely based on the evaluation of their business strategy plans and airport governance frameworks prepared during the policy implementation process. Kalimantan Airport in Berau is noted for its distinctive governance system, having achieved high ratings in airport management performance. Meanwhile, the implementation of the Public Service Agency policy at APT Pranoto Airport was also influenced by the relocation of the airport due to safety and aviation security considerations, in accordance with applicable regulations.

The implementation of the Public Service Agency policy at regional airports in Indonesia has implications for more structured planning processes and measurable performance outcomes. Business development planning at each regional airport is formalized through a Business Strategic Plan, prepared every five years, and further detailed in the Business and Budget Plan on an annual basis.

The comparison of regional airport performance before and after the implementation of the Public Service Agency policy can also be examined using the results of a two-tailed *t*-test. The performance comparison of regional airports is conducted by analyzing the ratio of outputs to inputs, using the same variables as those applied in the DEA-SBM efficiency calculation.

Based on Table 5, the performance of regional airports in Indonesia tends to decline following the implementation of the Public Service Agency policy. The ratios of aircraft movements to the number of employees and passengers to passenger terminal area are significantly lower after the Public Service Agency policy was applied to regional airports in Indonesia. The decline in the ratio of passengers to terminal area is largely attributed to three regional airports that underwent terminal expansion projects during the 2016–2024 period, Mutiara Sis Al-Jufri Airport in Palu, Mozes Kilangin Airport in Timika, and APT Pranoto Airport in Samarinda. At Mutiara Sis Al-Jufri Airport, a 4,279-square-meter terminal expansion was carried out after the airport was designated as a airport implementing the Public Service Agency policy in 2017. Meanwhile, terminal expansion prior to Public Service Agency implementation occurred at Mozes Kilangin Airport in Timika (2021) and APT Pranoto Airport in Samarinda (2019). Mozes Kilangin Airport recorded the largest terminal expansion among the three, with an increase of 19,400 square meters. The expansion was part of infrastructure development efforts to support the 20th Papua National Sports Week (PON XX) in 2021. According to in-depth interviews with representatives from the Ministry of Transportation, the new passenger terminal at Mozes Kilangin Airport was constructed to operate alongside the existing terminal managed by PT APCO. Furthermore, the 11,947-square-meter terminal expansion at APT Pranoto Airport in Samarinda was a result of the airport's relocation from downtown Samarinda (formerly Temindung Airport) to its current site in 2019. This relocation was undertaken due to safety and aviation security considerations in accordance with prevailing regulations.

The efficiency scores of regional airports also tend to be lower after the implementation of the Public Service Agency policy compared to the period before its adoption. Nevertheless, the *t*-test results for the efficiency values of regional airports indicate no statistically significant difference between the pre- and post-implementation periods, with a *p*-value < 0.05. This finding is consistent with Choi (2016), who emphasized that stakeholder performance needs to be further improved, particularly in planning, to ensure that service achievements align with allocated budgets and planned targets. The evaluation and monitoring parameters currently employed are largely limited to the POBO (Operating Revenue to Operating Expenditure) analysis implemented by the Ministry of Transportation. Performance assessment using the POBO indicator is conducted through the Internal Control System (SPI) and external audits, which mainly focus on the reasonableness of financial reporting.

Table 4.
Efficiency Scores of Regional Airports by Year (2016–2024) Using
The Data Envelopment Analysis Slack-Based Measurement (DEA-SBM) Compared by Stochastic Frontier Analysis (SFA) Approach

Airport	City	Year of Implementation	2016	2017	2018	2019	2020	2021	2022	2023	2024	Rata-Rata	Rank
DEA-SBM													
Domine E. Osok	Sorong	2023	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
Haluoleo	Kendari	2023	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
Juwata	Tarakan	2017	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
Mozes Kilangin	Timika	2023	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
Mutiara Sis Al-Jufri	Palu	2017	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
Rendani	Manokwari	2023	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
Sultan Babullah	Ternate	2023	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1
APT Pranoto	Samarinda	2023	1,000	1,000	1,000	1,000	1,000	0,770	0,755	0,810	0,901	0,915	8
Djalaluddin	Gorontalo	2017	1,000	0,705	1,000	0,705	1,000	0,714	0,650	0,631	0,731	0,793	9
Kalimara	Berau	2017	0,934	0,969	0,972	0,800	0,714	0,508	0,479	1,000	0,490	0,763	10
SFA													
Juwata	Tarakan	2017	0,9996	0,9996	0,9996	0,9996	0,9997	0,9997	0,9997	0,9997	0,9997	0,9996	1
Kalimara	Berau	2017	0,9995	0,9995	0,9996	0,9996	0,9997	0,9997	0,9997	0,9996	0,9997	0,9996	2
Domine E. Osok	Sorong	2023	0,9995	0,9994	0,9994	0,9994	0,9995	0,9995	0,9995	0,9994	0,9995	0,9995	3
Mutiara Sis Al-Jufri	Palu	2017	0,9993	0,9993	0,9993	0,9994	0,9996	0,9995	0,9995	0,9995	0,9996	0,9995	4
APT Pranoto	Samarinda	2023	0,9994	0,9994	0,9995	0,9992	0,9995	0,9995	0,9995	0,9995	0,9995	0,9994	5
Rendani	Manokwari	2023	0,9994	0,9993	0,9993	0,9994	0,9994	0,9994	0,9994	0,9994	0,9995	0,9994	6
Mozes Kilangin	Timika	2023	0,9995	0,9994	0,9993	0,9992	0,9991	0,9994	0,9994	0,9994	0,9994	0,9993	7
Sultan Babullah	Ternate	2023	0,9991	0,9990	0,9991	0,9991	0,9993	0,9993	0,9993	0,9993	0,9992	0,9992	8
Haluoleo	Kendari	2023	0,9991	0,9991	0,9991	0,9992	0,9993	0,9993	0,9992	0,9992	0,9992	0,9992	9
Djalaluddin	Gorontalo	2017	0,9991	0,9990	0,9991	0,9991	0,9993	0,9993	0,9992	0,9992	0,9993	0,9992	10

Source: Author's Calculation, 2025

Table 5.
Results of a Two-Tailed t-test Rasio Output-Input Regional Airports

<i>Two-Tailed t-test</i>	<i>means</i>		<i>diff</i>
	Befor Public Service Agency	After Public Service Agency	
Ratio of Passengers to Number of Employees	6475,299	5476,521	-998,778
Ratio of Cargo Volume to Number of Employees	58706,290	61024,940	2318,650
Ratio of Aircraft Movements to Number of Employees	104,156	79,324	-24,83202**
Ratio of Total Airport Revenue to Number of Employees (in Million IDR)	140,000	165,000	25,000
Ratio of Passengers to Passenger Terminal Area	71,528	61,095	-10,43283*
Ratio of Total Airport Revenue to Capital Expenditure	0,521	3,794	3,273
Ratio of Total Airport Revenue to Operating Expenditure	0,662	0,588	-0,074
Efficiency Score (DEA-SBM)	0,9851353	0,9409436	-0,044

Significance levels: 0.01 “, 0.05 “, 0.10 “.

Source: Author's Calculation, 2025

Beyond POBO analysis and governance performance assessments, additional indicators are necessary for the monitoring and evaluation of regional airport performance. One such indicator is efficiency analysis, which emphasizes the proportional balance between input and output variables in regional airport operations. Through this efficiency analysis, regional airports are expected to maintain input proportions that are reasonably aligned with their corresponding outputs. However, it is important to note that output variables, such as the number of passengers, cargo volume, and aircraft movements served by airports are often difficult to control, as they depend heavily on external stakeholders such as airlines and cargo operators utilizing airport services.

The reform of airport management through the implementation of the Public Service Agency policy, as a form of semi-decentralization, maintains the not-for-profit orientation of airport operations. The primary priorities of regional airports, as providers of impure public goods, include delivering public services to communities surrounding the airport, ensuring aviation safety and security, promoting good airport governance, and managing the business aspects of airport operations. The business aspect remains the lowest priority in regional airport operations following the policy's implementation. One of the public goods functions of regional airports is serving government-subsidized pioneer flights, whose revenues are not recorded as income, while their operational costs are borne by the regional airports providing the service. As highlighted by Karanki and Bilotkach (2024), subsidies are among the factors that may contribute to airport inefficiency. Nevertheless, the implementation of the Public Service Agency policy at airports can be viewed as a reform measure that does not necessarily displace the public service function of airports in practice.

The implementation of the Public Service Agency policy at regional airports in Indonesia tends to occur at airports with pre-existing infrastructure developed prior to the policy's adoption. The challenge of aligning existing airport infrastructure planning with the volume of outputs managed by regional airport operators is particularly evident at APT Pranoto Airport in Samarinda, Kalimantan Airport in Berau, and Djalaluddin Airport in Gorontalo. Strategic business planning that aligns infrastructure development with service capacity needs to account for the adequacy of airport infrastructure to meet demand (Quintero et al., 2022) and ensure that development enhances both public and private accessibility to airport services (Thomas & Jha, 2022). In addition to infrastructure planning challenges, regional airports have also faced the impact of the COVID-19 pandemic, which disrupted global economic activities, including the aviation sector.

Regional airports located in Kalimantan, Sulawesi, and Eastern Indonesia experienced a decline in passenger traffic but not in the volume of cargo handled. The implementation of the Public Service Agency policy at regional airports, as a form of semi-decentralized management reform, played an important role in sustaining airport operations during the COVID-19 pandemic. Airport management reform through the Public Service Agency framework continues to position the government as the primary actor in airport governance, ensuring that airports maintain their public good function in addressing market failures that may arise during crises such as the pandemic. Government intervention and presence in airport management remain crucial to maintaining a balanced proportion between airports' roles as public service providers and as business entities (Budd & Ison, 2021).

The second stage of analysis in this study aims to identify other variables that are correlated with the efficiency of regional airports. Policy-related and demographic variables are the main focus in examining their impact on regional airport efficiency scores. Policy variables include the implementation of the Public Service Agency policy itself and the tariff policies applied at regional airports, while demographic variables encompass the distance of the airport from the city center, the provincial GRDP per capita where the airport is located, and the number of tourists.

Based on the results of the random-effects Tobit regression model presented in Table 6, the implementation of the Public Service Agency policy at regional airports in Indonesia tends to have no statistically significant effect on airport efficiency. This finding is consistent with Abbot (2015), who found that the type of airport ownership or management structure does not significantly influence airport efficiency in the context of New Zealand. Similarly, Muslim et al. (2024) reported that in Pakistan, improvements in airport efficiency are not necessarily driven by ownership or management models. In line with these studies, Pavlyuk (2016) also noted that management reforms and shifts in governance structures tend to occur once airports have already achieved a certain level of efficiency and productivity. Furthermore, both passenger and cargo tariff policies appear to have no significant effect on the efficiency levels of regional airports in Indonesia.

The variables that have a significant impact on airport efficiency are demographic factors, particularly the distance between the airport and the city center and the provincial GRDP per capita where the regional airport is located. In contrast, the number of domestic tourists does not appear to have a significant effect on regional airport efficiency. Specifically, for every 1% increase in the distance of the airport from the city center, the efficiency score of regional airports tends to decrease significantly by 0.0417% ($p\text{-value} < 0.05$). In general, airport locations are typically determined based on long-term development plans that consider aviation safety and security. These aspects are not only crucial for air transport users and operators but also for the

surrounding communities. Airport operations, particularly aircraft movements, often have negative externalities, including air and noise pollution affecting nearby areas (Budd & Ison, 2021). Furthermore, the quality of road infrastructure and the effectiveness of public transport connectivity significantly influence the number of airport users. As highlighted by Thomas and Jha (2022) in the context of Indian airports, longer travel times to the airport tend to reduce the overall volume of air passengers.

Table 6.
The Influence of Policy and Demographic Variables on Airport Efficiency

Efficiency	Tobit
_cons	8,974***
	2,682
Status_Dum	
PSA	-0,096
	0,145
Ln_Tariff_Pax	-0,220
	0,165
Ln_Tariff_Cargo	-0,110
	0,107
Ln_Dist_CityCenter	-0,417**
	0,169
Ln_GRDPperCapita	-0,348**
	0,177
Ln_Tourist	-0,011
	0,070
sigma_u	0,193
	0,118
sigma_e	0,190***
	0,036
Log Likelihood	-6,554
Wald chi2	13,105**
LR test of sigma_u=0	4,42**
Significance levels: 0.01 '***', 0.05 '**', 0.10 '*'.	
Source: Author's Calculation, 2025	

Gross Regional Domestic Product (GRDP) per capita is often used as an indicator of the welfare level of residents in a given region. In addition, regional economic performance can be reflected through the level of economic activity, which is represented by the value of GRDP per capita. The results of the Tobit random-effects regression model indicate a negative correlation between GRDP per capita and the efficiency scores of regional airports. Specifically, a 1% increase in GRDP per capita significantly decreases the efficiency score of regional airports by 0.0348% (p-value < 0.05). A similar condition was observed in airports in Turkey, as reported by Güner and Codal (2022), where less efficient airports were often located in regions with more advanced economic structures and higher GDP per capita. This negative effect is likely influenced by geographical and infrastructural factors, as regions with higher economic development tend to

have better road networks and rail connectivity, making intercity travel more accessible and reducing dependence on air transportation

CONCLUSION

The implementation of the Public Service Agency policy at regional airports in Indonesia generally complies with the provisions stipulated in Minister of Finance Regulation (PMK) No. 129/PMK.05/2020 concerning Guidelines for the Management of Public Service Agencies, as amended by Minister of Finance Regulation (PMK) No. 202/PMK.05/2022. Nevertheless, the monitoring and performance evaluation mechanisms of regional airports have not yet been fully optimized. At present, the performance evaluation parameters primarily rely on the Operational Revenue to Operational Expenditure (POBO) analysis document, which limits the comprehensiveness of performance assessment.

Based on the efficiency analysis using the Data Envelopment Analysis Slack-Based Measurement (DEA-SBM) approach, the implementation of the Public Service Agency policy at regional airports in Indonesia tends to occur at airports that are already relatively efficient, while still maintaining their public service orientation, despite a general decline in performance following Public Service Agency policy implementation. Furthermore, the efficiency of regional airports in Indonesia is often challenged by infrastructure planning, both in terms of internal airport facilities and external supporting infrastructure. The increased flexibility in airport development resulting from the Public Service Agency policy has not yet been accompanied by sufficient improvements in transport connectivity, such as public transportation systems and road networks linking city centers to airports. According to the Tobit random-effects regression analysis, the efficiency of regional airports is significantly influenced by the distance between the airport and the city center, and the provincial GRDP per capita. In contrast, government policies, including the Public Service Agency policy itself and tariff regulations for passengers and cargo, tend to have no significant effect on the efficiency levels of regional airports in Indonesia.

Limitation

The limitations of this study include the limited number of regional airports that implementing Public Service Agency policy currently operating in Indonesia and the difficulty in obtaining historical airport data from the Ministry of Transportation, which constrains the analysis to a deterministic approach. The expansion of regional airports that implementing Public Service Agency policy in future years is expected to enrich the analysis by enabling the use of stochastic and parametric methods for a more comprehensive efficiency assessment. The DEA-SBM analysis in this study was conducted sequentially for each year, whereas SFA generally requires panel data. This difference in methodological structure results in less robust comparisons of efficiency scores due to the differing frontier assumptions between DEA-SBM and SFA. In addition, data limitations related to the monetary values of physical variables, such as terminal area valuation, employee salary data, and detailed tariff structures based on service proportions, restrict this research to an examination of technical efficiency only, rather than encompassing allocative or cost efficiency dimensions.

Suggestion

Policy recommendations based on the findings of this study include the implementation of a more comprehensive efficiency analysis to complement the existing POBO (Operating Revenue to Operating Expenditure) analysis currently used for performance evaluation. The combination of

these analytical approaches is expected to strengthen the process of designation, monitoring, and evaluation of Public Service Agency policy implementation at regional airports, thereby enhancing its overall effectiveness. Another recommendation is to strengthen infrastructure development collaboration between regional airport operators and local governments to improve connectivity between airports and nearby city centers. Additionally, a comprehensive market potential analysis should be developed to ensure that the business development plans of regional airports are better aligned with their operational performance targets and the regional economic context.

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Appendix A

