ASSESSING THE TECHNICAL EFFICIENCY OF GOVERNMENT EXPENDITURE ON REGIONAL REVENUE IN SUMATERA REGION

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Article History:
Received : April 10, 2026
Revised : June 23, 2026
Accepted : June 29, 2026

Keywords:
Data Envelopment Analysis; Fiscal Decentralization; Government Expenditure Efficiency; Local Own-Source Revenue

Abstract:
Purpose: This study aims to assess the technical efficiency of government expenditure in generating Local Own-Source Revenue across the Sumatera region within the framework of fiscal decentralization.
Methods: This study applies a quantitative approach using Data Envelopment Analysis (DEA) with the Variable Returns to Scale (VRS) model. The input variables consist of operational expenditure, capital expenditure, unexpected expenditure, and transfer expenditure, whereas Local Own-Source Revenue is employed as the output variable.
Findings: The results indicate that Bengkulu, Riau Islands, Lampung, South Sumatera, and North Sumatera achieved technical efficiency. Meanwhile, Aceh, Jambi, Bangka Belitung Islands, Riau, and West Sumatera experienced inefficiency in utilizing regional government expenditure.
Research Implications: The findings provide policy insights for improving budget allocation through expenditure optimization, reduction strategies, and efficiency benchmarking among provinces.
Originality: This study contributes empirical evidence on regional expenditure efficiency by examining the relationship between government spending composition and revenue generation performance in the Sumatera region.

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How to cite this article : Syaifullah, A., Mardalena, Pratama, N., & Pertiwi, R. (2026). Assessing the technical efficiency of government expenditure on regional revenue in Sumatera region. Assets: Jurnal Ekonomi, Manajemen, dan Akuntansi, 16(1), 152-170. https://doi.org/10.24252/assets.v16i1.67546

INTRODUCTION

Fiscal decentralization is a fundamental policy framework in Indonesia's regional governance system that enhances local government autonomy through improved fiscal capacity and public financial management by granting authority over Regional Budgets (APBD), including the mobilization of Local Own-Source Revenue (Pendapatan Asli Daerah/PAD) and the allocation of public expenditure. PAD, derived from regional taxes, user charges (retributions), and the management of regional assets, reflects the ability of local governments to generate revenue from their

own economic resources rather than relying on intergovernmental transfers (Arifin, 2024). However, strong fiscal capacity depends not only on the amount of revenue generated but also on the efficiency of public expenditure management, as higher spending does not necessarily produce better fiscal outcomes when resources are allocated inefficiently. In this context, technical efficiency refers to the ability of a Decision Making Unit (DMU) to maximize output with a given level of inputs or achieve a desired output using minimum resources (Huguenin, 2012). Therefore, analyzing expenditure efficiency provides a more comprehensive assessment of regional fiscal performance by evaluating how effectively government spending supports infrastructure, public services, economic productivity, and ultimately the growth of PAD.

Data Envelopment Analysis (DEA) has been widely applied as a non-parametric approach to measure technical efficiency in public sector performance evaluation. DEA enables comparisons among decision-making units by constructing an efficiency frontier based on multiple input and output variables, allowing researchers to identify relatively efficient and inefficient units (Huguenin, 2012). In the context of regional fiscal management, DEA is particularly relevant because local governments operate under different economic conditions and resource constraints, making simple comparisons of expenditure levels insufficient for evaluating performance. Previous studies have applied DEA to assess government expenditure efficiency and demonstrated significant variations in fiscal resource utilization among regions (Barata et al., 2025).

Indonesia's regional fiscal landscape demonstrates substantial disparities in fiscal capacity and expenditure performance. Although decentralization has provided greater authority to local governments, many regions continue to experience limited fiscal independence due to their high dependence on central government transfers (Permata Sari et al., 2025). At the national level, transfer revenues remain the dominant component of regional government income, while PAD contributes a relatively smaller proportion of total regional revenue (Ministry of Finance, 2024). This condition indicates that improving regional fiscal independence requires not only increasing PAD but also ensuring that public expenditures are managed efficiently to generate sustainable fiscal outcomes.

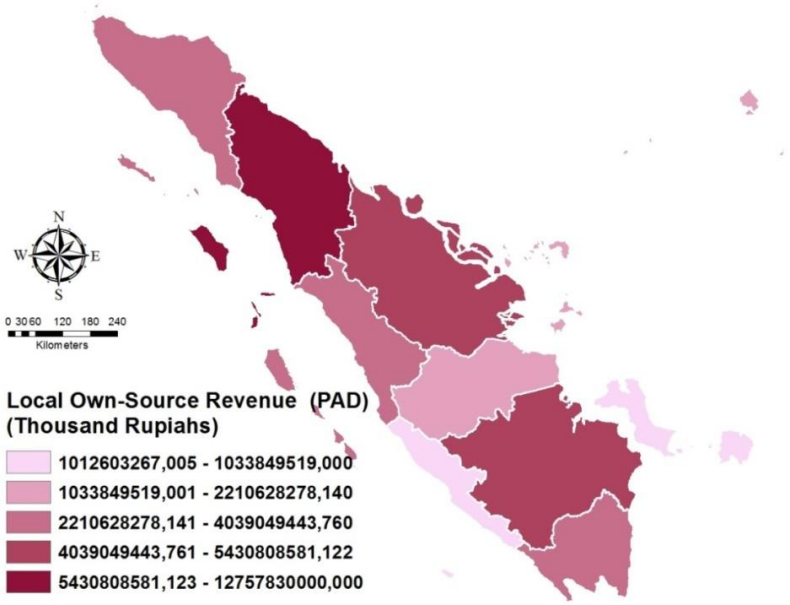
In the regional context, Sumatera exhibits substantial diversity in economic structure, natural resource endowments, and local government institutional capacity, resulting in significant disparities in the ability of provinces and districts to generate Local Own-Source Revenue (PAD) (Amelia et al., 2022; Fauji & Syafitri, 2024). Although Indonesia's economy grew by approximately 5.11% in 2025, creating opportunities to expand the local tax base and increase PAD, regional revenue performance remains uneven. For example, South Sumatera achieved only 38.14% of its 2025 PAD target by May, while many provinces continue to depend heavily on central government transfers rather than locally generated revenue (BPS, 2026; Febrianti et al., 2026). Nationally, transfer funds account for about 79% of regional revenue, with PAD contributing only around 20%, a pattern also evident in West Sumatera and Banyuasin Regency, where transfers comprise approximately 79.63% and 86.71% of regional revenue, respectively, highlighting the limited fiscal independence of many local governments in Sumatera (Ministry of Finance, 2024;

Directorate General of Treasury, 2024; BPK Representative Office of South Sumatera, 2024).

These conditions indicate that the increase in Local Own-Source Revenue is not solely determined by the economic potential of a region but is also strongly influenced by the effectiveness of regional fiscal policies in optimizing the tax base, improving taxpayer compliance, and strengthening the diversification of Local Own-Source Revenue sources. The most recent data on Local Own-Source Revenue (PAD) in the Sumatera region can be seen in Figure 1.

Based on Figure 1, data from Statistics Indonesia (BPS) in 2024 regarding local own-source revenue in 2024 for provincial governments in the Sumatera region indicate disparities in fiscal capacity across regions. North Sumatera recorded the highest Local Own-Source Revenue (PAD) or regional government revenue, amounting to approximately IDR 12.76 trillion, significantly surpassing other provinces in Sumatera. This was followed by Riau with approximately IDR 5.43 trillion and South Sumatera with around IDR 5.31 trillion, reflecting relatively stronger fiscal capacities compared with other provinces in the region. Meanwhile, provinces such as Lampung (approximately IDR 4.04 trillion), West Sumatera (approximately IDR 2.93 trillion), Aceh (approximately IDR 2.99 trillion), and Jambi (approximately IDR 2.21 trillion) fall into the middle category. On the other hand, provinces with relatively lower PAD include the Riau Islands (approximately IDR 1.95 trillion), Bengkulu (approximately IDR 1.03 trillion), and Bangka Belitung Islands (approximately IDR 1.01 trillion).

Figure 1. Distribution of Government Revenue in the Sumatera Region 2024

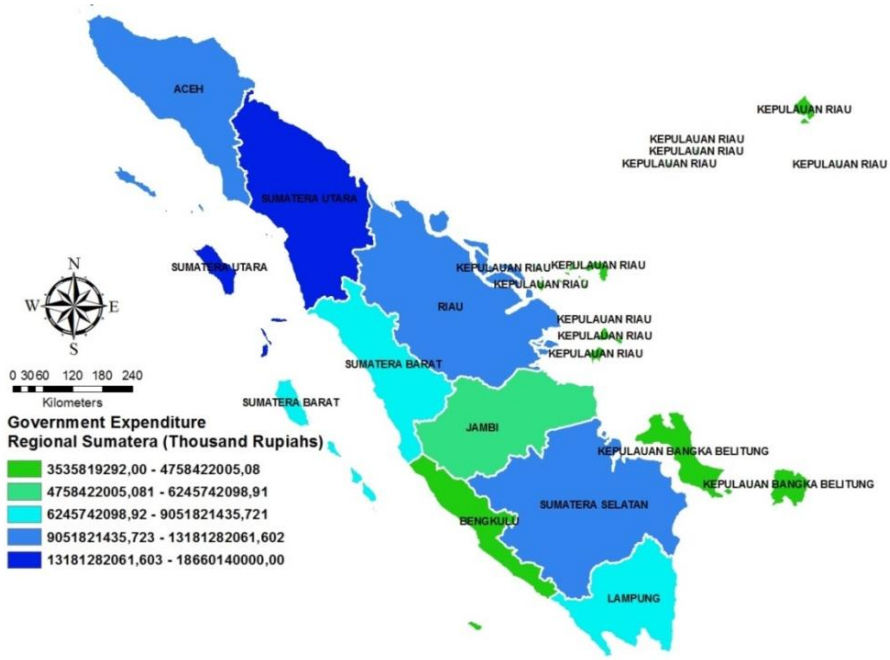


Source : Processed from Badan Pusat Statistik, 2024

These differences indicate that regional fiscal capacity in Sumatera is largely shaped by variations in economic structure, particularly the strength of the industrial,

mining, and trade sectors that form the primary sources of Local Own-Source Revenue (PAD). Provinces with broader economic bases generally generate higher PAD, whereas regions with limited economic activity and continued dependence on central government transfers face greater challenges in achieving fiscal independence, underscoring the need to optimize local taxes, user charges (retributions), and regional asset management (Maulana et al., 2025; Directorate General of Treasury, Ministry of Finance, 2025). From a regional economic perspective, efficient local government expenditure is essential for strengthening infrastructure, human capital, and the investment climate, thereby improving public service quality, enhancing regional fiscal capacity, and supporting sustainable long-term economic growth (Capello, 2016; Oates, 1999; Todaro & Smith, 2015; Sari & Tuah, 2025).

Figure 2. Distribution of Total Government Expenditure in the Sumatera Region, 2024



Source: Processed from Badan Pusat Statistik, 2024

Based on Figure 2, total local government expenditure across the provinces of Sumatera varies substantially, with North Sumatera recording the highest expenditure (approximately IDR 18.66 trillion), followed by Aceh and Riau, while Bengkulu and the Bangka Belitung Islands exhibit the lowest expenditure levels, reflecting differences in fiscal capacity, economic scale, population, and revenue-generating potential. Previous studies have generally examined either government expenditure efficiency in specific sectors or the determinants of Local Own-Source Revenue (PAD) independently (Andria et al., 2019; Allolayuk et al., 2025; Fauji & Syafitri, 2024). To address this gap, this study employs Data Envelopment Analysis (DEA) to evaluate how efficiently provincial governments utilize operational, capital, unexpected, and transfer expenditures as input variables to generate PAD as the

output, thereby providing a more comprehensive assessment of regional fiscal efficiency and fiscal independence.

Accordingly, this study aims to analyze the technical efficiency of local government expenditure in generating PAD across provinces in the Sumatera region. Specifically, this research identifies relative efficiency levels among provinces, determines efficient and inefficient units, evaluates potential improvements in expenditure allocation, and provides benchmarking insights for strengthening regional fiscal management. The findings are expected to contribute to the broader discussion on fiscal decentralization by demonstrating that sustainable fiscal capacity depends not only on increasing revenue sources but also on improving the efficiency of public resource utilization.

THEORETICAL REVIEW

Government expenditure efficiency is a fundamental concept in public finance that explains how governments utilize limited fiscal resources to achieve optimal public outcomes. This study is primarily grounded in Fiscal Federalism Theory, which argues that the delegation of fiscal authority to regional governments can improve resource allocation because local governments generally possess better knowledge of local needs and priorities (Oates, 1999). Within this framework, Local Own-Source Revenue (PAD) reflects regional fiscal capacity, while government expenditure represents the ability of local governments to transform fiscal resources into public services and economic outcomes. Therefore, efficient expenditure management is expected to strengthen fiscal capacity by improving program effectiveness and supporting sustainable regional development.

Public expenditure efficiency theory further emphasizes that government performance depends not only on the amount of resources allocated but also on the ability to convert fiscal inputs into measurable outputs. Inefficient expenditure allocation may reduce the benefits generated from public resources, whereas efficient spending can improve public services, stimulate economic activities, and enhance regional development outcomes. In this study, government expenditure components are selected based on their potential contribution to regional fiscal performance. Operational expenditure represents resources used to maintain administrative functions and public services, while capital expenditure reflects investment in infrastructure and productive assets that may expand future economic capacity and revenue potential. Unexpected expenditure is included as an indicator of fiscal flexibility and resilience, while transfer expenditure represents financial resources allocated to support regional development programs. Although transfer expenditure does not directly generate PAD, its effective utilization may strengthen economic activities and expand the local revenue base.

Previous studies indicate that expenditure efficiency remains a major challenge in regional financial management. Inefficiency may result from weak fiscal planning, limited monitoring mechanisms, inappropriate expenditure priorities, and insufficient managerial capacity (Lakat, 2025). Moreover, high fiscal capacity does not automatically guarantee efficient expenditure outcomes, as governance quality, accountability, transparency, and institutional capacity influence the effectiveness of public resource utilization (Afonso et al., 2024; Lubis & Purwoko, 2025). Therefore,

examining expenditure efficiency in relation to PAD generation provides a broader understanding of how regional governments transform fiscal resources into sustainable fiscal capacity under decentralization.

Although previous studies have examined expenditure efficiency and PAD determinants separately, these approaches provide limited insight into how expenditure allocation contributes to regional fiscal independence. Integrating expenditure efficiency and PAD performance within a single analytical framework is theoretically important because fiscal decentralization concerns not only the transfer of financial resources but also the capacity of local governments to utilize these resources effectively. Based on the fiscal federalism perspective (Oates, 1999), decentralization can improve public sector efficiency when fiscal authority is supported by institutional capacity, accountable expenditure management, and the ability to develop local revenue sources. Therefore, analyzing the relationship between expenditure inputs and PAD outputs provides a more comprehensive assessment of regional fiscal performance.

The Sumatera region provides an important context for examining this relationship due to its diverse economic, institutional, and fiscal characteristics. Provinces in Sumatera have different economic structures, including resource-based economies, industrial activities, and service-oriented sectors, resulting in variations in fiscal capacity and revenue potential. In addition, differences in decentralization implementation, dependence on intergovernmental transfers, administrative capacity, and regional development conditions create diverse patterns of fiscal management among provinces. These characteristics make Sumatera a relevant case for analyzing how regional governments allocate expenditure resources and convert them into PAD performance.

This study applies the Data Envelopment Analysis (DEA) approach to measure technical efficiency among regional governments. DEA is a non-parametric method that evaluates relative efficiency among decision-making units (DMUs) by comparing multiple inputs and outputs without requiring a predetermined functional relationship (Toma et al., 2017). Unlike conventional approaches that analyze expenditure efficiency or PAD determinants separately, DEA enables this study to assess how effectively provincial governments transform expenditure resources into revenue outcomes. In this framework, government expenditure components are treated as input variables, while PAD represents the output reflecting regional fiscal capacity. DEA therefore provides an empirical approach to identify efficiency differences among provinces and determine potential improvements based on efficiency scores.

Accordingly, this study contributes to the literature by integrating government expenditure efficiency and PAD performance within the fiscal decentralization framework. DEA serves as an empirical measurement tool, while fiscal federalism theory and public expenditure efficiency theory provide the conceptual foundation for explaining how fiscal autonomy, expenditure governance, and institutional capacity influence regional financial performance. Based on this theoretical framework and the identified research gap, this study formulates the following research question: How efficient are provincial governments in the Sumatera region

in utilizing government expenditure resources to generate Local Own-Source Revenue (PAD)?

RESEARCH METHODS

This study employs a quantitative approach using the non-parametric Data Envelopment Analysis (DEA) method to measure the technical efficiency of provincial government expenditure in generating Local Own-Source Revenue (Pendapatan Asli Daerah/PAD) across ten provincial governments in the Sumatera region (Aceh, North Sumatera, West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, Lampung, Bangka Belitung Islands, and Riau Islands). DEA was selected because it evaluates the relative efficiency of Decision Making Units (DMU) with multiple inputs and outputs without assuming a functional relationship between them and identifies efficiency based on the efficiency frontier (Henriques et al., 2022). The analysis was performed using Win4DEAP 2 (Series 2.1.0.1) with secondary data on realized provincial budgets for the 2024 fiscal year obtained from Financial Statistics of Provincial Government 2024 published by Statistics Indonesia (BPS), complemented by official publications of the Ministry of Finance and other government documents. The input variables include operational expenditure, capital expenditure, unexpected expenditure, and transfer expenditure, while PAD serves as the output variable because it reflects the capacity of provincial governments to generate revenue from their own fiscal resources. The use of realized expenditure and PAD provides a more accurate basis for evaluating the actual efficiency of regional fiscal resource utilization.

The operational definitions, measurement units, and data sources of the variables are presented in Table 1:

Table 1. Input and Output Variables Used in the Analysis

Variable	Operational Definition	Measurement	Data Source
Input 1: Operational Expenditure	Realized government expenditure used to finance routine government activities, including personnel expenditure, goods and services expenditure, subsidies, grants, and other operational costs. (Minister of Home Affairs Regulation Number 77 of 2020).	Thousand Rupiahs	Statistics Indonesia (BPS), *Financial Statistics of Provincial Government 2024*
Input 2: Capital Expenditure	Realized expenditure allocated for the acquisition or improvement of fixed assets that provide benefits for more than one fiscal period, including infrastructure, buildings, equipment, and public facilities. (Minister of Home Affairs Regulation Number 77 of 2020).	Thousand Rupiahs	Statistics Indonesia (BPS), *Financial Statistics of Provincial Government 2024*

Variable	Operational Definition	Measurement	Data Source
Input 3: Unexpected Expenditure	Realized expenditure allocated for emergency conditions or unforeseen events requiring immediate fiscal responses. (Minister of Home Affairs Regulation Number 77 of 2020).	Thousand Rupiahs	Statistics Indonesia (BPS), *Financial Statistics of Provincial Government 2024*
Input 4: Transfer Expenditure	Realized expenditure allocated for transfers to other government entities, including financial assistance and other forms of transfers within the framework of fiscal decentralization. (Minister of Home Affairs Regulation Number 77 of 2020).	Thousand Rupiahs	Statistics Indonesia (BPS), *Financial Statistics of Provincial Government 2024*
Output: Local Own-Source Revenue (PAD)	Realized revenue generated from regional economic sources, including regional taxes, retributions, separated regional asset management revenues, and other legitimate PAD sources. (Minister of Home Affairs Regulation Number 77 of 2020).	Thousand Rupiahs	Statistics Indonesia (BPS), *Financial Statistics of Provincial Government 2024*

This study applies the Data Envelopment Analysis (DEA) using the input-oriented Banker, Charnes, Cooper (BCC) model under the Variable Returns to Scale (VRS) assumption to evaluate the relative technical efficiency of each Decision Making Unit (DMU) (Guo & Ye, 2025). The input-oriented approach measures the ability of each province to optimize the use of expenditure inputs to maximize Local Own-Source Revenue (PAD), while the VRS assumption accounts for differences in operational scale, enabling a more accurate assessment of pure technical efficiency under actual empirical conditions (Fauzi, 2019; Ikhsan, 2025). Mathematically, the efficiency measurement method using the DEA approach was first formally formulated by Abraham Charnes and his colleagues in 1978, who developed a linear optimization model to measure the efficiency ratio between combinations of outputs and inputs as follows (Fauzi, A., 2019):

$$\text{Max} \sum_{r=1}^{s} = u_r y_{ro} \qquad (1)$$

$$\text{Subject to : } \sum_{r=1}^{s} = u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0$$

$$\sum_{i=1}^{m} = v_i x_{io} = 1$$

$$u_{r,} v_i \geq 0$$

Where y_{rj} and x_{ij} represent the outputs and inputs of the j Decision Making Unit (DMU) . Variable u_r and v_i denote the weights associated with outputs and inputs, which are determined by solving the optimization equation above. The term $\sum_{i=1}^{m} v_i x_{io} = 1$ is used when transforming the efficiency ratio form into a linear programming formulation. In DEA terminology, Equation (1) is also commonly referred as the multiplier model of DEA. The DEA formulation for an input-oriented model under the assumption of Variable Returns to Scale (VRS) can be expressed through the following equation (Fauzi, A., 2019):

$$\text{Max} \sum_{r=1}^{s} = u_r y_{ro} - u_o \qquad (2)$$

$$\text{Subject to :} \sum_{r=1}^{s} = u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} - u_o \leq 0$$

$$\sum_{i=1}^{m} = v_i x_{io} = 1, \qquad u_r \geq 0\,, \qquad v_i \geq 0$$

where:

u_r = weight assigned to output (r)
v_i = weight assigned to input (i)
y_{ro} = amount of output (r) produced by (DMU)
x_{io} = amount of input (i) used by (DMU)

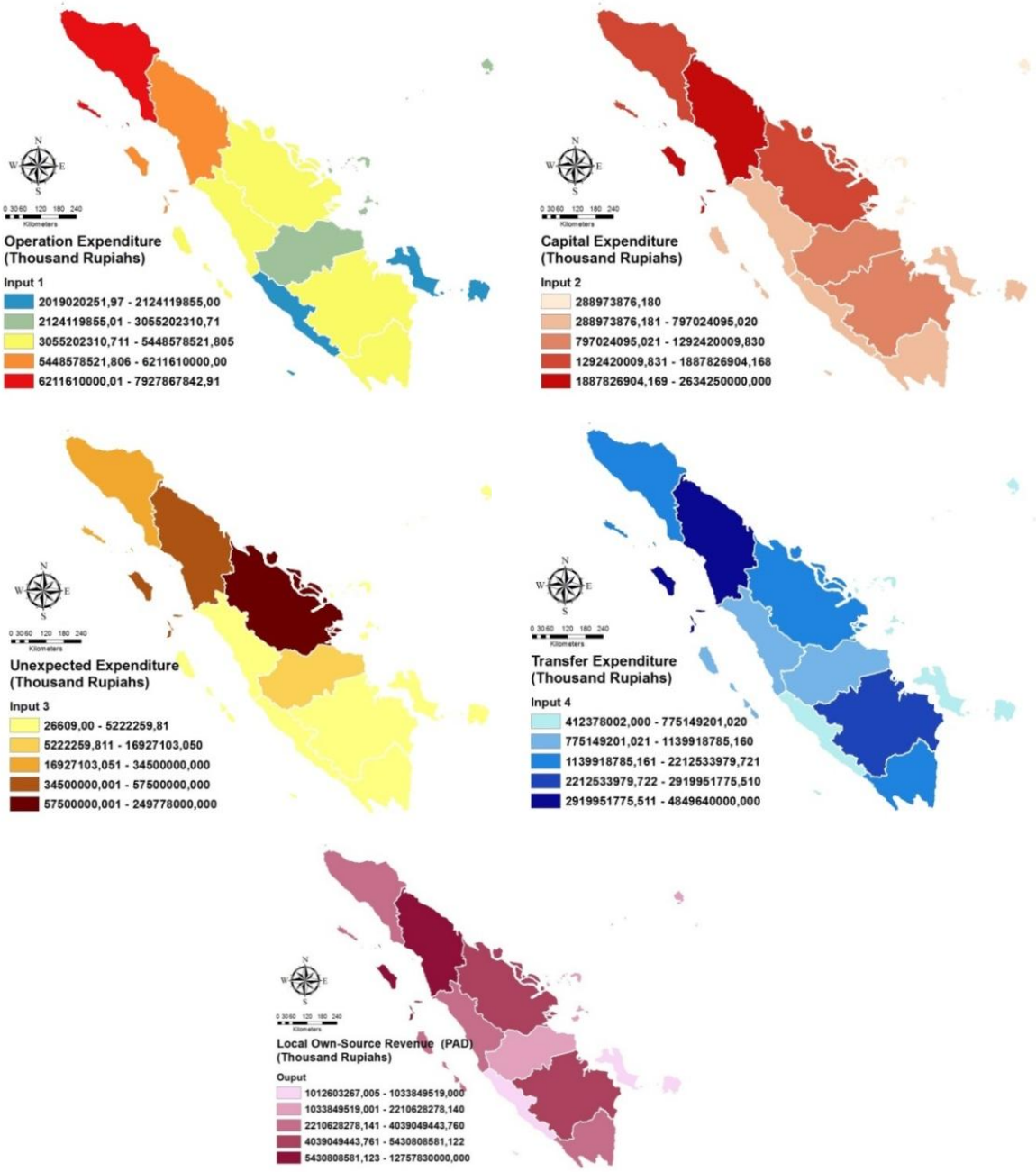
DEA measures the relative efficiency of each Decision Making Unit (DMU) by comparing its performance with the efficiency frontier, while generating projected targets and radial movement values that indicate the proportional input adjustments required for inefficient provinces to achieve optimal efficiency (Mohammadi et al., 2025). In this study, radial movement represents the potential proportional reduction in provincial government expenditure components needed to attain the efficiency frontier without reducing the expected level of output. Additionally, DEA identifies efficient provinces as benchmarking reference sets, providing practical guidance for improving expenditure management and strengthening regional fiscal policy (Hajarana et al., 2025).

RESULTS AND DISCUSSION

The results of this study provide an overview of the level of technical efficiency of local government expenditure in generating regional revenue in the Sumatera region using the Data Envelopment Analysis (DEA) approach. The analysis incorporates several components of government expenditure as input variables, including operational expenditure, capital expenditure, unexpected expenditure, and

transfer expenditure, while Local Own-Source Revenue (Pendapatan Asli Daerah/PAD) is employed as the output variable. The distribution of the input and output variables used in this study can be seen in Figure 3.

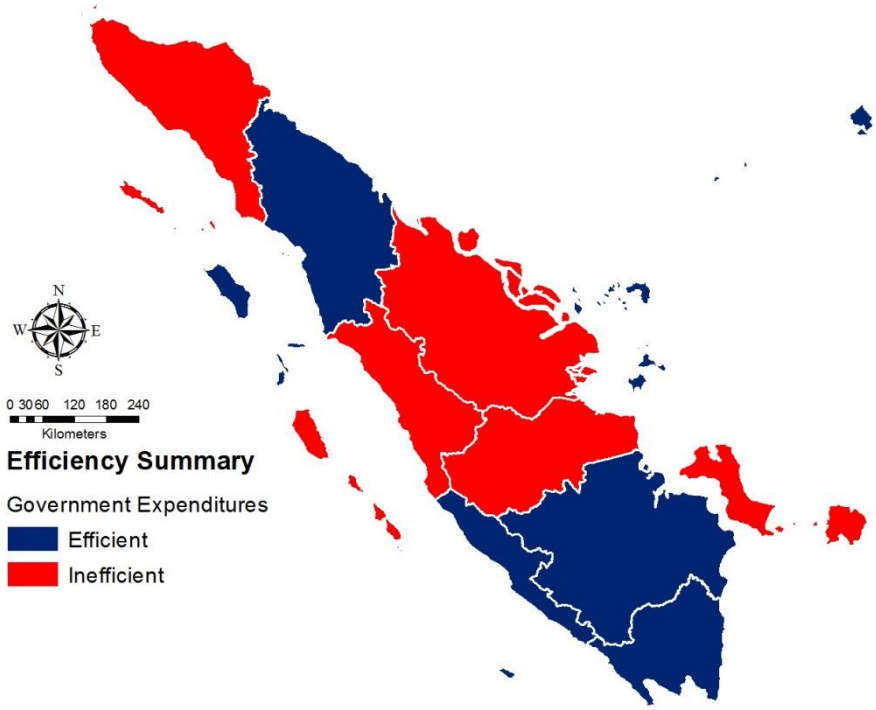
Figure 3. Distribution of Input and Output Analysis



This study identifies variations in efficiency levels across provinces and reveals the potential for improving fiscal performance in several regions that have not yet achieved efficient conditions. These findings not only demonstrate the extent to which regional budgets are effectively utilized to support Local Own-Source Revenue, but also provide an analytical basis for formulating policies aimed at improving government expenditure management so that it becomes more optimal, accountable,

and oriented toward strengthening regional fiscal capacity. The results of the DEA technical efficiency calculations are presented in Figure 4.

Figure 4. Results of the Technical Efficiency DEA of Government Expenditure in the Sumatera Region



Province	Output	Input 1	Input 2	Input 3	Input 4	Efficiency Weigth	Summary
ACEH	2985959002,060	7927867842,910	1668913999,168	34500000,000	1757750109,762	0,646	Inefficient
BENGKULU	1033849519,000	2124119855,000	586890215,000	26609,000	412378002,000	1	Efficient
JAMBI	2210628278,140	3055202310,710	1055723618,630	16927103,050	1050480981,730	0,8	Inefficient
KEPULAUAN BANGKA BELITUNG	1012603267,006	2019020251,970	589274660,950	849364,000	586610973,770	0,66	Inefficient
KEPULAUAN RIAU	1951801482,270	2915014852,580	288973876,180	2067437,140	775149201,020	1	Efficient
LAMPUNG	4039049443,760	5164775276,920	797024095,020	1077865,000	1543933166,890	1	Efficient
RIAU	5430808581,122	5448578521,805	1887826904,169	249778000,000	2212533979,722	0,933	Inefficient
SUMATERA BARAT	2933232747,820	4602876324,900	767606311,810	5222259,810	1139918785,160	0,982	Inefficient
SUMATERA SELATAN	5309757143,240	4790559064,730	1292420009,830	82301,000	2919951775,510	1	Efficient
SUMATERA UTARA	12757830000,000	6211610000,000	2634250000,000	57500000,000	4849640000,000	1	Efficient

The input and output variables were were subsequently analyzed using the Data Envelopment Analysis (DEA) method with a Variable Returns to Scale (VRS) assumption and an input-oriented approach. Under this approach, each decision-making unit (DMU), represented by provinces in the Sumatera region, is evaluated based on its ability to maximize output given a relatively similar level of input usage.

Based on Figure 4, the DEA results reveal substantial variation in the technical efficiency of local government expenditure in generating Local Own-Source Revenue (PAD) across provinces in the Sumatera region. The DEA model evaluates each province as a Decision-Making Unit (DMU) by comparing its ability to transform expenditure inputs into revenue outputs relative to the best-performing provinces within the observed sample.

The findings indicate that five provinces, namely Bengkulu, Riau Islands, Lampung, South Sumatera, and North Sumatera, achieved an efficiency score of 1 and were located on the efficiency frontier, while the remaining provinces operated below the frontier. However, these results should be interpreted as measures of relative efficiency within the observed sample rather than absolute indicators of superior fiscal management or government performance. In the DEA framework, the efficiency frontier represents the best observed input-output combinations among the selected Decision-Making Units (DMUs), indicating that frontier provinces were relatively more capable of transforming government expenditure into Local Own-Source Revenue (PAD) compared with other provinces. Therefore, efficiency scores should be understood within the institutional and fiscal context of each province rather than as a direct ranking of government quality.

The achievement of technical efficiency in Bengkulu, Riau Islands, Lampung, South Sumatera, and North Sumatera indicates that these provinces demonstrated relatively favorable relationships between government expenditure inputs and PAD outputs. From the perspective of Fiscal Federalism Theory (Oates, 1999), these results reflect the extent to which decentralized governments are capable of utilizing their fiscal authority and resources to generate locally responsive and financially sustainable outcomes. Fiscal decentralization is expected to improve efficiency when local governments possess adequate institutional capacity, economic resources, and governance mechanisms to align expenditure allocation with regional development priorities. Consequently, provinces positioned on the efficiency frontier may reflect relatively stronger fiscal management capacity in converting public resources into locally generated revenue.

However, efficiency performance cannot be explained solely by the magnitude of fiscal resources available to provincial governments. Differences in economic structure, revenue-generating capacity, institutional arrangements, and expenditure governance may influence the ability of local governments to transform fiscal inputs into PAD. For example, North Sumatera and South Sumatera achieved frontier efficiency, which may be associated with their relatively diversified economic activities, larger economic bases, and broader potential sources of regional revenue. Nevertheless, the DEA model applied in this study does not directly estimate the causal effect of these factors. Therefore, these interpretations should be understood as contextual explanations of efficiency differences rather than definitive determinants.

In contrast, provinces with efficiency scores below one indicate that government expenditure has not been converted into PAD as effectively as benchmark provinces. The Bangka Belitung Islands recorded the lowest efficiency score (0.66), followed by Jambi, Riau, West Sumatera, and Aceh. These results indicate the existence of structural efficiency challenges in fiscal resource utilization. Within the fiscal federalism perspective, lower efficiency does not necessarily imply insufficient fiscal capacity but rather reflects limitations in how decentralized financial resources are allocated, managed, and transformed into sustainable local revenue.

Aceh represents an important case in understanding this phenomenon. Despite receiving substantial asymmetric decentralization funds through special autonomy arrangements, Aceh remained below the efficiency frontier in generating PAD. This finding suggests that greater fiscal transfers do not automatically produce stronger

fiscal independence. From the perspective of fiscal federalism, transfer dependence may reduce incentives and institutional pressures for developing endogenous revenue sources when expenditure management is not sufficiently oriented toward productive economic activities. In Aceh's case, the availability of significant fiscal resources has not yet been fully translated into expenditure structures capable of expanding the regional revenue base. Therefore, the issue is not merely the amount of fiscal resources received, but rather the effectiveness of expenditure allocation, institutional capacity, and governance mechanisms in generating sustainable fiscal outcomes.

Similarly, Jambi, Riau, West Sumatera, and Bangka Belitung Islands Province demonstrate that fiscal efficiency challenges are closely related to the capacity of regional governments to optimize expenditure composition. These provinces may experience limitations in directing government spending toward sectors with high economic multiplier effects and long-term revenue generation potential. Accordingly, improving fiscal efficiency requires a transition from expenditure-oriented budgeting toward performance-based fiscal management, where public spending is evaluated based on its contribution to economic expansion and PAD enhancement.

These findings are comparable with previous studies on regional government expenditure efficiency. Barata et al. (2025) demonstrated that efficiency differences among government units are associated with variations in expenditure management performance, while Allolayuk et al. (2025) emphasized the importance of expenditure effectiveness in supporting regional development outcomes. Nevertheless, the present study extends the literature by evaluating the relationship between government expenditure and PAD generation at the provincial level in Sumatera.

The radial movement analysis presented in Table 2 provides more specific information regarding the potential expenditure adjustments required for inefficient provinces. Within the input-oriented DEA framework, the radial movement values represent the proportional reduction in expenditure inputs required for provinces to reach the efficiency frontier while maintaining their existing level of PAD. These values should not be interpreted as recommendations for uniform budget reductions; instead, they indicate the magnitude of potential expenditure restructuring needed to improve fiscal efficiency.

Table 2. Potential Improvements in Government Expenditure Allocation Based on DEA Radial Movement

Province	Government Expenditure (Thousand Rupiahs)	Radial Movement (Thousand Rupiahs)	Percentage Reduction (%)
Aceh	11.389.031.951,840	4.034.649.542,371	35,43
Jambi	5.178.334.014,120	1.035.950.763,236	20,01
Kepulauan Bangka Belitung	3.195.755.250,690	1.087.859.288,899	34,04
Riau	9.798.717.405,696	655.975.303,967	6,69
Sumatera Barat	6.515.623.681,680	119.226.555,018	1,83

The analysis demonstrates that Aceh Province has the largest potential adjustment, amounting to approximately IDR 4,034 trillion or 35.43% of total government expenditure. This finding indicates that Aceh requires substantial improvements in expenditure allocation. Rather than reducing public spending indiscriminately, fiscal restructuring should focus on reducing less productive operational expenditure components and reallocating resources toward capital expenditure and economic development programs that generate long-term regional revenue capacity. Considering Aceh's fiscal dependency on special autonomy transfers, expenditure should be directed toward strengthening productive sectors, improving investment attractiveness, and expanding economic activities that contribute to PAD growth.

Jambi Province demonstrates a potential adjustment of approximately IDR 1,035 trillion (20.01%), indicating the need to improve expenditure prioritization. The province should evaluate operational spending components that have limited direct economic impacts and increase investment allocation in sectors capable of strengthening local economic competitiveness. Similarly, the Bangka Belitung Islands, with a potential adjustment of IDR 1,087 trillion (34.04%), require expenditure restructuring strategies that prioritize productive investments, particularly in sectors related to tourism, downstream industries, and economic diversification to reduce dependence on limited revenue sources.

Riau Province shows a relatively smaller potential adjustment of approximately IDR 655.975 billion (6.69%), indicating that its expenditure structure is closer to efficient conditions compared with other inefficient provinces. Nevertheless, continuous expenditure evaluation remains necessary to ensure that government spending supports economic productivity rather than increasing administrative costs. West Sumatera requires the smallest adjustment of approximately IDR 119.226 billion (1.83%), suggesting that efficiency improvements can be achieved through incremental improvements in expenditure planning, monitoring, and allocation effectiveness.

Based on Table 3, the benchmarking results further demonstrate that inefficient provinces can improve expenditure management by learning from provinces positioned on the efficiency frontier. Aceh is benchmarked against Lampung and North Sumatera, while Jambi is associated with North Sumatera, Lampung, and Bengkulu. The Bangka Belitung Islands and Riau are benchmarked against Lampung and North Sumatera, whereas West Sumatera is linked to Bengkulu and Lampung. These reference relationships indicate potential fiscal management patterns that can be adapted by inefficient provinces according to their institutional and economic characteristics.

Table 3. Benchmarking Recommendations for Government Expenditure Management in the Sumatera Region

No	Inefficient Province	Reference 1	Reference 2	Reference 3
1	Aceh	Lampung	Sumatera Utara	-
2	Jambi	Sumatera Utara	Lampung	Bengkulu

3	Kepulauan Bangka Belitung	Lampung	Sumatera Utara	-
4	Riau	Lampung	Sumatera Utara	-
5	Sumatera Barat	Bengkulu	Lampung	-

Lampung Province emerges as the most frequently selected benchmark province, suggesting that its expenditure-PAD combination represents a relatively efficient allocation pattern among provinces in the sample. However, benchmarking does not imply that other provinces should replicate Lampung's fiscal structure entirely. Instead, it provides comparative evidence regarding possible improvements in expenditure prioritization, budget discipline, and resource allocation strategies.

The findings demonstrate that improving regional fiscal efficiency requires more than increasing financial resources. Consistent with Fiscal Federalism Theory, effective decentralization depends on the ability of local governments to transform fiscal autonomy into productive expenditure allocation and sustainable revenue generation. Therefore, regional policymakers should focus on restructuring expenditure composition by reducing inefficient operational costs, strengthening capital investment, and directing fiscal resources toward sectors that expand the local economic base and improve PAD performance.

This study has several limitations that should be considered when interpreting the findings. The DEA analysis is based on a single year of observation and involves only ten provincial governments as Decision-Making Units (DMUs). Consequently, the efficiency scores and benchmarking results reflect relative performance within the observed sample and period rather than absolute measures of fiscal management quality. Future studies are encouraged to employ panel data, incorporate additional DMUs, and include explanatory variables related to economic structure, institutional quality, and governance characteristics to provide a more comprehensive understanding of regional government expenditure efficiency and its relationship with Local Own-Source Revenue (PAD) performance.

CONCLUSION

This study examined the technical efficiency of local government expenditure in generating Local Own-Source Revenue (PAD) across provinces in the Sumatera region using the Data Envelopment Analysis (DEA) approach. The results indicate variations in relative technical efficiency among the ten provincial governments included in the analysis. Five provinces, namely Bengkulu, Riau Islands, Lampung, South Sumatera, and North Sumatera, were positioned on the efficiency frontier, while the remaining provinces operated below the frontier and therefore exhibited potential for efficiency improvement relative to the benchmark provinces. These findings suggest that differences exist in the ability of provincial governments to convert expenditure inputs into PAD outputs within the observed sample.

However, the results should be interpreted with caution. In the DEA framework, an efficiency score reflects relative performance compared with other Decision-Making Units (DMUs) included in the analysis and does not constitute an

absolute measure of government effectiveness, fiscal governance quality, or overall public sector performance. Consequently, provinces identified as efficient should not automatically be interpreted as having superior governance systems, while provinces classified as inefficient should not necessarily be regarded as having poor fiscal management. The efficiency scores are conditional upon the selected input and output variables, the DEA model specification, and the observation period used in the study.

The findings provide several policy implications for regional governments. Provinces operating below the efficiency frontier may consider undertaking expenditure optimization and expenditure reallocation efforts to improve the alignment between fiscal inputs and revenue-generating outcomes. The radial movement and benchmarking analyses offer useful comparative information that may assist policymakers in evaluating expenditure priorities, strengthening budget planning, improving monitoring mechanisms, and enhancing the effectiveness of resource allocation. Nevertheless, the benchmarking results should be viewed as indicative references derived from relative performance within the sample rather than prescriptive policy models that can be directly replicated without considering regional characteristics and institutional contexts.

This study has several limitations that should be acknowledged. First, the analysis is limited to ten provincial governments in the Sumatera region; therefore, the findings cannot be generalized beyond the provinces included in the sample. Second, the study relies on a single fiscal year of observation, meaning that the efficiency scores reflect fiscal conditions only during the analyzed period and may not capture changes in expenditure performance over time. Third, the results are highly dependent on the selection of input and output variables as well as the DEA model specification employed in the analysis. Different variable selections, model assumptions, or analytical approaches may produce different efficiency estimates and benchmarking outcomes.

Future research is encouraged to extend the analysis by incorporating panel data covering multiple fiscal years and a larger number of DMUs to capture the dynamic nature of regional expenditure efficiency. Further studies may also integrate additional variables related to institutional quality, governance capacity, fiscal transparency, and regional economic characteristics to provide a more comprehensive understanding of the factors associated with local government expenditure efficiency and Local Own-Source Revenue (PAD) performance.

Author Contributions Statement: Author 1 contributed to the conceptual development of the study, the design of the research methodology, data analysis employing the Data Envelopment Analysis (DEA) approach, interpretation of the research findings, and the drafting of the manuscript. Author 2 participated in data collection, literature review activities, validation of the study results, and revision of the manuscript. Author 3 was responsible for data processing, formulation of the theoretical framework, and assessment of the research analysis outcomes. Author 4 contributed through research supervision, enhancement of the academic content, and final revision of the manuscript before submission. All authors were actively involved in discussing the findings, reviewing the final version of the manuscript, and approving the article for submission.

Funding Statement: This study did not receive any specific financial support or grant from public, commercial, or non-profit funding agencies. All research activities, including the publication process, were independently financed by the authors.

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