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Analysis of Parking Fee System Management at The Tegal Regency Transportation Agency to Increase Local Revenue

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Abstract

This study analyzes the management of the parking levy system at the Tegal Regency Transportation Agency and evaluates its effectiveness in increasing Local Own-Source Revenue. A descriptive qualitative method with a case study approach was applied using observation, interviews, documentation, and secondary revenue data for 2022–2024. The findings show that parking levy administration has shifted gradually from conventional collection toward digital management through APIKEPOL and DUTA Laku Pandai Bank Jateng. The system improves transaction recording and payment traceability, but revenue performance remains below the established targets. Parking levy realization reached 49.04% in 2022, 48.01% in 2023, and 46.82% in 2024, indicating a continuing decline in collection effectiveness. The main constraints include limited field supervision, uneven compliance among parking attendants, incomplete control of parking locations, and insufficient integration between field collection and digital payment administration. Strengthening transaction digitalization, parking-point verification, human resource capacity, supervision, tariff evaluation, and institutional accountability is therefore necessary to improve revenue collection. Effective integration of these measures can strengthen parking levy governance and increase its contribution to regional fiscal capacity.

Keywords: parking levy, parking management, local own-source revenue, digital payment, transportation agency.



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INTRODUCTION

Regional fiscal autonomy requires local governments to strengthen their capacity to generate sustainable own-source revenue through accountable and efficiently managed public services. Parking levies constitute one of the revenue instruments that can support local fiscal capacity while simultaneously regulating the use of public road space. The effectiveness of parking management is therefore determined not only by the amount of revenue collected, but also by the quality of planning, supervision, enforcement, and administrative control applied by the responsible institution. Studies on urban parking management indicate that appropriate pricing, institutional regulation, and operational control can significantly influence parking behavior and the effectiveness of public parking systems (Mingardo et al., 2022; Brudner, 2023).

Parking levies are particularly relevant in urban and peri-urban areas because parking demand is closely associated with mobility patterns, commercial activity, and the intensity of road-space utilization. Weak management of on-street parking may result in revenue leakage, unauthorized collection, inefficient use of parking spaces, and reduced public confidence in local government services. Empirical studies have shown that inadequate control and non-compliance in parking activities can generate both economic losses and governance problems, particularly when monitoring mechanisms are limited (Gössling et al., 2022; Gao et al., 2022). Effective parking management therefore requires an integrated administrative system that links revenue collection, parking-location control, service supervision, and transparent financial reporting.

The Tegal Regency Transportation Agency is responsible for managing parking services and collecting parking levies from designated parking locations within the regency. The existing system involves parking attendants, field coordinators, administrative officers, and the Transportation Agency as part of the collection and deposit process, creating a relatively long administrative chain before

revenue reaches the regional treasury. The manuscript indicates that this arrangement remains vulnerable to inefficiency because parking revenue management still depends partly on manual procedures and field-based collection mechanisms. Similar findings in Indonesian local governments demonstrate that the effectiveness of parking levies is strongly influenced by collection procedures, supervision, compliance, and the institutional capacity of local authorities (Sulastiningsih et al., 2023; Tiara et al., 2024).

Digitalization has increasingly been adopted as an instrument for improving transparency and reducing administrative leakage in parking revenue management. Smart parking systems and electronic payment mechanisms enable more systematic transaction recording, faster revenue transfer, and stronger monitoring of parking activities across multiple locations (Channamallu et al., 2023; Nguyen et al., 2023). In Tegal Regency, the Transportation Agency has introduced APIKEPOL, an electronic parking payment instrument designed to facilitate non-cash parking levy transactions and direct revenue recording. The implementation of such a system is expected to shorten the payment chain, improve traceability, and strengthen accountability in the management of parking revenue.

Technological innovation, however, does not automatically guarantee improved revenue performance when institutional and operational constraints remain unresolved. Digital parking management must be supported by accurate parking-location databases, consistent use of official payment procedures, adequate human resources, and effective supervision of parking attendants. Research on smart parking management emphasizes that technology produces stronger administrative benefits when it is integrated with institutional control, user compliance, and reliable operational data (Kadusic et al., 2022; Dahiya et al., 2024). The effectiveness of APIKEPOL therefore depends not only on the availability of electronic payment facilities but also on the extent to which the system is consistently implemented across all managed parking locations.

Revenue data presented in the manuscript indicate that the performance of parking levy collection in Tegal Regency remained below the established targets throughout the 2022–2024 period. The realization rate reached 49.04% in 2022, declined to 48.01% in 2023, and decreased further to 46.82% in 2024, despite the continued existence of hundreds of managed parking points. This pattern suggests that the expansion or maintenance of parking locations has not been accompanied by a proportional improvement in revenue realization, indicating possible weaknesses in collection effectiveness, compliance, supervision, or revenue control.

Low realization of parking levy revenue has direct implications for the ability of local governments to optimize own-source revenue and strengthen fiscal independence. Indonesian studies have shown that parking levies can contribute to local revenue when collection mechanisms are supported by clear targets, effective supervision, accurate potential assessment, and consistent administrative enforcement (Algadri et al., 2022; Juita, 2024). Parking policy literature also demonstrates that pricing mechanisms and regulatory design can influence parking demand, user behavior, and the efficiency of revenue collection (Albalate & Gragera, 2022; Zhou et al., 2023). The management of parking levies should consequently be treated as both a transportation governance issue and a local fiscal management issue.

The persistence of a gap between targeted and realized parking revenue in Tegal Regency creates a need for a systematic evaluation of the existing management system. The evaluation should examine the collection mechanism, institutional roles, digital payment implementation, parking-point supervision, and the effectiveness of revenue realization in relation to predetermined targets. The study therefore focuses on analyzing how the parking levy system is currently managed by the Tegal Regency Transportation Agency and assessing its effectiveness in supporting increased Local Own-Source Revenue. This analysis is expected to provide an empirical basis for improving parking levy governance through stronger administrative control, more consistent digitalization, improved supervision, and more accurate management of parking revenue potential.

RESEARCH METHODS

This study employed a descriptive qualitative method with a case study approach to examine the management of the parking levy system at the Tegal Regency Transportation Agency. The qualitative design was selected because the study focused on understanding the administrative process, collection mechanism, institutional practices, and operational conditions associated with parking levy management in its actual organizational setting. The research subject was the Tegal

Regency Transportation Agency, while the object of analysis consisted of the parking levy management system and the revenue performance reflected in the target and realization data for the 2022–2024 fiscal years. The analysis was directed toward identifying how the existing management system was implemented and assessing its effectiveness in supporting Local Own-Source Revenue.

Data were collected through observation, interviews, and documentation. Observation was conducted by directly examining the parking levy administration process, including the recording and input of parking levy payments, while interviews were used to obtain information from parties involved in the management process concerning operational procedures and implementation constraints. Documentary data were obtained from records maintained by the Tegal Regency Government, particularly annual parking levy targets and realized revenues for 2022, 2023, and 2024, as well as administrative records related to the implementation of the parking payment system. The collected data were analyzed descriptively by organizing the findings according to the management process, comparing revenue realization with predetermined targets, and interpreting the observed conditions to determine the effectiveness of parking levy management in contributing to regional revenue.

RESULTS AND DISCUSSION

Existing Parking Levy Management and Digital Payment Workflow

Parking levy management at the Tegal Regency Transportation Agency is implemented through a combination of conventional field collection and gradually developed digital administration. Parking attendants remain responsible for collecting parking fees directly from users at designated locations, while the revenue is subsequently recorded and transferred through the administrative structure of the Transportation Agency. The field arrangement therefore still depends on the interaction between parking attendants, field coordinators, administrative personnel, and the regional treasury. Such a layered structure is common in local parking administration, although its effectiveness depends on the clarity of institutional responsibilities, transaction traceability, and consistency of supervision (Brudner, 2023; Sulastiningsih et al., 2023).

The administrative process observed in the study indicates that digitalization has been introduced without completely eliminating the conventional collection mechanism. APIKEPOL functions as an electronic administrative platform for recording parking levy deposits, while payment transactions are processed through DUTA Laku Pandai Bank Jateng. This arrangement represents an attempt to connect parking revenue collection with formal banking channels so that transactions can be documented more systematically. The use of electronic parking administration is consistent with the broader development of smart parking systems that emphasize transaction recording, monitoring, and the reduction of manual administrative intervention (Channamallu et al., 2023; Kadusic et al., 2022).

The first administrative stage begins when an authorized officer accesses the APIKEPOL system using the username, password, and authentication code provided for administrative purposes. The dashboard serves as the principal interface for accessing parking levy information and managing the payment records available in the system. This stage is important because administrative access determines who can view and process parking revenue data before the payment is completed through the banking channel. Digital authentication of administrative users is a basic component of accountable revenue management because transaction control requires identifiable access and a clear record of system activity (Ahmed et al., 2024; Nguyen et al., 2023).

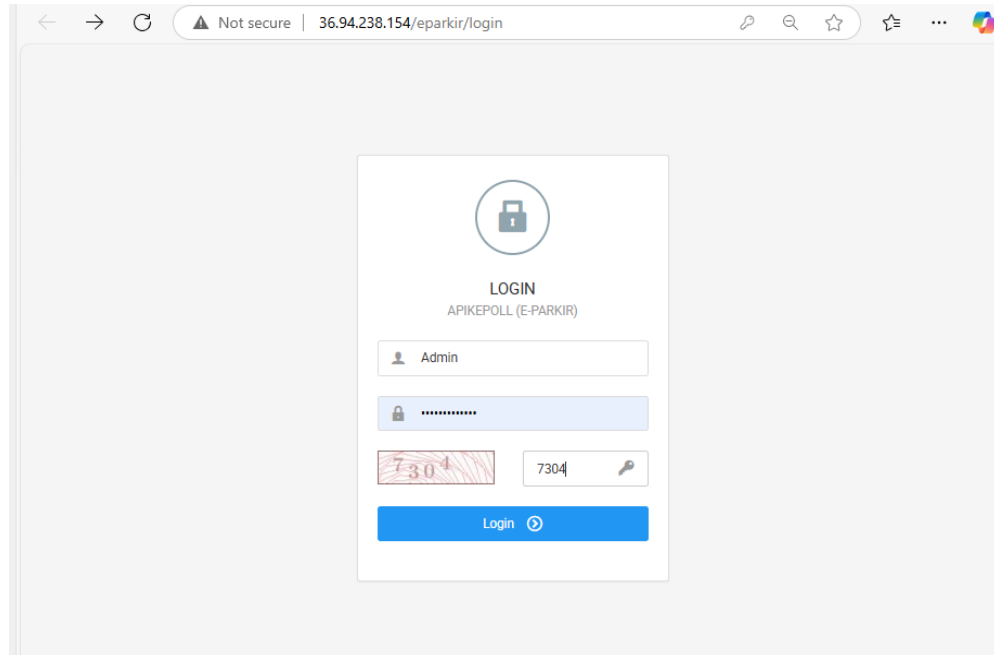


Figure 1. APIKEPOL Login

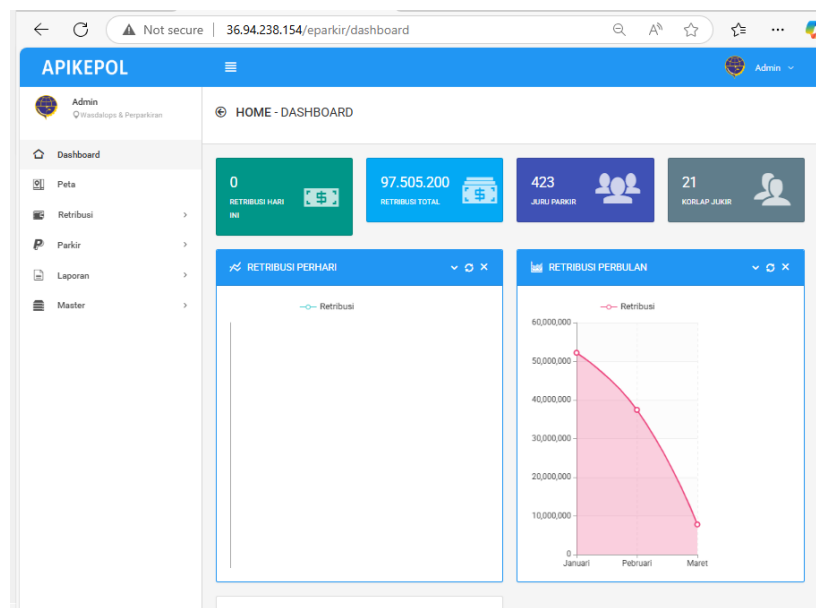


Figure 2. APIKEPOL Administrator Dashboard

The next stage is conducted through the parking deposit page, which contains transaction information, including the date and payment identification number used for the levy settlement process. The payment ID provides an administrative reference connecting a particular parking levy obligation with the subsequent transaction through the banking system. The use of a unique transaction reference can strengthen traceability because revenue records can be associated with specific payment activities rather than relying exclusively on manual documentation. Studies of technology-based parking management indicate that structured digital records improve the capacity of public authorities to monitor transactions and identify inconsistencies in parking operations (Dahiya et al., 2024; Gao et al., 2022).

	Bulan	Tagihan Juru Parkir	Proyeksi Retribusi	Realisasi Retribusi	Opsi
1	Mei 2025	1903 / 1332	Rp 10.360.000	Rp 7.798.000	Q
2	Februari 2025	7609 / 6955	Rp 40.406.600	Rp 37.465.600	Q
3	Januari 2025	9968 / 9968	Rp 52.241.600	Rp 52.241.600	Q
4	Desember 2024	9142 / 9142	Rp 46.859.000	Rp 46.859.000	Q
5	November 2024	9082 / 9067	Rp 51.197.500	Rp 48.647.500	Q
6	Oktober 2024	9779 / 9778	Rp 51.947.500	Rp 51.647.500	Q
7	September 2024	9257 / 9227	Rp 48.358.000	Rp 48.108.000	Q
8	Agustus 2024	9517 / 9516	Rp 60.300.000	Rp 60.285.000	Q
9	Juli 2024	9568 / 9568	Rp 49.261.000	Rp 49.261.000	Q
10	Juni 2024	10023 / 9259	Rp 50.640.000	Rp 47.740.000	Q

Figure 3. Parking Levy Deposit Page

The empirical workflow further requires the agent or customer to access DUTA Laku Pandai Bank Jateng using the authorized username and password. The banking interface acts as the payment channel through which the parking levy obligation recorded in APIKEPOL can be settled. Integration with a formal financial institution provides an administrative advantage because payments are processed through an identifiable transaction channel rather than being retained exclusively within a cash-based collection chain. Electronic payment mechanisms have similarly been associated with improved transaction accountability and stronger administrative control in contemporary parking management systems (Magsino et al., 2022; Channamallu et al., 2023).

The observed operational stages can be summarized to clarify the relationship between APIKEPOL and DUTA Laku Pandai Bank Jateng. Table 1 presents the principal stages identified during the observation of parking levy payment administration at the Tegal Regency Transportation Agency. The table does not represent a newly constructed system but organizes the actual procedures documented in the submitted manuscript into an analytical sequence.

Table 1. Operational Stages of the Parking Levy Payment System at the Tegal Regency Transportation Agency

Stage	System/Channel	Main Activity	Administrative Function
1	APIKEPOL	Administrator login using authorized credentials	Provides controlled access to parking levy administration
2	APIKEPOL Dashboard	Access to administrative and payment information	Supports monitoring of parking levy records
3	Parking Deposit Page	Identification of deposit date and payment ID	Creates a reference for each parking levy payment
4	DUTA Laku Pandai Bank Jateng	Agent/customer login	Provides access to the banking payment channel
5	DUTA Payment Interface	Input of the parking levy payment ID	Links the levy obligation with the banking transaction
6	Confirmation Page	Entry of PIN and transaction confirmation	Authorizes the payment transaction
7	Transaction Completion	System records the completed transaction	Provides evidence of completed levy payment

Source: Research observation and administrative process documented at the Tegal Regency Transportation Agency.

Table 1 shows that parking levy payment administration is distributed between the Transportation Agency's internal system and the banking payment platform. APIKEPOL primarily performs the administrative identification and recording function, whereas DUTA Laku Pandai Bank Jateng provides the transaction channel used to complete the payment. This separation of functions can support financial control because administrative recording and payment execution occur through identifiable stages. Digital parking systems generally produce stronger governance outcomes when transaction identification, payment processing, and administrative monitoring are connected within a traceable sequence (Kadusic et al., 2022; Nguyen et al., 2023).

After accessing DUTA Laku Pandai Bank Jateng, the agent enters the payment ID obtained from the parking deposit data recorded in APIKEPOL. The accuracy of this stage is essential because the payment ID links the banking transaction to the corresponding parking levy obligation. Incorrect entry or inconsistent recording could weaken transaction reconciliation and complicate the verification of deposits received by the regional administration. The importance of reliable transaction data has also been identified in smart parking research, where data accuracy constitutes a central requirement for effective monitoring, pricing, and operational control (Dahiya et al., 2024; Pavlek et al., 2025).

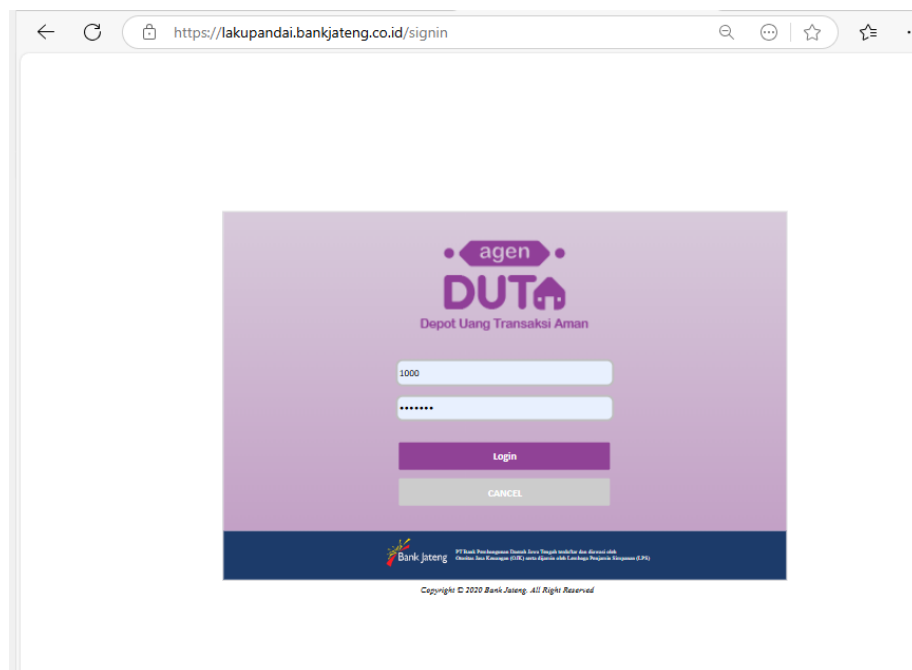


Figure 4. DUTA Login Page

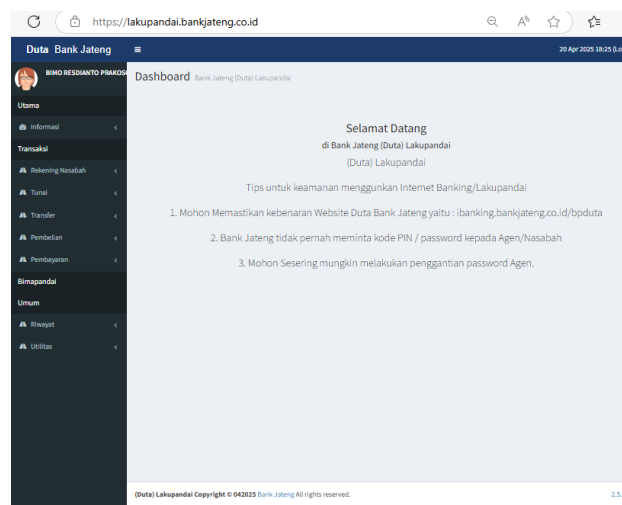


Figure 5. DUTA Agent Dashboard

https://lakupandai.bankjateng.co.id/trx_tax

Duta Bank Jateng 20 Apr 2025 18:29 (Logout)

(Duta) Lakupandai Pembayaran Pajak

Form Pembayaran Pajak

Tanggal: 20-Apr-2025 18:29:59

No Rekening Sumber: 2035322607-BIMO RESDIANTO PRAKOSO

Penyedia Jasa: RETRIBUSI DAERAH

ID Billing Pajak: 2815203250221

Reset Lanjut

(Duta) Lakupandai Copyright © 042025 Bank Jateng All rights reserved. 2.5.3-chs

Figure 6. Parking Levy Payment ID Input

The final payment stage requires the agent or customer to verify the transaction details and enter a personal identification number before selecting the processing command. A successfully processed transaction produces confirmation that the parking levy payment has been completed through the banking system. This mechanism provides a more identifiable payment trail than a fully manual system because each transaction passes through a formal confirmation process before completion. Electronic transaction confirmation is particularly relevant in public revenue administration because it provides documentary evidence that can support subsequent reconciliation and supervision (Ahmed et al., 2024; Xie et al., 2023).

https://lakupandai.bankjateng.co.id/trx_billpayment

Konfirmasi Pembayaran Pajak

Tanggal: 20-Apr-2025 18:29:59

Referensi Bank: DB160405059

Rekening Sumber: 2035322607-BIMO RESDIANTO PRAKOSO

ID Billing Pajak: 2815203250221

Penerangan: RETRIBUSI DAERAH

Nominal: Rp. 5.000

Biaya Admin Agen (Tunai): 1000

Jumlah Total (+Biaya): Rp. 6.000

INFO PEMBAYARAN

Retribusi: PENDOPIN-RETRIBUSI KAB. TEGAL

Kode OPD: 15

Nama OPD: DINAS PERHUBUNGAN KABUPATEN TEGAL

No. Dokumen: -

Tgl Penetapan: 20250221

Tgl Cetak Tempa: 20250221

No. Pokok M-R: 094/0049/2024

Nama Wajib Retribusi: KUSWANTORO

Alamat Wajib Retribusi: DEWABARATI RT 005 RW 001 BECAM

Penerangan: RETRIBUSI PARKIR PASAR BALAMBA

Total Bayar: 5.000

PIN Agn: *****

Batal Proses

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Figure 7. Payment PIN Confirmation

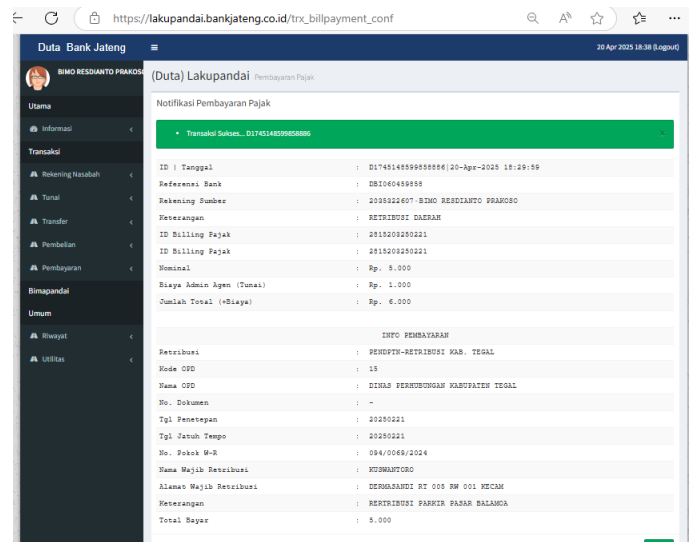


Figure 8. Completed Parking Levy Transaction

The implementation of APIKEPOL and DUTA Laku Pandai Bank Jateng demonstrates that the Tegal Regency Transportation Agency has established an initial digital infrastructure for improving parking levy administration. The system provides identifiable administrative stages from deposit recording to payment confirmation, thereby creating greater potential for transaction traceability than a purely cash-based mechanism. The existence of digital infrastructure, however, does not by itself establish the effectiveness of the overall parking levy management system because field collection, parking-attendant compliance, coverage of parking locations, and supervisory capacity remain integral components of revenue performance. Research on parking governance consistently indicates that technological instruments produce better results when they are supported by effective regulation, operational supervision, and compliance among the actors responsible for parking services (Gössling et al., 2022; Tiara et al., 2024).

The observed system therefore reflects a transitional form of parking levy management in which digital payment administration operates alongside conventional field-based collection. This condition is important for interpreting subsequent revenue performance because deficiencies may arise not only from the technological platform but also from the institutional processes occurring before revenue enters the electronic payment channel. Evidence from parking policy research shows that collection effectiveness is shaped by the interaction between pricing structures, user behavior, enforcement, and administrative mechanisms rather than by a single technological intervention (Albalate & Gragera, 2022; Mingardo et al., 2022). Assessment of parking levy effectiveness in Tegal Regency consequently requires examination of both the digital payment process and the relationship between revenue targets, realized collections, supervision, and the number of managed parking locations.

Effectiveness of Parking Levy Revenue Realization

The effectiveness of parking levy management can be assessed through the relationship between the predetermined revenue target and the amount actually realized within each fiscal year. In the Tegal Regency Transportation Agency, this comparison provides a direct indication of the capacity of the existing collection system to convert parking potential into actual regional revenue. Revenue performance during the 2022–2024 period consistently remained below half of the annual target, indicating that the administrative and operational mechanisms had not yet achieved the expected level of collection effectiveness. Similar studies in Indonesian local governments have shown that the performance of parking levies is closely related to the accuracy of target setting, the effectiveness of collection procedures, and the capacity of local authorities to supervise revenue-generating locations (Algadri et al., 2022; Sulastiningsih et al., 2023).

The revenue target for 2022 was IDR 1,329,000,000, while the realized revenue amounted to IDR 651,793,000, corresponding to 49.04% of the target. In 2023, the target increased to IDR

1,461,900,000, whereas the realization reached only IDR 701,829,000 or 48.01%. The 2024 target was subsequently set at IDR 1,329,000,000, but actual revenue declined to IDR 622,180,000, producing a realization rate of 46.82%. The persistence of realization rates below 50% indicates that the gap between projected and collected revenue was structural rather than limited to a single fiscal year.

The declining realization ratio also demonstrates that an increase in nominal revenue does not necessarily reflect an improvement in collection effectiveness. Revenue increased from IDR 651.793 million in 2022 to IDR 701.829 million in 2023, but the realization percentage declined because the annual target increased at a faster rate. This condition illustrates the importance of evaluating parking revenue through both absolute receipts and relative target achievement rather than relying solely on nominal growth. Parking management studies have similarly emphasized that performance assessment must consider the relationship between demand, pricing, available capacity, regulatory design, and the actual revenue generated from parking activity (Rodríguez et al., 2022; Pavlek et al., 2025).

The 2024 performance presents a more substantial concern because both nominal realization and the realization ratio declined relative to the preceding year. Actual receipts fell from IDR 701.829 million in 2023 to IDR 622.180 million in 2024, while the realization ratio decreased from 48.01% to 46.82%. This pattern indicates that lowering the target to the 2022 level did not result in stronger target achievement. Evidence from parking pricing research suggests that revenue performance depends not only on target formulation but also on the alignment of tariffs, parking demand, compliance, and enforcement mechanisms (Geva et al., 2022; Zhou et al., 2023).

The annual revenue performance can be summarized through the target–realization relationship presented in Table 2. The figures are derived directly from the administrative data contained in the submitted manuscript and are used to assess the effectiveness of parking levy collection during the three-year observation period.

Table 2. Parking Levy Revenue Target and Realization in Tegal Regency, 2022–2024

Year	Revenue (IDR)	Target	Revenue (IDR)	Realization	Realization (%)	Rate	Revenue (IDR)	Gap
2022	1,329,000,000		651,793,000		49.04		677,207,000	
2023	1,461,900,000		701,829,000		48.01		760,071,000	
2024	1,329,000,000		622,180,000		46.82		706,820,000	

Source: Tegal Regency Transportation Agency data.

Table 2 shows that the annual revenue gap remained substantial throughout the observation period, exceeding IDR 677 million in every year. The largest gap occurred in 2023, when the difference between target and realization reached IDR 760.071 million, despite that year recording the highest nominal revenue realization. The continued gap suggests that the existing collection structure has not fully captured the economic potential represented by managed parking activity. Juita (2024) similarly identified implementation, supervision, and compliance as important determinants of parking levy performance in local revenue administration, while Tiara et al. (2024) showed that the operational performance of on-street parking can materially affect the capacity of local governments to increase parking revenue.

The submitted manuscript also reports that Tegal Regency managed hundreds of parking locations during the observation period, with 359 parking points recorded in 2022 and approximately 364 parking points in the following years. The relatively stable number of parking locations, accompanied by a declining realization rate, indicates that the number of collection points alone cannot explain revenue performance. A larger or stable parking network can generate revenue only when each location is effectively supervised, properly recorded, and supported by consistent collection procedures. Research on parking search and parking management demonstrates that spatial characteristics, utilization patterns, and operational control determine whether available parking capacity is translated into efficient service and revenue outcomes (Ogulenko et al., 2022; Parmar et al., 2023).

The performance gap may also be interpreted through the relationship between formal parking administration and actual field practices. The manuscript identifies limited human resources,

incomplete supervision of parking locations, and insufficient public compliance as factors associated with the low effectiveness of parking levy collection. These constraints are particularly important in systems where payment administration has been digitalized but the first stage of revenue collection remains dependent on parking attendants and field-level interactions. Research on illegal and non-compliant parking has shown that monitoring capacity and enforcement intensity can influence both parking behavior and the effectiveness of revenue-related policies (Gao et al., 2022; Gössling et al., 2022).

Pricing and tariff structures constitute another dimension that should be considered when interpreting the persistent revenue shortfall. Parking charges that do not adequately reflect local demand, parking duration, location intensity, or changes in economic conditions may limit the revenue-generating capacity of the system. International evidence demonstrates that parking pricing affects user behavior and can be designed to improve the allocation of parking space while supporting broader management objectives (Mingardo et al., 2022; Xiao et al., 2024). Dynamic and differentiated pricing studies further indicate that pricing mechanisms can be adjusted according to temporal and spatial demand, although their application requires reliable operational data and clear regulatory authority (Magsino et al., 2022; Liu et al., 2023).

The decline in revenue effectiveness also highlights the need to distinguish technological adoption from substantive improvement in fiscal performance. The existence of APIKEPOL and the use of a formal banking channel have strengthened the administrative framework for recording and processing payments, but the annual realization data show that these improvements have not yet translated into achievement of the established revenue targets. This outcome is consistent with the broader literature on smart parking, which emphasizes that digital systems are most effective when they are supported by accurate data, user compliance, enforcement, and integrated institutional management (Nguyen et al., 2023; Dahiya et al., 2024). The principal issue is therefore not the absence of digital infrastructure, but the limited capacity of the overall management system to ensure that all potential revenue enters the formal collection channel.

The observed revenue pattern indicates that parking levy management in Tegal Regency remained ineffective during the 2022–2024 period when effectiveness is measured against annual target achievement. The realization ratio declined for three consecutive years, while the revenue gap remained substantial despite the operation of hundreds of parking points and the introduction of digital payment administration. This condition suggests that improvements must address target formulation, field supervision, parking-attendant compliance, tariff relevance, and the integration of collection data with digital payment records. The findings therefore provide a basis for examining the broader strategy required to optimize parking levy management and strengthen its contribution to Local Own-Source Revenue, which is addressed in the following subsection.

Optimization Strategy for Parking Levy Management and Local Revenue

The optimization of parking levy revenue in Tegal Regency requires improvements that extend beyond the payment transaction stage and address the entire management chain from parking-point identification to revenue transfer. The submitted manuscript identifies several priority measures, including strengthening payment digitalization, improving human resource capacity, intensifying field supervision, reformulating tariffs, and reviewing cooperation arrangements with third parties. These measures are relevant because the persistent gap between revenue targets and realization indicates that the current system has not fully converted existing parking activity into formal Local Own-Source Revenue. Effective optimization should therefore combine administrative reform, technological control, regulatory adjustment, and systematic monitoring rather than relying on a single intervention.

Digitalization constitutes an important component of the proposed improvement because the existing APIKEPOL mechanism already provides an institutional foundation for electronic parking levy administration. The principal requirement is to expand the consistency of its application so that transactions from managed parking points can be recorded through a traceable payment channel and reconciled with deposit data. Smart parking research has demonstrated that integrated technological systems can support monitoring, transaction control, and more efficient parking management when operational data are captured continuously and linked to administrative decisions (Channamallu et al., 2023; Nguyen et al., 2023). The experience of parking systems in other urban contexts also shows that digital management becomes more effective when payment platforms, parking information, and

enforcement functions are treated as components of a unified management framework rather than independent applications (Bahrami & Roorda, 2022; Chai et al., 2023).

The expansion of digital payment should be accompanied by stronger reconciliation between field collection, recorded parking activity, and funds entering the regional treasury. The present system still involves parking attendants and coordinators before revenue is processed through the formal administrative channel, leaving a managerial space in which discrepancies may arise between potential collections and recorded deposits. The manuscript itself identifies electronic payment as a means of shortening the collection chain and reducing the risk of parking revenue leakage. Technology-based parking systems can strengthen accountability under such conditions, but their effectiveness depends on complete transaction coverage and the capacity of the authority to identify transactions that remain outside the formal system (Kadusic et al., 2022; Dahiya et al., 2024).

Supervision of parking locations represents a second priority because revenue collection cannot be optimized when the authority lacks adequate information regarding active parking points, attendants, transaction volume, and compliance with official procedures. The submitted manuscript explicitly includes data collection, control of parking locations, surveys of potential parking sites, and supervision of parking points among the management measures undertaken by the Tegal Regency Transportation Agency. Empirical parking research indicates that unauthorized parking, weak enforcement, and insufficient monitoring can reduce the effectiveness of parking regulation and weaken the management of public road space (Gao et al., 2022; Gössling et al., 2022). Consistent supervision is therefore necessary not only for controlling parking activity but also for ensuring that revenues generated at each location are recorded and deposited according to formal procedures.

The main optimization priorities identified from the submitted manuscript and the findings of this study are summarized in Table 3. The table links each observed management issue with the corresponding corrective direction and the expected implication for Local Own-Source Revenue. These priorities are derived from the empirical findings and recommendations already documented in the manuscript rather than from assumptions unrelated to the observed parking levy system.

Table 3. Priority Strategies for Optimizing Parking Levy Management in Tegal Regency

Management Area	Observed Condition	Priority Improvement	Expected Revenue Implication
Digital payment	APIKEPOL and banking payment channels are available, but implementation remains transitional	Expand mandatory electronic recording and transaction reconciliation	Reduce unrecorded collections and strengthen traceability
Parking-point database	Hundreds of locations require continuous updating and monitoring	Conduct periodic verification of active, potential, and inactive parking points	Improve accuracy of revenue potential and target setting
Field supervision	Monitoring capacity and human resources remain limited	Establish routine supervision, clear responsibility, documented control procedures	Increase parking-attendant compliance and reduce leakage
Human resources	Implementation depends on parking attendants, coordinators, and administrative personnel	Provide standardized training and operational procedures	Improve consistency of collection and deposit procedures
Tariff policy	Revenue realization remains substantially below annual targets	Review tariff structure according to location, demand, and regulatory provisions	Improve alignment between parking utilization and revenue potential
Institutional arrangements	Collection involves several administrative actors	Clarify duties, accountability, and	Reduce administrative gaps and strengthen

			cooperation arrangements	responsibility	for
Revenue	Target	achievement	Conduct periodic target–	revenue	
evaluation	remained below 50% during	50% during	realization and location-	Support	evidence-
	2022–2024		level performance	based	revenue
			evaluation	planning	and
				corrective	intervention

Source: Developed from the findings.

Table 3 indicates that revenue optimization depends on the interaction between technical, administrative, and institutional measures. Digital payment can strengthen transparency, but its fiscal impact will remain limited if parking locations are not accurately recorded or if field-level compliance is weak. The same principle applies to tariff reform because adjusting charges without improving enforcement and transaction recording would not necessarily increase formal revenue. Parking policy research has similarly shown that pricing outcomes depend on the interaction between parking demand, enforcement, spatial characteristics, and user responses (Ben-Dor et al., 2022; Mingardo et al., 2022).

Tariff evaluation is particularly relevant because the manuscript recommends reformulation of parking levy rates in accordance with regional potential and economic conditions. Parking pricing studies demonstrate that differentiated or demand-responsive rates can influence parking choices and improve the allocation of limited parking space when pricing structures reflect location and utilization characteristics (Zhou et al., 2023; Xiao et al., 2024). Recent research also indicates that advanced parking pricing strategies require reliable demand information and administrative capacity because inappropriate pricing may shift rather than resolve parking pressure (Zhang et al., 2025). Any tariff adjustment in Tegal Regency should therefore be preceded by an assessment of parking demand, location productivity, duration of use, and actual payment compliance.

Parking levy optimization should also be integrated with broader transportation and urban space management rather than being treated solely as a revenue collection exercise. Parking policy influences travel decisions, road-space allocation, congestion, and the attractiveness of different transport modes, which means that fiscal objectives need to remain compatible with mobility objectives. Studies from international urban settings show that parking restrictions and pricing can influence vehicle use and encourage changes in travel behavior when they are coordinated with wider transport policies (González Sarmiento et al., 2022; González et al., 2023). A revenue-oriented strategy in Tegal Regency should therefore maintain the service and regulatory functions of parking management while improving the ability of the local government to collect legally established levies.

Human resource capacity constitutes another critical element because the existing system depends on several actors who perform different functions across the collection process. Parking attendants are responsible for direct interaction with service users, coordinators are involved in collecting or organizing deposits, and administrative officers process transaction information before revenue reaches the regional treasury. Standardized operational procedures and regular training can reduce variation in collection practices and establish clearer accountability for each stage. Indonesian evidence concerning parking levy administration similarly indicates that weak supervision and inconsistent implementation can restrict the contribution of parking revenue to Local Own-Source Revenue even when formal collection mechanisms already exist (Juita, 2024; Tiara et al., 2024).

A location-based performance evaluation would further strengthen revenue planning by allowing the Transportation Agency to distinguish productive parking points from locations with weak or declining revenue potential. The current annual target–realization comparison provides an overall measure of effectiveness, but it does not by itself identify which parking points account for the largest revenue gaps. More detailed recording of transaction frequency, payment value, active parking attendants, and deposit consistency would permit more accurate target formulation and targeted supervision. Research on parking demand and parking search confirms that parking activity varies considerably according to spatial and temporal conditions, making uniform assumptions about revenue potential inappropriate across heterogeneous locations (Ogulenko et al., 2022; Parmar et al., 2023).

The optimization of Local Own-Source Revenue from parking levies ultimately requires institutional consistency between revenue planning, parking operations, digital transactions, and

evaluation. The declining realization ratio from 49.04% in 2022 to 46.82% in 2024 demonstrates that the current management structure has not yet produced a proportional fiscal return from the existing parking network. Strengthening digital recording, verifying parking points, improving field supervision, reviewing tariff structures, developing human resources, and clarifying institutional responsibilities provide a management framework that directly addresses the weaknesses documented in the study. Such measures can strengthen the contribution of parking levies to regional revenue while preserving the regulatory function of parking management within the local transportation system (Johansson et al., 2022; Xie et al., 2023).

CONCLUSION

The management of parking levies at the Tegal Regency Transportation Agency has undergone a transition from predominantly manual collection toward a more structured digital mechanism through APIKEPOL and DUTA Laku Pandai Bank Jateng. The system has improved administrative recording and payment traceability, but its implementation has not yet produced optimal revenue performance. Parking levy realization reached 49.04% of the target in 2022, 48.01% in 2023, and 46.82% in 2024, indicating a persistent gap between projected and realized revenue. These findings show that the effectiveness of parking levy management remains constrained by limited supervision, uneven compliance among parking attendants, insufficient control over parking points, and the incomplete integration of field collection with digital payment administration.

Improvement in parking levy performance requires an integrated strategy that combines stronger digital transaction coverage, periodic verification of active parking locations, clearer operational procedures, improved human resource capacity, and more consistent field supervision. Tariff evaluation should also consider parking demand, location characteristics, and regional economic conditions so that revenue targets are based on realistic parking potential. Institutional responsibilities between parking attendants, field coordinators, administrative officers, and the Transportation Agency should be clearly defined to reduce administrative gaps and strengthen accountability. Strengthening these components is necessary to improve the effectiveness of parking levy collection and increase its contribution to Local Own-Source Revenue.

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