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Review Article

TARIFF POLICY AND DIGITAL GOVERNANCE IN COAL-SECTOR NON-TAX REVENUE: A SYSTEMATIC LITERATURE REVIEW ON FISCAL OPTIMIZATION

Heri Syafardi[1,*], Lela Nurlaela Wati [2], Heri Ispriyahadi [3]

[1] Muhammadiyah University of Technology Jakarta, Jakarta, Indonesia
Corresponding author email: herisyafardi03@gmail.com

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Abstract
Non-Tax Revenue (NTR) from the coal sector constitutes an important component of fiscal resources in resource-dependent economies. However, existing studies tend to examine tariff policy and digitalization as separate instruments, with limited synthesis on how their interaction shapes revenue optimization within extractive governance frameworks. This study aims to address this gap by systematically reviewing the literature on the role of tariff policy and digital governance in optimizing coal-sector NTR. This study employs a non-empirical qualitative SLR. Relevant national and international journal articles, policy reports, and academic publications published within the last decade were identified through structured database searches and screened using predefined inclusion and exclusion criteria. The selected literature was analyzed using narrative and thematic synthesis to identify recurring patterns, governance mechanisms, and conceptual linkages related to NTR optimization. The results indicate that tariff policy remains a central fiscal instrument in coal-sector NTR management, particularly when tariff structures are adaptive, transparent, and aligned with administrative capacity. The literature also shows that digitalization enhances NTR management indirectly by improving administrative efficiency, data accuracy, compliance assurance, and inter-agency coordination. Importantly, the findings suggest that digitalization alone is insufficient to optimize NTR outcomes without coherent institutional frameworks and effective governance coordination. The integrated synthesis reveals that tariff policy and digitalization are mutually reinforcing when implemented in a coordinated manner. Digital governance mechanisms strengthen the credibility and enforceability of tariff policy, while sound tariff design provides the fiscal foundation for effective digital implementation. This interaction constitutes the main conceptual contribution of the study.

Keywords: Coal Sector, Digitalization, Non-Tax Revenue, Tariff Policy, Systematic Literature Review.

INTRODUCTION

Non-Tax Revenue (NTR) has increasingly been recognized in contemporary public finance literature as a strategic component of government revenue, particularly in resource-rich economies where

income from extractive activities complements conventional taxation. Recent studies emphasize that revenues derived from natural resource exploitation constitute a key mechanism through which the state transforms ownership rights over public assets into fiscal capacity, while simultaneously confronting challenges related to revenue volatility, compliance, and governance effectiveness (Prichard et al., 2018). In extractive industries, NTR functions not only as a budgetary instrument but also as a regulatory tool that shapes economic incentives, reporting behavior, and the sustainability of resource utilization.

While classical public finance theory provides the foundational rationale for non-tax revenue as a complement to taxation in fulfilling allocative, distributive, and stabilization functions (Musgrave & Musgrave, 1989; Rosen & Gayer, 2009), more recent scholarship places greater emphasis on institutional quality and governance arrangements as key determinants of revenue performance. From this perspective, revenue systems are expected not merely to maximize fiscal returns, but also to promote efficiency, equity, and long-term sustainability through adaptive fiscal instruments and effective administrative mechanisms, particularly in sectors characterized by finite and non-renewable natural resources (Daniel et al., 2010).

The strategic importance of NTR is especially pronounced in extractive sectors such as coal mining, which has historically constituted a major contributor to Indonesia's state revenue. However, NTR derived from coal exhibits substantial volatility, reflecting fluctuations in global commodity prices, production dynamics, and changes in regulatory frameworks. Empirical evidence from Indonesia confirms this pattern. Anggara & Andari (2023) demonstrate that adjustments in coal royalty tariff policies significantly affect market reactions and revenue outcomes, underscoring the sensitivity of NTR performance to fiscal instrument design. Similarly, Tama (2024) finds that coal price benchmarks, export performance, investment dynamics, and exchange rate movements jointly shape regional and national revenue structures, indicating that macroeconomic conditions and fiscal mechanisms interact closely in determining NTR realization.

To convert natural resource endowments into public revenue streams, governments primarily rely on royalties, production fees, and tariff-based instruments. Classical and contemporary studies conceptualize mining royalties and tariffs as mechanisms for capturing economic rent generated from non-renewable resource extraction and translating state ownership rights into public income (Otto et al., 2006; Boadway & Keen, 2009). Nevertheless, reliance on extractive-based NTR exposes public finances to significant volatility. Early evidence highlights that mineral and coal revenues fluctuate sharply with global commodity price cycles, generating instability in government revenue streams (Tilton, 1996). More recent analyses reinforce this view, showing that heavy dependence on natural resource revenues increases fiscal vulnerability to external shocks and commodity cycles (International Monetary Fund, 2022).

Subsequent empirical studies further demonstrate that mining-related revenues are highly sensitive to changes in international prices, production volumes, and regulatory settings (Daniel et al., 2010). In the Indonesian context, Utami et al. (2024) show that variations in coal prices, firm profitability, and macroeconomic indicators significantly affect the coal sector's contribution to state revenue. Such volatility complicates fiscal planning, weakens budget predictability, and constrains long-term development financing, thereby highlighting the urgency of strengthening NTR governance in the coal sector.

Within this context, tariff policy has received considerable attention as a key determinant of NTR performance. Tariff levels and structures directly influence mining companies' financial obligations, production decisions, and investment behavior (Otto et al., 2006). While poorly designed tariff regimes may discourage investment and erode long-term revenue potential, adaptive and rent-based tariff structures, such as ad valorem or price-linked royalties, have been shown to enhance revenue responsiveness to commodity price movements without undermining sector competitiveness (Babu et al., 2003; Daniel et al., 2017). However, the effectiveness of tariff policy is constrained by administrative capacity. Complex tariff structures increase compliance costs and heighten the risk of underreporting when monitoring and enforcement mechanisms are weak (Schlereth et al., 2010). Evidence from Indonesia further indicates that revisions to coal royalty tariffs influence not only revenue outcomes but also investment expectations and market behavior (Anggara & Andari, 2023).

Alongside tariff policy, digitalization has emerged as an increasingly important component of public revenue management. Advances in information technology have transformed public financial administration through electronic reporting, automated assessment, and real-time monitoring. Digital revenue systems are shown to reduce administrative costs, improve data accuracy, and enhance

transparency in revenue collection processes (Gupta et al., 2017). From a governance perspective, digital government initiatives strengthen accountability when embedded within coherent institutional frameworks and supported by inter-agency coordination. In Indonesia, digital platforms such as e-PNBP Minerba, SIMPONI, and the integrated SIMBARA system have been introduced to synchronize data on production, exports, and royalty payments in the mineral and coal sector. Empirical studies suggest that such platforms improve payment processes, reduce administrative bottlenecks, and enhance compliance assurance (Situmorang & Al-Afgani, 2023).

Nevertheless, the literature cautions that digitalization alone is insufficient to optimize revenue outcomes. Fragmented digital initiatives and weak institutional coordination may replicate existing administrative silos and limit the effectiveness of technological reforms. Mergel et al. (2019) emphasized that digital transformation in the public sector extends beyond the mere digitization of processes, requiring fundamental changes in organizational practices, inter-agency collaboration, and governance arrangements.

Recent evidence from Indonesia further highlights the fiscal and developmental implications of natural resource revenue governance. Brehm et al. (2024) using district-level data, demonstrate that both resource extraction and shared natural resource revenues significantly affect local economic outcomes, with revenue-sharing mechanisms generating substantial spillover effects even in regions without direct extraction activities. These findings underscore that the effectiveness of extractive revenues depends not only on the magnitude of resource rents but also on institutional arrangements governing revenue allocation, coordination, and utilization. Although their analysis focuses on revenue-sharing and growth outcomes, it reinforces the broader argument that governance structures critically mediate the fiscal and economic impacts of natural resource revenues.

From a theoretical standpoint, the governance of NTR from extractive industries can be understood through the integration of state revenue theory and stewardship-oriented governance. State revenue theory frames NTR as economic returns derived from state ownership over natural resources, implying both fiscal entitlement and responsibility for collective welfare (Musgrave & Musgrave, 1989; Rosen & Gayer, 2009). Complementing this view, stewardship theory posits that public officials act as stewards motivated by collective goals, institutional trust, and public value creation rather than narrow self-interest (Donaldson & Davis, 1991; Davis et al., 1997). Recent public administration studies demonstrate that effective governance regimes balance control-based mechanisms with trust-based stewardship, particularly in settings involving complex inter-agency coordination and information asymmetry (Schillemans & Bjurstrøm, 2020).

At the macro level, international evidence indicates that natural resource revenues constitute a significant share of total government revenue in many commodity-exporting countries, yet they are among the most volatile components of public finance (International Monetary Fund, 2022; World Bank, 2022). In Indonesia, NTR remains a major contributor to state revenue, with coal consistently among the largest sources. However, pronounced year-to-year fluctuations and recent declines following earlier peaks reveal persistent structural weaknesses in coal-related NTR governance, particularly in tariff calibration, compliance monitoring, and institutional integration.

Despite the extensive literature on tariff policy, digitalization, and extractive revenue governance, important gaps remain. Existing studies tend to examine tariff design and digital reforms separately, focusing either on fiscal instrument design and rent capture mechanisms or on administrative and technological improvements, without sufficiently integrating governance and institutional behavior perspectives (Prichard et al., 2018). Moreover, limited research systematically synthesizes how adaptive tariff policy and digital governance interact within a unified framework to optimize NTR in extractive sectors. This gap is particularly evident in coal-dependent developing economies such as Indonesia, where regulatory reforms and digital initiatives have progressed in parallel but remain unevenly integrated.

Addressing this gap, the present study conducts a SLR to critically synthesize academic research on tariff policy and digitalization in the management of Non-Tax Revenue from coal mining. The novelty of this study lies in its integrative perspective, which connects fiscal instrument design with digital governance and stewardship-oriented institutional frameworks. By clarifying how tariff policy and digitalization jointly influence revenue stability, compliance, and transparency, this study provides a consolidated state of the art and a conceptual foundation for future empirical research and evidence-based policy development in extractive revenue governance. 1) How does tariff policy influence the performance and optimization of NTR in the coal sector? 2) How does digitalization enhance the management and optimization of NTR in the coal sector?

RESEARCH METHOD

This study adopts a SLR as its primary research method to synthesize and critically evaluate existing academic findings and empirical evidence concerning the role of supervision and governance mechanisms in the optimization of NTR. The SLR approach is employed to enable an in-depth examination of the literature and to map how prior studies have addressed NTR optimization across different analytical dimensions, institutional settings, and governance perspectives (Tranfield et al., 2003; Snyder, 2019; Xiao & Watson, 2019).

An SLR is particularly suitable for this study because it enables a structured and comprehensive synthesis of a research field that remains relatively fragmented and underexplored, particularly with respect to tariff policy and digitalization in Non-Tax Revenue (NTR) governance. Prior studies demonstrate that SLRs are effective tools for systematically mapping research themes and methodological patterns in public finance and governance research (Albadarin et al., 2024; Gaur & Saxena, 2023). Meanwhile, empirical and conceptual studies on NTR management, fiscal supervision, and digitally enabled public revenue administration highlight the fragmented and sector-specific nature of existing evidence, reinforcing the need for an integrative review (Pahmi et al., 2022; Zuhri et al., 2023; Sudirman et al., 2025; Minsih et al., 2025).

The scope of the review covers literature addressing NTR, state revenue governance, public financial management, and public services, drawing on publications indexed in Scopus, ScienceDirect, Emerald Insight, and Google Scholar. In addition, selected official NTR reports issued by the Ministry of Finance are incorporated to provide institutional and regulatory context. The review period spans 1998–2025, a timeframe chosen to capture recent developments in NTR governance while acknowledging the still limited volume of scholarly work in this area. To ensure methodological rigor, transparency, and replicability in the literature selection process, this study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. PRISMA is applied as a procedural guide for systematically identifying, screening, assessing eligibility, and selecting relevant studies using explicit inclusion and exclusion criteria, thereby strengthening the reliability and credibility of the review (Page & Moher, 2017; Snyder, 2019).

Consistent with the PRISMA framework, the SLR was conducted through four sequential stages: identification, screening, eligibility, and inclusion.

Identification, At this stage, a comprehensive search was conducted across the selected databases using keywords such as *"NTR," "Non-Tax Revenue," "state revenue governance," "public financial management,"* and *"public services."* This process yielded records from Emerald Insight and Google Scholar as the primary sources, supplemented by official NTR reports published by the Ministry of Finance to strengthen contextual validity.

Screening, The identified records were subsequently screened by reviewing titles and abstracts to eliminate duplicate publications and exclude studies that did not fall within the scope of public sector revenue or NTR governance. Screening criteria were applied to ensure that publications were released between 1998 and 2025, focused on the public sector, addressed non-tax revenue, and were available as open access sources. This stage substantially reduced the number of records retained for further analysis.

Eligibility, In the eligibility stage, full-text assessments were conducted using predefined inclusion and exclusion criteria. Studies were included if they examined supervision, public financial management, internal control, or governance mechanisms and demonstrated a clear relationship between governance arrangements and revenue performance. Studies focusing solely on taxation, private-sector issues, or purely conceptual discussions without substantive governance analysis were excluded. As a result, a refined set of articles meeting the eligibility criteria was retained for qualitative synthesis.

Inclusion, In the final inclusion stage, a more selective evaluation was undertaken to ensure that the retained studies provided sufficient empirical evidence or robust theoretical discussion directly relevant to NTR management, supervision, and optimization. Based on this assessment, twenty five core studies were included as the primary analytical sources for answering the research questions. A summary of the article selection process is presented in Figure 1 (PRISMA Flow Diagram).

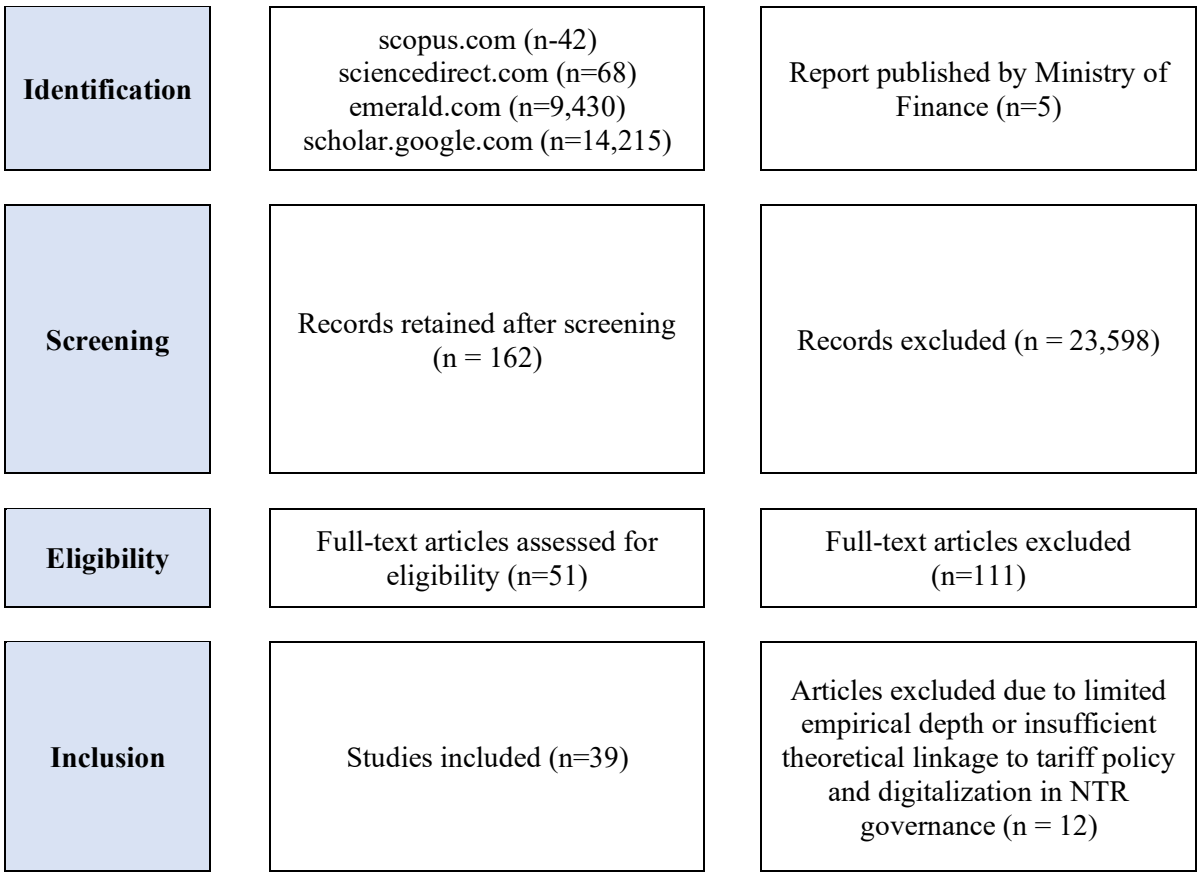

Figure 1. PRISMA Results

Following the PRISMA-based literature selection process presented in Figure 1, the methodological design of this study is further guided by a conceptual framework that structures the synthesis and interpretation of the reviewed literature. While the PRISMA flow diagram ensures transparency, rigor, and replicability in identifying and selecting relevant studies, the conceptual framework serves a distinct analytical function by organizing and integrating the evidence derived from the selected literature.

Specifically, the framework provides an analytical lens for mapping and synthesizing findings related to two core determinants, tariff policy and digitalization, and their direct relationship with NTR performance in the coal sector. Rather than functioning as an empirical or causal model, the framework supports a structured comparison of how these relationships have been examined across different institutional, fiscal, and governance contexts within the existing literature.

RESULTS AND DISCUSSION

Based on the PRISMA-based selection process, a total of thirty-nine (39) journal articles and policy-oriented studies were retained for qualitative synthesis. These studies represent a broad spectrum of empirical evidence, conceptual frameworks, and governance perspectives related to tariff policy, digitalization, and Non-Tax Revenue (NTR) optimization, particularly within extractive and public finance contexts. To ensure analytical clarity and transparency, the selected literature was systematically mapped into a structured matrix, summarizing each study's authors and publication year, main variables, and key findings. This mapping enables a comparative synthesis of how prior studies conceptualize and empirically examine the mechanisms through which tariff policy and digital governance influence NTR performance.

Table 1 presents the consolidated matrix of reviewed studies, which serves as the primary empirical foundation for addressing the research questions formulated in this study.

Table 1. Summary of Reviewed Studies on Tariff Policy, Digitalization, and Non-Tax Revenue (NTR) Optimization

No	Author(s) – Year	Main Variable(s)	Key Findings
1	(Gupta et al., 2017)	Digitalization; Revenue Administration	Digitalization of revenue administration enhances transparency, reduces administrative and compliance costs, and strengthens compliance capacity through electronic filing, real-time or high-frequency reporting, and automated data matching and reconciliation mechanisms.
2	(Situmorang & Al-Afgani, 2023)	E-Government; NTR Management	Digital platforms (e-PNBP Minerba, SIMPONI) enhance payment efficiency, reduce delays, and improve governance quality in mineral and coal NTR collection.
3	(Anggara & Andari, 2023)	Tariff Policy; Coal Royalty	Changes in coal royalty tariffs significantly affect revenue realization and market expectations, indicating the sensitivity of NTR performance to tariff design.
4	(Tama, 2024)	Coal Price; Exchange Rate; NTR	Coal price benchmarks, export performance, and exchange rates jointly influence coal-based NTR volatility in Indonesia.
5	(Otto et al., 2006)	Royalty Structure; Tariff Design	Royalties and tariffs function as rent-capture instruments converting state ownership of natural resources into public revenue.
6	(Boadway & Keen, 2009)	Resource Taxation; State Revenue	Well-designed rent-based tariffs improve revenue efficiency without discouraging investment in extractive industries.
7	(Daniel et al., 2010)	Fiscal Regime; Resource Revenue	Adaptive royalty and tariff systems increase revenue responsiveness to commodity price fluctuations.
8	(Tilton, 1996)	Commodity Prices; Revenue Volatility	Mineral and coal revenues are highly volatile and strongly correlated with global price cycles.
9	(International Monetary Fund, 2022)	Natural Resource Revenue; Fiscal Stability	Heavy dependence on extractive revenues increases fiscal vulnerability and necessitates stronger governance mechanisms.
10	(Prichard et al., 2018)	Governance; Revenue Compliance	Inter-agency coordination and transparency are critical determinants of effective non-tax revenue collection.
11	(Mergel et al., 2019)	Digital Transformation; Public Sector	Digitalization improves performance only when accompanied by organizational and governance reforms.
12	(Wu et al., 2017)	Coal Industry Competitiveness; Regulatory Environment	Regulatory frameworks and pricing mechanisms significantly influence coal industry performance and competitiveness. These effects have indirect implications for the sector's fiscal contribution through their impact on production capacity, efficiency, and market conditions.
13	(Utami et al., 2024)	Coal Prices; Firm Profitability	Coal prices and firm-level profitability significantly affect NTR realization in coal-producing regions.
14	(Albadarin et al., 2024)	Digital Governance; Public Finance	Digital public finance systems enhance accountability and monitoring effectiveness.

No	Author(s) – Year	Main Variable(s)	Key Findings
15	(Nugroho et al., 2024)	Fiscal Supervision; NTR	Strengthened supervision improves compliance and revenue realization in non-tax revenue systems.
16	(Peng, 2011)	Sector Reform; Policy Integration; Central–Local Governance	Coal sector reforms and decentralization significantly improved production efficiency; however, weak coordination and policy fragmentation between central and local governments and across sectors reduced overall policy effectiveness.
17	(Prest & Stock, 2023)	Royalty Tariff; Commodity Prices; State Revenue	Climate-based royalty surcharges substantially increase government revenue, but reveal trade-offs between revenue maximization and broader policy objectives such as emissions reduction.
18	(Pramugar & Sinaga, 2021)	E-Government; Mining NTR; System Integration	E-government implementation improves transparency and accountability in mining NTR management; limited inter-agency system integration remains a key constraint to revenue optimization.
19	(Paschke et al., 2021)	Digital Transformation; Legal Framework; Mining Governance	Digital transformation enhances efficiency and data security in the mining sector; its effectiveness depends on regulatory readiness, institutional capacity, and coordination among stakeholders.
20	(Babu et al., 2003)	Coal Royalty; Price Structure; Non-Tax Revenue	Unit-based coal royalties are less responsive to price increases, causing real revenue erosion; ad valorem royalty systems better preserve non-tax revenue performance over time.
21	(Yudianto & Haryanto, 2018)	Royalty Policy; Coal Downstreaming; State Revenue	Government revenue outcomes from coal are highly sensitive to royalty rates, price policies, and downstreaming strategies; lower state revenue shares significantly improve downstream project viability.
22	(Chikkatur et al., 2007)	Tariff Incentives; Performance Monitoring; Regulatory Oversight	Performance-based tariff incentives improve efficiency when supported by transparent operational data, accurate reporting, and strong regulatory oversight mechanisms.
23	(Sun et al., 2019)	Vertical Integration; Corporate Performance; Coal Industry	Vertical integration significantly enhances firm performance through financial structure and market power channels, indicating the importance of organizational integration in strategic coal-sector outcomes.
24	(Brehm et al., 2024)	Revenue Sharing; Local Economy	Natural resource revenue governance affects regional economic outcomes beyond extraction areas.
25	(O'Faircheallaigh, 1998)	Equity; Mineral Taxation	Fair and inclusive tariff design enhances legitimacy and long-term sustainability of mineral-based revenue systems.
26	(Alam et al., 2019)	Accountability; Internal Control; Public Sector Governance	Integrity systems, internal control mechanisms, and leadership practices significantly enhance public sector accountability. Improved accountability conceptually supports compliance behavior

No	Author(s) – Year	Main Variable(s)	Key Findings
			and strengthens governance in public revenue management.
27	(Wibowo & Murwaningsari, 2024)	Internal Control; Accountability; Governance; NTR Sustainability	Internal control mechanisms and accountability have a direct and significant effect on the sustainability of non-tax revenue (NTR). Accountability mediates the relationship between internal control, leadership, and information systems and NTR sustainability, indicating that governance quality is critical for long-term revenue performance.
28	(Januar et al., 2024)	Information Technology; Supervision and Audit; Use of PNBP (NTR) Funds; NTR Management	The use of information technology, supervision and audit, utilization of PNBP (NTR) funds, and implementation of sanctions have a positive and significant effect on the quality of NTR management in ministries and state institutions.
29	(Yasin et al., 2024)	Supervision; Public Financial Management	Fiscal supervision improves accountability and reduces deviations in public revenue management.
30	(Tengberg & Valencia, 2018)	Institutional Integration; Policy Coordination; Natural Resource Governance	Effective natural resource governance requires integrated institutional arrangements and policy coordination across sectors and governance levels. Fragmentation of policies and institutions weakens implementation effectiveness, while integrated approaches improve governance outcomes.
31	(Brown et al., 2016)	Commodity Price; Revenue Stability	Coal-based revenues are structurally volatile, requiring risk-aware fiscal and royalty instruments.
32	(Liu et al., 2017)	Regulation; Industry Performance	Regulatory certainty significantly influences production decisions and fiscal outcomes in the coal industry.
33	(Zhao et al., 2022)	ICT; Organizational Arrangement; Public Sector Governance	Digital tools enhance monitoring capacity and data transparency; however, their effectiveness depends on organizational arrangements, legal and policy frameworks, and institutional coordination. Digitalization alone is insufficient to improve public sector performance.
34	(Matyjaszek et al., 2018)	Investment Climate; Tariff Policy	Stable and predictable tariff policies are critical for sustaining coal mining investment.
35	(Bartle et al., 2011)	Revenue Composition; Decentralization	Non-tax revenue contributes to local fiscal capacity but weak coordination limits optimization.
36	(Indrawati et al., 2024)	Fiscal Sustainability; NTR	Strengthening non-tax revenue is essential for post-pandemic fiscal consolidation.
37	(Schlereth et al., 2010)	Tariff Structure; Revenue Optimization	Two-part tariff structures optimize revenue when supported by strong monitoring systems.
38	(Rahman & Raphael, 2025)	Coal Downstreaming; Economic Value; State Revenue	Coal downstreaming increases value added and non-tax state revenue, but its effectiveness depends on regulatory support, investment feasibility, and inter-agency coordination.

No	Author(s) – Year	Main Variable(s)	Key Findings
39	(Abcede & Gera, 2018)	Legal Integration; Governance; Mining Regulation	Fragmented legal and institutional frameworks weaken coordination and reduce the effectiveness of mineral revenue governance, highlighting the need for integrated regulatory systems.

This section presents the findings of a systematic literature review conducted using national and international journals, research monographs, government regulations, and academic manuscripts related to NTR, particularly in the coal sector. The analysis focuses on the role of tariff and digitalization as the two main determinants of NTR optimization. The findings of the systematic literature review indicate that tariff policy remains the most decisive fiscal instrument in optimizing NTR within coal-based extractive sectors. Recent studies consistently show that the effectiveness of tariff policy is determined not merely by tariff rates, but by tariff structure, adaptability to market conditions, and alignment with administrative capacity.

Tariff Design and Revenue Performance

Contemporary literature emphasizes that adaptive and price-linked tariff structures play a critical role in stabilizing government revenue derived from coal extraction. Studies on extractive fiscal regimes demonstrate that tariff mechanisms incorporating variable components, such as ad valorem or price-indexed tariffs, allow state revenue to adjust automatically to fluctuations in global commodity prices, thereby reducing revenue volatility (International Monetary Fund, 2022; Prest & Stock, 2023). In contrast to rigid tariff regimes, adaptive tariff designs enhance revenue responsiveness while preserving investment incentives, particularly in capital-intensive extractive industries. Empirical evidence from resource-dependent economies indicates that such tariff structures improve fiscal predictability and mitigate the risk of revenue shortfalls during commodity price downturns (World Bank, 2022; International Monetary Fund, 2022; IMF, 2025).

Within this framework, NTR performance in the coal sector can be conceptually represented as:

$$NTR = Tariff \times Volume \times Price \times Exchange\ Rate + Compliance\ Adjustment$$

This formulation is presented as a conceptual synthesis derived from the reviewed literature, rather than an empirical estimation. This formulation highlights tariff policy as the central fiscal lever influencing NTR outcomes, while also acknowledging the interaction with production dynamics, market prices, and compliance behavior.

Tariff Alignment, Compliance, and Administrative Capacity

Beyond tariff design, recent studies underscore the importance of aligning tariff levels with production capacity and compliance capability. Evidence from Indonesia shows that excessively high or poorly calibrated tariffs may discourage accurate reporting and weaken compliance, ultimately undermining revenue realization (Wibowo & Murwaningsari, 2024). Conversely, tariff regimes that balance fiscal objectives with operational feasibility tend to promote voluntary compliance and reporting accuracy. Digital-era fiscal studies highlight that tariff credibility, defined by fairness, transparency, and consistency, directly influences taxpayer behavior in non-tax revenue systems (Prichard et al., 2018; International Monetary Fund, 2022).

In this context, selective tariff differentiation, including the application of zero-rated tariffs for specific services, has been identified as a governance strategy to maintain fiscal equity while safeguarding revenue efficiency (Wibowo & Murwaningsari, 2024). Such approaches reflect a shift from revenue maximization toward revenue optimization, where sustainability and compliance are prioritized.

Tariff Policy, Fiscal Stability, and Governance

Recent fiscal governance literature reinforces the role of tariff policy in strengthening long-term revenue stability. Studies by the International Monetary Fund (2022, 2025) demonstrate that predictable and transparent tariff frameworks enhance fiscal planning, reduce exposure to commodity cycles, and support macro-fiscal sustainability in resource-dependent economies.

From an institutional perspective, tariff policy also embodies the state's dominial authority over natural resources, translating constitutional ownership into measurable public revenue. In the Indonesian context, this aligns with Article 33 of the 1945 Constitution, which mandates that natural resources be

managed for the greatest benefit of the people. Accordingly, tariff policy functions not only as a fiscal instrument but also as a governance mechanism that ensures equitable distribution of economic rent derived from coal resources.

Based on the synthesis of recent literature, the influence of tariff policy on NTR optimization can be categorized into four interrelated dimensions, as summarized in Table 1.

Table 2. Synthesis of RQ1 Findings

Thematic Dimension	Key Evidence (Recent Literature)	Implications for NTR Optimization
Adaptive Tariff Design	Price-linked and ad valorem tariff structures improve revenue responsiveness and reduce exposure to commodity price volatility (International Monetary Fund, 2022; Prest & Stock, 2023).	Adaptive, data-driven tariff design enhances fiscal predictability and resilience.
Tariff Calibration and Compliance	Poorly calibrated tariffs weaken reporting accuracy, while fair and transparent tariffs promote voluntary compliance (Wibowo & Murwaningsari, 2024; Prichard et al., 2018).	Tariff levels should align with production capacity and administrative capability to maximize realized revenue.
Fiscal Stability and Governance	Predictable tariff frameworks strengthen fiscal planning and mitigate commodity-cycle risks in resource-dependent economies (International Monetary Fund 2022, 2025).	Institutionalized tariff evaluation supports macro-fiscal sustainability and governance credibility.
Revenue Optimization Orientation	Modern extractive fiscal regimes emphasize revenue optimization rather than maximization, balancing stability, compliance, and equity (International Monetary Fund 2022, 2025).	Tariff policy should prioritize sustainable and equitable revenue outcomes over short-term gains.

Overall, the synthesis confirms that tariff policy functions as a central fiscal and governance instrument in optimizing NTR in the coal sector. Adaptive, transparent, and well-calibrated tariffs not only stabilize revenue performance but also enhance compliance and ensure equitable management of natural resource rents, consistent with Indonesia's constitutional mandate.

The synthesis of the reviewed literature indicates that digitalization functions not merely as an administrative tool, but as a governance mechanism that conditions the effectiveness of NTR optimization in the coal sector. Rather than directly increasing revenue, digitalization reshapes institutional capacity, compliance behavior, and supervisory effectiveness across the revenue cycle. The reviewed studies converge on the view that the contribution of digitalization to NTR optimization operates through three interrelated governance pathways: system integration and administrative efficiency, compliance assurance and data accuracy, and inter-agency coordination and transparency.

Digitalization as an Enabler of Integrated Fiscal Governance

Recent literature emphasizes that digital revenue systems enhance administrative efficiency by automating data processing, reducing manual intervention, and enabling real-time synchronization across fiscal institutions (Gupta et al., 2017). Digital platforms accelerate payment cycles, minimize reporting delays, and improve revenue predictability in public financial management (Pramugar & Sinaga, 2021). However, the synthesis highlights that efficiency gains alone do not guarantee optimal NTR outcomes. Digitalization becomes effective only when embedded within integrated governance structures that connect fiscal, regulatory, and supervisory functions. In the coal sector, integrated digital systems facilitate the consolidation of data on production, exports, and royalty payments, thereby narrowing the gap between potential and realized NTR.

Compliance and Data Accuracy

Beyond efficiency, the literature underscores the role of digitalization in strengthening compliance and data integrity. Digital supervision and audit mechanisms enable automated validation of transactions, cross-checking of reported volumes and prices, and continuous monitoring of fiscal obligations (Januar et al., 2024). Studies further suggest that digital traceability enhances accountability

by creating verifiable audit trails throughout the revenue process (Situmorang & Al-Afgani, 2023). Digital-based internal control systems reinforce the link between fiscal policy execution and actual revenue realization, reducing opportunities for underreporting and leakage while supporting the sustainability of NTR collection (Wibowo & Murwaningsari, 2024).

Importantly, the synthesis indicates that digital compliance mechanisms do not substitute for effective tariff design, but rather amplify the credibility and enforceability of tariff policy.

Transparency, Inter-Agency Coordination, and State Revenue Governance

A central theme emerging from the recent literature is the role of digitalization in enhancing inter-agency coordination and transparency in NTR governance. Integrated digital systems enable automatic reconciliation of data across ministries and agencies responsible for NTR collection and oversight, ensuring consistency between production records, export declarations, and payment information (Gupta et al., 2017; Situmorang & Al-Afgani, 2023). Empirical and policy-oriented studies indicate that such interoperability reduces information asymmetry and strengthens cross-institutional supervision in extractive revenue management (Mergel et al., 2019; Schillemans & Bjurstrøm, 2020; Prichard et al., 2018).

From a contemporary governance perspective, digital integration transforms state ownership over natural resources into transparent, data-driven revenue control mechanisms, thereby enhancing accountability and enforcement capacity in extractive sectors (Gupta et al., 2017; World Bank, 2022). Recent studies emphasize that digitalization shifts revenue supervision from ex post administrative audits toward continuous, technology-enabled monitoring, improving traceability and reducing fiscal leakage risks in non-tax revenue systems (Prichard et al., 2018; International Monetary Fund, 2022).

Nevertheless, recent literature consistently cautions that digitalization alone is insufficient in the absence of institutional coordination and governance coherence. Fragmented digital initiatives may reproduce existing administrative silos and limit their impact on revenue optimization when data-sharing arrangements, legal mandates, and accountability structures are weak (Mergel et al., 2019; World Bank, 2022).

Table 3. Synthesis of RQ2 Findings

Thematic Dimension	Key Evidence	Implications for NTR Optimization
Integrated System Efficiency	Digital revenue platforms improve efficiency and enable real-time fiscal monitoring (Gupta et al., 2017; Pramugar & Sinaga, 2021).	Enhances administrative capacity and reduces implementation gaps.
Compliance and Data Integrity	Digital supervision strengthens audit quality and reporting accuracy (Januar et al., 2024; Wibowo & Murwaningsari, 2024)	Improves compliance and reduces underreporting and leakage.
Transparency and Coordination	Integrated systems enhance accountability and inter-agency collaboration (Situmorang & Al-Afgani, 2023).	Strengthens coordinated fiscal governance and revenue control.

Digitalization enhances the optimization of NTR by improving administrative efficiency, compliance accuracy, and inter-agency coordination. It creates an integrated and transparent ecosystem of fiscal governance, which is essential for sustaining reliable revenue performance in the coal sector.

Integrated Synthesis: The Synergy between Tariff and Digitalization

The integrated synthesis of RQ1 and RQ2 reveals that tariff policy and digitalization are mutually reinforcing components of NTR optimization, rather than independent policy instruments. While tariff policy defines fiscal parameters and economic incentives, digitalization ensures that these parameters are implemented consistently, transparently, and credibly across institutions.

The literature suggests that adaptive tariff structures yield optimal results only when supported by digitally integrated supervision systems that enable real-time monitoring, cross-verification, and compliance enforcement. Conversely, advanced digital systems cannot compensate for poorly designed or non-credible tariff regimes.

This interaction highlights that NTR optimization in the coal sector is fundamentally a governance challenge, requiring the alignment of fiscal instrument design and digital governance capacity. The synergy between tariff policy and digitalization constitutes the core contribution of this study and provides a consolidated conceptual framework for understanding extractive revenue optimization in resource-dependent economies.

Based on the PRISMA-based systematic literature review, this study develops a conceptual model that synthesizes the key relationships identified in prior research. The model positions tariff policy and digitalization as core governance-based determinants of NTR optimization in the coal sector. Rather than functioning as an empirical estimation model, this framework serves as a conceptual foundation that clarifies variable selection and theoretical linkages. Accordingly, the model is intended to be used as a reference framework for subsequent empirical research examining the quantitative and causal relationships between tariff structures, digital system integration, and NTR performance.

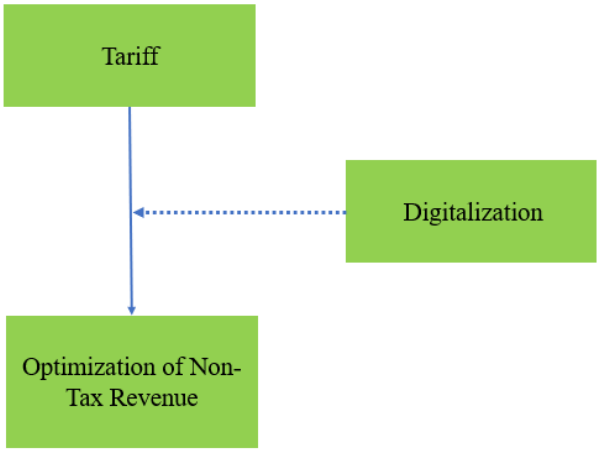

Figure 2. Conceptual Model

CONCLUSION

This study provides a systematic synthesis of the literature on tariff policy and digitalization in the management and optimization of NTR in the coal sector using a non-empirical SLRapproach. By addressing two research questions, the study consolidates existing evidence on how fiscal instruments and digital governance mechanisms interact in extractive revenue systems. With regard to tariff policy (RQ1), the review indicates that tariff design plays a central role in NTR optimization. The literature consistently emphasizes that adaptive, transparent, and well-calibrated tariff structures, such as ad valorem and price linked tariffs, support revenue stability, improve compliance, and contribute to more equitable management of non-renewable resources. Tariff effectiveness is shown to depend not only on tariff levels, but also on alignment with administrative capacity and governance arrangements. Regarding digitalization (RQ2), the findings suggest that digital systems enhance NTR management by strengthening administrative efficiency, data accuracy, compliance assurance, and inter-agency coordination. Digitalization enables real-time monitoring, automated validation, and improved transparency across the revenue cycle. However, the literature also highlights that digitalization alone is insufficient to optimize NTR outcomes in the absence of coherent institutional frameworks and effective governance coordination.

The integrated synthesis of RQ1 and RQ2 shows that tariff policy and digitalization function as mutually reinforcing components in NTR optimization. Digital governance mechanisms enhance the credibility and enforceability of tariff policy, while sound tariff design provides the fiscal foundation for effective digital implementation. This interaction underscores that NTR optimization in the coal sector is fundamentally a governance challenge rather than a purely technical or fiscal one. Future research may extend the findings of this review by conducting empirical studies to examine the interaction between tariff structures and levels of digital system integration in coal-sector NTR management. Comparative studies across countries and extractive sectors may also provide broader insights into how different institutional contexts shape the effectiveness of tariff–digitalization alignment. Such research would complement the conceptual synthesis offered by this study and contribute to evidence-based policymaking in extractive revenue governance.

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AUTHOR CONTRIBUTIONS

Conceptualization and methodology, Syafardi, Wati, and Ispriyahadi; software, Syafardi; Validation, Wati and Ispriyahadi; Formal Analysis, Syafardi, Wati, and Ispriyahadi; Investigation, Syafardi; Resources, Syafardi; Data Curation, Syafardi, Wati, and Ispriyahadi; Writing – Original Draft Preparation, Syafardi; Writing – Review & Editing, Syafardi, Wati, and Ispriyahadi; Visualization, Syafardi; Supervision, Wati and Ispriyahadi.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

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